2023

School of EE Lab Introductions

KAIST EE

교 수 현 황

KAIST

KAIST

전기및전자공학부 교수 현황

(전화) 042-350-**** / 랩방문 시에는 통화후 방문하세요.

No	교수명	그룹	연구실 전화번호	건물명	연구실 위치	랩 위치	교수KAIST메일	랩전화번호
1	강준혁	Communication	7422	IT융합센터 (N1)	714	719	jkang@kaist.ac.kr	7522
2	권경하	circuit	7467	나노종합기술원 (E19)	207	204	kyeongha@kaist.ac.kr	7567
3	김대식	Signal	3490	IT융합센터 (N1)	511	521	daeshik@kaist.ac.kr	8172~8174
4	김동준	Computer	7448	IT융합센터 (N1)	514	518	jjk12@kaist.ac.kr	7548, 7648
5	김문철	Signal	7419	LG홀 (N24)	1107	1106, 1108	mkimee@kaist.ac.kr	7519
6	김민준	Signal	7464	정보전자동 (E3-2)	3234	3239, 3244	minjun.kim@kaist.ac.kr	7564
7	김상식	Wave	7472	정보전자동 (E3-2) 6층구간	3209	3220, 3221	sangsik.kim@kaist.ac.kr	7572
8	김상현	Device	7452	정보전자동 (E3-2)	1225	1230	shkim.ee@kaist.ac.kr	7552
9	김성민	Computer	7453	IT융합센터 (N1)	913	918	songmin@kaist.ac.kr	7553
10	김용대	Computer	7430	CHiPS (N26)	203	201	yongdaek@kaist.ac.kr	7530
11	김용훈	Device	7423	정보전자동 (E3-2)	5223	N5 2148	y.h.kim@kaist.ac.kr	7523
12	김이섭	Circuit	3460	나노종합기술원 (E19)	208	204	leesup@kaist.ac.kr	8060
13	김정호	Wave	3458	나노종합기술원 (E19)	114	112	joungho@kaist.ac.kr	5458
14	김주영	Circuit	7461	정보전자동 (E3-2)	4202	4208, 4209	jooyoung1203@kaist.ac.kr	7561
15	김준모	Signal	3488	IT융합센터 (N1)	210	214	junmo.kim@kaist.ac.kr	8088
16	김창익	Signal	7421	IT융합센터 (N1)	413	419	changick@kaist.ac.kr	7521
17	김현식	Circuit	7457	정보전자동 (E3-2)	4223	4222, 4226	hyunskim@kaist.ac.kr	7557
18	김회린	Signal	7417	LG홀 (N24)	2111	2104, 2105	hoirkim@kaist.ac.kr	7517, 7617
19	김훈	Wave	7433	정보전자동 (E3-2)	4204	4203, 4210	hoonkim@kaist.ac.kr	7633
20	노용만	Signal	3494	IT융합센터 (N1)	414	418	ymro@kaist.ac.kr	5494, 8094
21	류승탁	Circuit	7425	정보전자동 (E3-2)	4225	4224, 4231, 4230	stryu@kaist.ac.kr	7625
22	명현	Signal	7451	정보전자동 (E3-2)-5층구간(동측)	3236	3237, 3245	hmyung@kaist.ac.kr	7551
23	문건우	Signal	3475	LG홀 (N24)	4101	4101	gwmoon@kaist.ac.kr	8075
24	문재균	Communication	3487	IT융합센터 (N1)	616	617	jaemoon100@kaist.ac.kr	5487, 8087
25	박경수	Computer	7412	IT융합센터 (N1)	813	820	kyoungsoo@kaist.ac.kr	7512, 7612
26	박성욱	Wave	7414	정보전자동 (E3-2)	5206	5205, 5207, 5208	soparky@kaist.ac.kr	7514, 7614
27	박인철	Circuit	3461	나노종합기술원 (E19)	320	316	icpark@kaist.ac.kr	5461
28	박현욱	Signal	3466	fMRI 연구동(N23)	3113, fMRI 연구동(N23)	3105	hwpark@kaist.ac.kr	8066
29	박현철	Communication	7420	IT융합센터 (N1)	715	718	hcpark@kaist.ac.kr	7520, 6817
30	배준우	Wave	7446	정보전자동 (E3-2)	3203	3215, 3216	joonwoo.bae@kaist.ac.kr	7546
31	배현민	Circuit	3489	나노종합기술원 (E19)	307	304	hmbae@kaist.ac.kr	5489, 8089
32	서창호	Communication	7429	IT융합센터 (N1)	912	920	chsuh@kaist.ac.kr	7529
33	성영철	Communication	3484	IT융합센터 (N1)	614	619	ycsung@kaist.ac.kr	5484
34	손영익	wave	7466	정보전자동 (E3-2)	4206	4214, 4215	youngik.sohn@kaist.ac.kr	7566
35	송익호	Communication	3445	정보전자동 (E3-2)	4202	5201, 4219	isong@kaist.ac.kr	5445
36	신민철	Device	7418	정보전자동 (E3-2)	6204	5216, 5217, 6203	mshin@kaist.ac.kr	7518, 7618
37	신승원	Computer	7438	IT융합센터 (N1)	910	919	claude@kaist.ac.kr	7538, 7638
38	신영수	Circuit	3479	정보전자동 (E3-2)	6206	6205, 5219, 5220	youngsoo-p@kaist.ac.kr	5479
39	심현철	Computer	7445	IT융합센터 (N1)	308	312	hcshim@kaist.ac.kr	7138
40	안희진	Signal	7471	정보전자동 (E3-2)	3235	3238, 3246	heejin.ahn@kaist.ac.kr	7571
41	양경훈	Device	3471	정보전자동 (E3-2)	1223	1224, 1227	khyang@kaist.ac.kr	5471, 8071
42	원유집	Computer	7456	IT융합센터 (N1)	309	313	ywon@kaist.ac.kr	7556
43	유경식	Wave	7415	미래융합소자동(E3-3)	2309	2302	ksyu@kaist.ac.kr	7515

전기및전자공학부 교수 현황

(전화) 042-350-**** / 랩방문 시에는 통화후 방문하세요.

No	교수명	그룹	연구실 전화번호	건물명	연구실 위치	랩 위치	교수KAIST메일	랩전화번호
44	유민수	Computer	7447	IT융합센터 (N1)	809	818	mrhu@kaist.ac.kr	7547
45	유승협	Device	3483	정보전자동 (E3-2)	6202	6201, 6219, 6220	syoo_ee@kaist.ac.kr	5483
46	유재민	Computer		IT융합센터 (N1)	914 (임시)		yjm9595@kaist.ac.kr	
47	유종원	Wave	3478	정보전자동 (E3-2)	5204	5203, 5210	drjwyu67@kaist.ac.kr	5478
48	유창동	Signal	3470	LG홀 (N24)	2109	2106, 2108	cd_yoo@kaist.ac.kr	5470
49	유회준	Circuit	3468	정보전자동 (E3-2)	1221	1233, 1232, 1222	hjyoo@kaist.ac.kr	8068
50	윤기완	Device	7411	미래융합소자동(E3-3)	2306	2302	gwyoon@kaist.ac.kr	7511
51	윤영규	Signal	7449	LG홀 (N24)	4103	4102	ygyoon@kaist.ac.kr	7549
52	윤인수	Computer	7469	IT융합센터 (N1)	812	819	insuyun@kaist.ac.kr	7569
53	윤준보	Device	3476	나노종합기술원 (E19)	513	523	jbyoon@kaist.ac.kr	5476
54	윤찬현	Computer	3495	정보전자동 (E3-2)	3205	3206, 3211	chyoun@kaist.ac.kr	7261
55	이가영	Device	7468	미래융합소자동(E3-3)	2307	2302	kayoung.lee@kaist.ac.kr	7568
56	이동환	Signal	7462	IT융합센터 (N1)	307	314	donghwan@kaist.ac.kr	7562
57	이성주	Computer	7413	IT융합센터 (N1)	306	315	profsj@kaist.ac.kr	7513
58	이시현	Communication	7463	IT융합센터 (N1)	712	720	sihyeon@kaist.ac.kr	7563
59	이안오클리	Computer		새늘동	임시 1404호			
60	이정용	Device	7428	정보전자동 (E3-2)	6208	E4 523	jungyong.lee@kaist.ac.kr	7528
61	이준구	Wave	7416	정보전자동 (E3-2)	3208	3210, 3217	rhee.jk@kaist.ac.kr	7516
62	이현주	Device	7436	정보전자동 (E3-2)	4220	4221, 4233, 4232	hyunjoo.lee@kaist.ac.kr	7536, 7636
63	장동의	Signal	7440	LG홀 (N24)	1109	1110, 1103	dechang@kaist.ac.kr	7640
64	장민석	Wave	7439	정보전자동 (E3-2)	2221	2222, 2235	jang.minseok@kaist.ac.kr	7539, 7639
65	전상훈	Device	7444	나노종합기술원 (E19)	217	216	jeonsh@kaist.ac.kr	7544
66	정명수	Computer	7455	IT융합센터 (N1)	411	421	m.jung@kaist.ac.kr	7555
67	정완영	Circuit	7459	정보전자동 (E3-2)	4201	4207, 4207-1	wanyeong@kaist.ac.kr	7559
68	정재웅	Device	7442	나노종합기술원 (E19)	516	522	jjeong1@kaist.ac.kr	7542
69	정준선	Signal	7470	LG홀 (N24)	3102	3103	joonson@kaist.ac.kr	7570
70	정혜원	Communication	7441	IT융합센터 (N1)	206	213	hwchung@kaist.ac.kr	7541, 7641
71	제민규	Circuit	7437	나노종합기술원 (E19)	317	316	mkje@kaist.ac.kr	7537, 7637
72	조병진	Device	3485	나노종합기술원 (E19)	515	521	elebjcho81@kaist.ac.kr	5485
73	조성환	Circuit	3480	나노종합기술원 (E19)	308	304	chosta@kaist.ac.kr	5480
74	최경철	Device	3482	미래융합소자동(E3-3)	2308	2302	kyungcc@kaist.ac.kr	5482
75	최성율	Device	7427	정보전자동 (E3-2)	5221	5222, 5232, 5233	sungyool.choi@kaist.ac.kr	8353, 7627
76	최신현	Device	7450	정보전자동 (E3-2)	5224	5234, 5235	shinhyun@kaist.ac.kr	7550
77	최양규	Device	3477	나노종합기술원 (E19)	514	524	yangkyu@kaist.ac.kr	5477
78	최정우	Signal	7435	LG홀 (N24)	2102	2103	jwoo@kaist.ac.kr	7535, 7635
79	최준균	Computer	3459	문지캠퍼스	문지캠퍼스진리관 237	문지캠퍼스진리관244호	jkchoi59@kaist.ac.kr	5459, 6282
80	최준일	Communication	7460	IT융합센터 (N1)	716	717	junil@kaist.ac.kr	7560
81	최진석	Communication	7473	IT융합센터 (N1)	615	618	jinseok@kaist.ac.kr	7573, 7673
82	하정석	Communication	7424	IT융합센터 (N1)	612	620	mail2jsha@kaist.ac.kr	7524
83	한동수	Computer	7431	IT융합센터 (N1)	814	817	dhan.ee@kaist.ac.kr	7631
84	한수진	Signal	7474	새늘동	임시 1410호			
85	함자쿠르트	Wave	7465	정보전자동 (E3-2)	2223	2231, 2232	hamzakurt@kaist.ac.kr	7565
86	홍성철	Device	3449	나노종합기술원 (E19)	220	216	schong1234@kaist.ac.kr	79942
87	황의종	Computer	7443	IT융합센터 (N1)	516	519	swhang@kaist.ac.kr	7543

연구실별 소개자료

KAIST

KAIST

KAIST EE

Contents

<Professor Joonhyuk Kang's Lab.>

Advanced Radio Technology Labarotory

■ **Contact information**

Professor : Email: jkang@kaist.ac.kr TEL : 7422
Lab. : ITC building (N1), 719 TEL : 7522
Website : http://artlab.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 8 Master's Student: 10

■ **Research Areas**

The Advanced Radio Technology Laboratory (ART Lab) has researched advanced antenna technology to improve the performance and spectral efficiency of communication systems. In particular, we focused on machine learning based communication approach, wireless communication research for autonomous vehicles. Furthermore, future wireless systems, such as reconfigurable intelligent surface (RIS), edge computing, etc, are also important parts of our research area. Specific research topics are given as follows.

- ML for Communications and Communications for ML

Machine learning driven communications can enable wireless network analysis and can be of advantage in handling the increasing volume of communication and computation costs. Recently, ART Lab has been working on federated learning that can reduce communication overhead and guarantees data privacy. Also, we investigate problems related detection of the occupancy status of the sub-channel in a broadband cognitive radio network to increase spectrum usage efficiency.

- Wireless Communications for Autonomous Vehicles

Autonomous vehicle associated with advanced technology of wireless communications has sparked huge research interest, such as V2X, IoV, UAV-assisted system, and vehicular edge computing (VEC). However, the huge amount of traffic data poses challenges for wireless communication systems. ART Lab proposes solutions by researching energy-efficient task offloading over VEC system and also handling trajectory design problem in UAV-assisted networks.

- Future Wireless System

ART Lab has been actively working on multiple-input multiple-output (MIMO), space division multiple access (SDMA), and intelligent surface systems, such as RIS for future wireless communications. Also, we study for the 6G communication technology such as sub-THz communication or spatial mode multiplexing.

■ **Recommended courses & Career after graduation**

Recommended courses : Signal and Systems, **Probability and Statistics,** Communication Engineering, **Linear Algebra**

Career after graduation : A research institute such as Agency for Defense Development (ADD), Electronics and Telecommunications Research Institute (ETRI), and major company (Samsung Electronics Co., KT Co. and etc.)

■ **Introduction to other activities besides research**

ART lab promotes friendship among students with various activities: birthday party, picnics, summer/winter workshop, and so on. Also, we have home-coming day annually and share alumni's experience after graduation.

■ **Introduction to the Lab.**

ART Lab encourages students to research in an environment where members feel free to share their ideas. We have considerate professor's guidance and spend our time in graduate school energetically. Our laboratory is open to those who want to research and study in a good environment with prospective students.

■ **Recent research achievements ('21~'23)**

[1] Projects : ETRI, ADD, Samsung Electronics Co., Ministry of Science, ICT and Future Planning, etc. (Currently doing 9 projects)

[2] Publications : Journal Papers 15 / Conference papers 10 / Patents 12

⟨Professor Kyeongha Kwon⟩

THE KWON GROUP

■ Contact information		
Professor	Email: kyeongha@kaist.ac.kr	Tel: 7467
Lab.	Nanofab Center, 204	Tel: 7567/7667
Website	https://krg.kaist.ac.kr	

■ **Current state of the Lab. (in 2023 Spring Semester)**

PhD Student: 2 Master's Student: 9

■ **Research Areas**

▷ **Battery Management System (BMS)**

- Maximize the remaining useful life (RUL) for entire multi-storage platform
- Development of cell state prediction techniques with high stability
- Ongoing research topics:
  - ✓ EV/ESS battery management IC: Measurement & Power Control
  - ✓ Advanced diganosis device (e.g. EIS system) for safety
  - ✓ Algorithm optimization for embbeded system

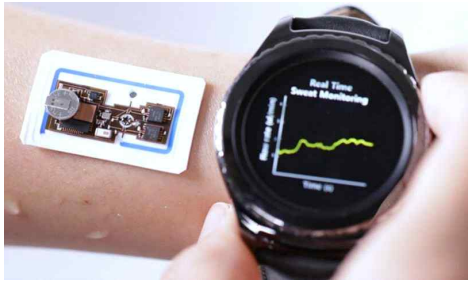
▷ **Medical Application Specific Integrated Circuits (M-ASIC)**

- Real-time monitoring of physical condition using small, wireless and low-power devices
- Flexible, skin-attachable systems to sense various biosignals
- Ongoing research topics:
  - ✓ Blood flow rate monitoring
  - ✓ Capnography: sensing CO2 concentration
  - ✓ Wireless power transfer for implanted cardiac stents

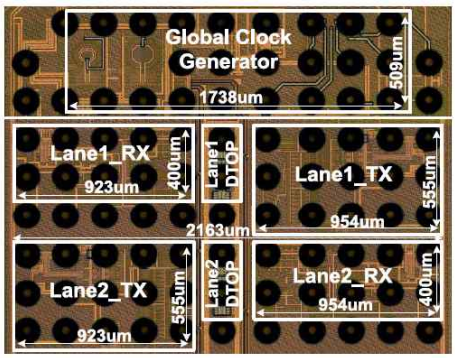
▷ **High-Speed Transceivers**

- Signal distortion due to channel and other environmental causes, resulting erroneous data at receiver
- Distortion compensation in transceiver ICs
- Ongoing research topics:
  - ✓ Crosstalk cancellation for PIM (Processing-in-Memory)
  - ✓ Dispersion compensation for optical communication
  - ✓ Low power on-chip transcievers

<Battery management system on EV>



<Sweat flow monitoring device>



<High speed transceiver die photo>

■ **Recommended courses & Career after graduation**

- Courses on circuits, signals and communcations: EE201, EE304, EE372, EE403, EE202, EE303, EE321, etc. (More information on our website)
- Potential career options after graduation include government-funded/private research institutes or companies related to IC design, medical devices, automobile, etc.

■ **Introduction to the Lab.**

- Horizontal organizational structure and lively workplace atmosphere.
- Lab members with friendly relationship
- Group lunch/dinner and birthday celebrations
- Regular participation in workshops and seminars

■ **Recent research achievements (2023)**

"ASIL-D compliant Battery Monitoring IC with High Measurement Accuracy and Robust Communication," ***IEEE International Solid-State Circuits Conference (ISSCC) Digest of Technical Papers***, 2023.

"Battery-free, cardiovascular implant for wireless monitoring of arterial/ventricular pressure, flow rate and temperature in real-time fashion," ***Nature Biomedical Engineering*** (IF:29.234), April 2023.

"Bioresorbable, wireless, and battery-free system for electrotherapy and impedance sensing at wound sites," ***Science Advances*** (IF:14.957), vol. 9, no. 8, Feb. 2023.

<Professor Dae-Shik Kim's Lab.>

Brain Reverse Engineering and Imaging Laboratory

■ Contact information

Professor : ITC building 511 TEL : 042-350-3490

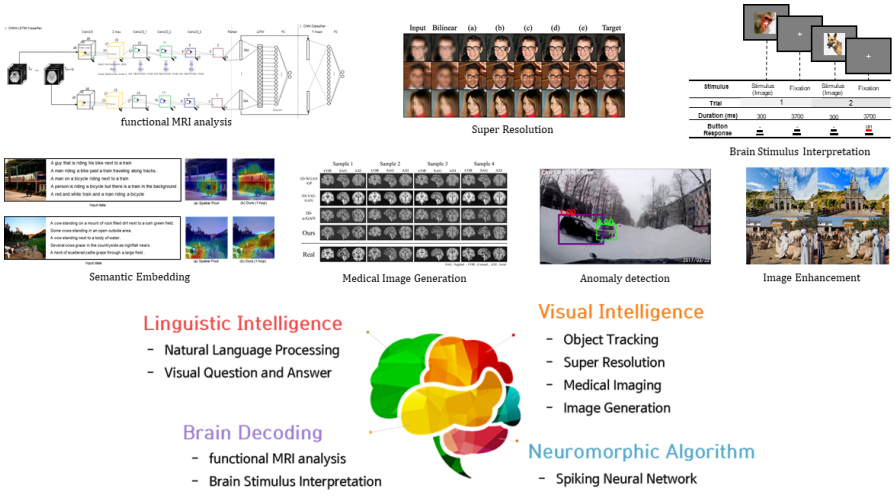
Lab. : ITC building 521 TEL : 042-350-8172~4

Website : http://brain.kaist.ac.kr

■ Current state of the Lab. (in 2023 Fall Semester)

PhD Students: 10 Master's Student: 9 Staff: 3

■ Research Areas



Brain Reverse Engineering and Deep Learning

Our laboratory aims to understand how the brain functions and use the knowledge to build an artificial brain close to human brain performance. In the Visual Intelligence group, we study computer vision, including object tracking, super resolution, and medical imaging. In the Brain Decoding group, we carry out research using fMRI and EEG to understand the brain, including studies on human emotion decoding and reconstruction of arm movement. Linguistic Intelligence group conducts research in natural language processing such as dialogue system and semantic embedding. Finally, the neuromorphic engineering group seeks to improve current technologies by drawing inspiration from the brain.

■ Recommended courses & Career after graduation

We recommend laboratory candidates to take Introduction to Brain IT and coursework in machine learning, information theory, and signal processing. We have Ph. D graduates (postdoc at Samsung medical center, CTO at Omnious, etc.) and graduates with master's degree (Samsung DMC Lab, Lunit, LG, ETRI, Hynix, Hyundai Motors, UCL Wellcome Trust Centre for Neuroimaging, Ph. D candidates, CEO of Omnious and bHaptics, etc.).

■ Introduction to other activities besides research

Professor Dae-Shik Kim is currently serving as the director of SHINSEGAE I&C-KAIST AI Research Center and Kyobo/Dplanex-KAIST AI Center for Future of Insurance. In our Laboratory, we freely share and socialize cultural life such as MT, dining, sports and birthday parties.

■ Introduction to the Lab.

Our laboratory conducts studies that lead the current flow of science and technology. We are actively engaged in cutting-edge research in areas such as deep learning, neuromorphic engineering and brain decoding, enriched by active collaboration with leading groups. Striving for excellence and innovation, we have entered the DARPA Robotics Challenge with the HUBO laboratory KAIST and dispatched our members for overseas research at Cambridge U.K, UCL, Leiden (Netherlands), EPFL (Switzerland), and Stanford. Alongside collaborating with top authorities in the industry and academia, we also nurture a venture spirit that has led to the establishment of successful venture startups such as Omnious and bHaptics.

■ Recent research achievements (2023)

[1] Jae-Hyeok Lee and Dae-Shik Kim, "ICE-NeRF: Interactive Color Editing of NeRFs via Decomposition-Aware Weight Optimization", International Conference on Computer Vision (ICCV), Paris, France, 2023.

[2] Kassymzhomart Kunanbayev, Jeongwon Lee, Dae-Shik Kim, "ROI-to-ROI fMRI Brain Functional Connectivity Analysis of Flickering Light Stimulation for Entraining Gamma Waves", 2023 Conference on Cognitive Computational Neuroscience, CCN 2023, Oxford, UK, Aug 24-27, 2023

[3] Yucheol Cho*, Gyeongdo Ham*, Jae-Hyeok Lee, and Daeshik Kim "Ambiguity-aware Robust Teacher (ART): Enhanced Self-knowledge Distillation Framework with Pruned Teacher Network", Elsevier Pattern Recognition, Vol. 140C, 109541, Mar.2023, (*These authors equally contributed to this work.)

[4] Sunhyeok Lee, Donggon Jang, Dae-Shik Kim, "Temporally Averaged Regression for Semi-Supervised Low-Light Image Enhancement", Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2023, pp. 4207-4216

[5] Yucheol Cho, Gyeongdo Ham and Daeshik Kim, "First-principles Study on As Antisites in InGaAs Alloys, GaAs and InAs", International Workshop on Computational Nanotechnology (IWCN), Barcelona (Spain), June 12-16, 2023

<Professor John Dongjun Kim's Lab.>

Computer Systems and Network Lab

■ **Contact information**

Professor : jjk12@kaist.edu TEL : 042-350-7735

Lab. : N1-518 TEL : 042-350-7548

Website : https://icn.kaist.ac.kr

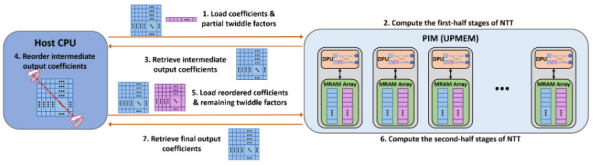
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows: 0 PhD Students: 8 Master's Student:: 7

■ **Research Areas**

● **Computer and System Architecture for Deep Learning**

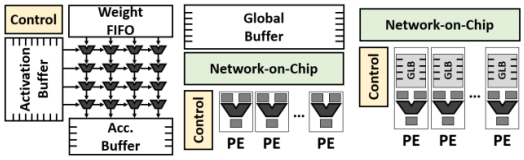
- Scale-out interconnection networks
- Efficient communication-centric architecture for accelerators



Accelerating fully homomorphic encryption

● **Memory-centric Network Architecture**

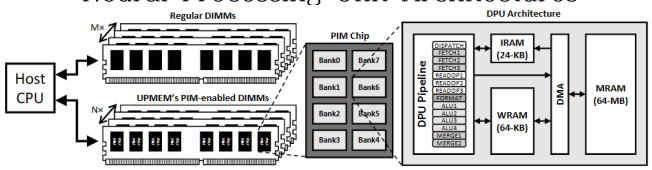
- Memory-centric network architecture for machine learning
- Processing-in-memory (PIM) Architectures



Neural Processing Unit Architectures

● **Architecture and Security**

- Side-channel attacks in CPU and GPU
- Fully homomorphic encryption (FHE)



Processing-in-Memory Architectures

● **Mobile System for Continuous Monitoring and Intervention**

- Monitoring Itching condition
- Language Development

■ **Recommended courses & Career after graduation**

Courses recommended include topics related to computer architecture, system programming, distributed systems, and operating systems. Students in the lab have participated in internship at Samsung, NVIDIA, and Deep Learning start-ups. After graduation, students have become professors at POSTECH, Kangwon University, as well as joined industry including Samsung Research, Arm Inc, as well as research positions at National Research Labs.

■ **Introduction to other activities besides research**

The lab provides a very open environment where you are encouraged to freely discuss with the professor and other students. We encourage collaboration with other professors in the department, within KAIST, as well as other institutions. We also actively collaborate with industry as well. We also encourage extracurricular activities to provide the best environment.

■ **Introduction to the Lab.**

The Computer Systems and Network Lab is led by Prof. John Kim at KAIST. Prof. John Kim graduated from Stanford University and was part of School of Computing at KAIST before joining School of Electrical Engineering. He has worked on the design of several microprocessors in the industry (Intel, Motorola) and has worked on the design of interconnect at Cray Inc. Currently, the lab addresses the system and architectural design challenges in high performance computing as well as mobile systems. All research in the lab target publications in top-tier conferences in systems and architecture.

■ **Recent research achievements ('21~'23)**

The research group publishes in top-tier conferences, including architecture (ISCA, MICRO, HPCA, ASPLOS) and top-tier conferences in other domains, including CHI, CCS, Usenix Security, UBICOMP, CSCW. Recent publications include

- ISCA'23 Decoupled SSD: Rethinking SSD Architecture through Network-based Flash Controllers
- HPCA'23 VVQ: Virtualizing Virtual Channel for Cost-Efficient Protocol Deadlock Avoidance
- HPCA'23 Logical/Physical Topology-Aware Collective Communication in Deep Learning Training
- MICRO'22 Networked SSD: Flash Memory Interconnection Network for High-Bandwidth SSD
- ISCA'22 Dynamic global adaptive routing in high-radix networks

<Professor Munchurl Kim's Lab.>

VICLAB

■ **Contact information**

Professor : Munchurl Kim TEL : 042-350-7419
Lab. : N24 # 1106 TEL : 042-350-7198
Website : https://www.viclab.kaist.ac.kr/

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 2 PhD Students: 16 Master's Student: 12

■ **Research Areas**

We are Video & Image Computing Lab at KAIST.

Our research of interest includes **deep-learning-based computer vision, computational image & video processing as well as image & video understanding and 2D/3D video coding**.

Recently, our intensive works are in the fields of
image/video super-resolution,
frame interpolation,
SDR-to-HDR inverse tone mapping,
optical flow estimation,
depth estimation,
image deraining, image dehazing,
video motion debluring, neural radiance field (NeRF) learning of images and video,
image in-painting,
GAN-based restoration of old photos,
PAN sharpening and super-resolution of satellite images,
deep-learning-based image/video compression,
learning-based perceptual video coding,
detection and classification of SAR image targets etc.

■ **Recommended courses & Career after graduation**

EE432 Digital Signal Processing

EE474 Introduction to Multimedia

EE534 Pattern Recognition

Recent Alumni: Adobe, Qualcomm, ChungAng Univ. Prof, Samsung (SAIT, VD, MX), Naver, ADD .etc

■ **Introduction to other activities besides research**

Birthday parties

Organizational strengthening activities

Health training with non-professional trainers

Gapcheon bike riding

■ **Recent research achievements ('21~'23)**

2023

Agus Gunawan, Soo Ye Kim, Hyeonjun Sim, Jae-Ho Lee, Munchurl Kim, "Modernizing Old Photos Using Multiple References via Photorealistic Style Transfer," Computer Vision and Pattern Recognition (CVPR), Vancouver, Canada, June 18-22, 2023.

Jongmin Park, Jooyoung Lee and Munchurl Kim, "COMPASS: High-Efficiency Deep Image Compression with Arbitrary-scale Spatial Scalability," International Conference on Computer Vision (ICCV), Paris, France, Oct. 2-6, 2023.

⟨Professor Min Jun Kim⟩

Intelligent Robotic Systems Lab

■ Contact information

Professor	**Email: minjun.kim@kaist.ac.kr**	**Tel: 042-350-7464**
Lab.	**E3-2 3239호**	**Tel: 042-350-7664**
Website	**https://sites.google.com/view/kaist-roboticslab**	

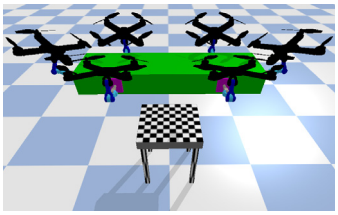
■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 3 Master's Student: 10

■ Research Areas

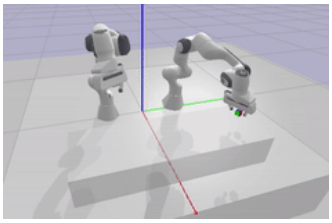
Physical Interaction with Aerial Manipulators

By mounting a manipulator on a multi-rotor, an aerial manipulator can perform active tasks through physical interaction. However, its application is limited due to the limited payload of the aerial manipulator and the coupling between the floating base and the manipulator. To this end, studies on the **collaboration of multiple aerial manipulators**, **fully-actuated multi-rotors**, and **trajectory optimization** have been conducted so that the aerial manipulator can interact with the environment stably.



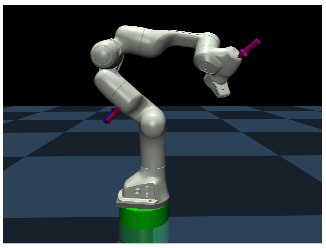
Dual-arm Robot Intelligence

We are developing perception, planning, and control techniques for the intelligence of dual-arm robots. This includes skills such as: 1) **manipulation planning**, which allows the robot to plan where to grasp and place the unseen object, 2) **compliance control**, which allows both arms to safely interact with the environment, 3) **grasp detection**, which allows the robot to know which part of an object can be grasped using a deep vision network.



Model-based Robot Control & State Estimation

One of our primary research interests is the development of safe human-robot physical interactions. For this purpose, we conduct research on torque-controlled robots and state estimation techniques. The robot's **compliant motion behavior** is achieved through precise torque control. In addition, for **contact estimation**, proprioceptive sensors are used to estimate the contact points and forces.



■ Recommended courses & Career after graduation

Recommended courses: Control system engineering, Linear Systems, Nonlinear Control, Optimization Techniques, Machine learning

Career: The practical / theoretical experience gained in the robotics lab is applicable to a wide range of engineering careers (both academia and industry).

■ Introduction to other activities besides research

Our lab holds regular events such as outing, dinner parties, to maintain a strong bond between members. Also, there are private groups that share personal hobbies such as sports and cultural life.

■ Introduction to the Lab.

In our laboratory, students who are academically curious and full of self-motivation gather to create a synergistic effect in robotics research. The professor's kind advice and full research support are at the center of it. Our lab provides the best environment for students who want to study responsibly in an atmosphere of freedom.

■ Recent research achievements (2022-2023)

[1] K. Kim, D. Park, and M. J. Kim, "A Reachability Tree-Based Algorithm for Robot Task and Motion Planning", IEEE ICRA 2023

[2] S. Han, and M. J. Kim, "Proprioceptive Sensor-Based Simultaneous Multi-Contact Point Localization and Force Identification for Robotic Arms", IEEE ICRA 2023

[3] J. Jeong, and M. J. Kim, "Passivity-based Decentralized Control for Collaborative Grasping of Under-Actuated Aerial Manipulators", IEEE ICRA 2023

[4] J. Jeong, H. Mishra, C.Ott, and M. J. Kim, "A Memory-based SO(3) Parameterization: Theory and Application to 6D Impedance Control with Radially Unbounded Potential Function", IEEE ICRA 2022

[5] M. J. Kim, A. Werner, F. Loeffl, and C. Ott, "Passive Impedance Control of Robots with Viscoelastic Joints via Inner-loop Torque Control", IEEE T-RO

<Professor Sangsik Kim's Lab.>

KAIST INTEGRATED METAPHOTONICS GROUP

■ **Contact information**

Professor: Sangsik Kim (sangsik.kim@kaist.ac.kr)

TEL: 7472

Lab. : E3-2, #3220 (TEL: 042-350-7572)

Website : https://kimgroup.kaist.ac.kr/

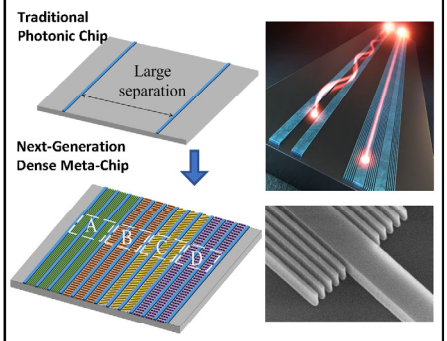
■ **Current state of the Lab. (in 2023 Fall Semester)**

Integrated PhD Students: 1 Master's Students: 2 Undergraduate Students: 4 (+3 PhD students at Texas Tech)

■ **Research Areas**

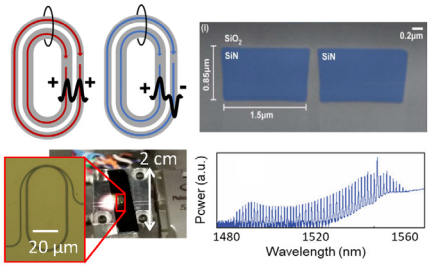
Integrated Nanophotonics	I. Small device size ⇒ scalable & portable system	II. Efficient nonlinear & quantum processes
	II. CMOS compatibility ⇒ mass production & low cost	IV. Nanofabrication ⇒ alignment-free & stable operation

On-Chip Metamaterials



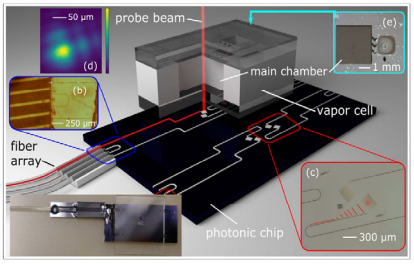
- High-density integration via metamaterials [2,4]
- Record-high coupling length (>1,000x) [4]
- Toward large-scale quantum/AI photonic chips

On-Chip Frequency Combs



- High-Q SiN microresonators
- Concentric microresonators for dispersion engineering [5] ⇒ Microcombs at visible & mid-IR frequencies & CMOS process compatibility
- Emerging quantum source having >100 qubits
- Pulse shapers for quantum process

On-Chip Atomic/Quantum System



- Photonic/Atomic hybrid integration [1,3]
- Collaboration with US NIST team
- Quantum sensor & atomic clock
  ⇒ Freq. referencing & Laser stabilization
  ⇒ Toward <1 cm precision GPS

■ **Recommended courses & Career after graduation**

- **Recommended courses:** Introduction to Integrated Photonics, Nonlinear and Ultrafast Optics, and other photonics courses

- **Career after graduation:** Great for both academia and industry
  - National Labs: KIST, ETRI, KRISS (Domestic)
    NIST , SNL, ORNL (International)
  - Industrial Companies: Samsung, Hyundai, Intel, IBM, IMEC, ASML, NTT, Meta (Facebook), Keysight, Finisar, NeoPhotonics, AyarLabs, Voyant Photonics, Analog Photonics, Hyperlight.

Our recent 3 PhD alumni went to Intel and Lumentum.

■ **Other activities besides research**

Our group strongly supports activities other than research and is open to various options! Since we just started, the detailed activities are up to members.

We usually have a group lunch and happy hours (coffee breaks) when we needed refresh.

■ **Introduction to the Lab.**

Our group is developing novel integrated nanophotonics chips using the semiconductor manufacturing processes. We explore both fundamental science and technical applications, bridging the gap between new science and future technologies. Our group is relatively new and just moved to KAIST in Fall 2022, thus we are looking for highly motivated and brilliant students to join this exciting journey with integrated photonics. For more details, please visit the FAQ page in our group webpage and feel free to email at sangsik.kim@kaist.ac.kr and other members!

■ **Recent research achievements**

[1] K. Kabir, M. Mia, I. Ahmed, N. Jaidye, S. Ahmed, S. Kim, ***Light: Science & Applications***, 12, 135 (2023)
[2] A. Yulaev*, S. Kim*, *et al.*, ***Nature Nanotechnology*** 17, 583 (2022) (*equal contribution)
[3] M. Mia, S. Ahmed, I. Ahmed, Y. Lee, M. Qi, and S. Kim, ***Optica*** 7, 881 (2020)
[4] S. Kim, *et al.*, ***Light: Science & Applications*** 7, 72 (2018)
[5] S. Jahani*, S. Kim*, *et al.*, ***Nature Communications*** 9, 1893 (2018) (*equal contribution)
[6] S. Kim, *et al.*, ***Nature Communications*** 4, 1345 (2017)

⟨Professor Sanghyeon Kim's Lab.⟩

3D integrated opto-electronic device Laboratory	■ Contact information		
	Professor	**Email: shkim.ee@kaist.ac.kr**	**Tel: 7452**
	Lab.	**Email: mmb07@kaist.ac.kr**	**Tel: 7552**
	Website	**https://www.3doedl.com/**	

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 11 Master's Student: 10

■ **Research Areas** : 3D integrated opto-electronic semiconductor devices (mainly using III-V compound semiconductor and Ge.), which is one of the most promising device research areas toward future 3D integrated systems

▶ **Monolithic 3D integration**

Monolithic 3D (M3D) integration provides increased bandwidth, smaller power consumption, smaller footprint, and increased functionality. We are exploring layer stacking and device technology to realize stackable 3D devices.

▶ **Next generation computing**

To reduce computing power, we are developing next-generation CMOS devices using III-V, Ge. Not only beyond conventional CMOS under Von-Neumann architecture, we initiated the research on semiconductor devices for artificial neural network / neuromorphic computing. To realize the ultra-low computing, we are developing 3D stackable neuronal and synaptic devices, which would be ultimate device structure minimizing the power consumption in the interconnect as well as the power consumption for computing.

▶ **MicroLED display**

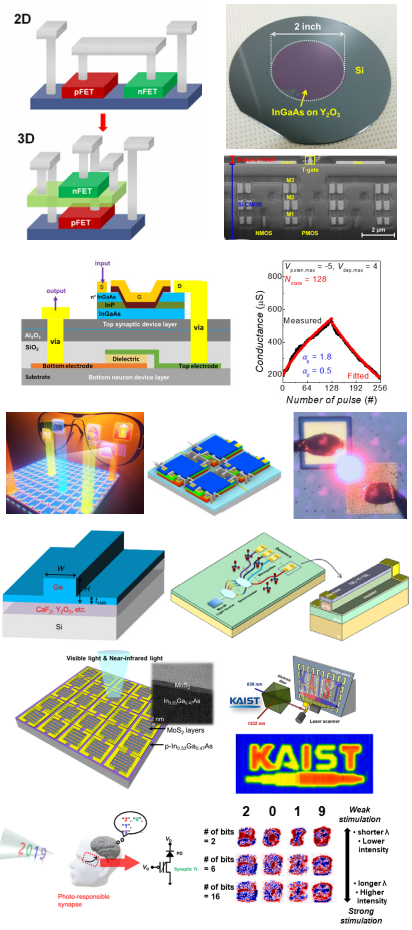
For ultra-small, but ultra-high resolution display, we are developing 3D stacked inorganic MicroLED display using wafer bonding and sequential device fabrication process.

▶ **Mid-IR photonics**

For very compact on-chip gas sensor, we are developing Mid-IR integrated photonics platform using Ge-on-insulator structure.

▶ **Thin film imager**

Ultimate goal of the semiconductor-based hardware system would be a full imitation of the human's function such as feeling emotions, learning, and thinking, etc. To do that with semiconductor-based hardware, sensing the information will be an inevitable functionality. Sensing the visual information is one of the most important features to enable lots of tasks such as pattern recognition, real-time image processing, self-adaptive detecting, etc. Therefore, we are exploring the thin film imager using M3D integration technology.



■ **Recommended courses & Career after graduation**

Any courses about semiconductor devices and solid-state physics, semiconductor integration, photonics are recommended. Career path will include academia, major industries in semiconductor and display, etc.

■ **Introduction to other activities besides research**

We are encouraging students to participate in international and domestic conferences and also internship programs for their experiences. We are also planning to have enjoyable dinner and outer activities regularly.

■ **Introduction to the Lab.**

Prof. Kim opened the lab in KAIST on Feb. 2019. We are doing multi-disciplinary researches on various semiconductor electron and photonic devices with an emphasis on monolithic 3D integration (M3D). To contribute to future M3D semiconductor devices, we are fully supporting students' research and helping to broaden their research scope with world-class infrastructure.

■ **Recent research achievements (2020-2023)**

39 journal papers (some of them were featured as a cover article), 44 conference papers including flagship conferences (IEDM, VLSI, IMID, etc.)

<Professor Song Min Kim's Lab.>

Smile LAB

SMart and MobILE Systems (SMILE) Lab

■ **Contact information**

Professor : songmin@kaist.ac.kr TEL : 042-350-7453
Lab. : smilelabkaist@gmail.com TEL : 042-350-7653
Website : https://smile.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

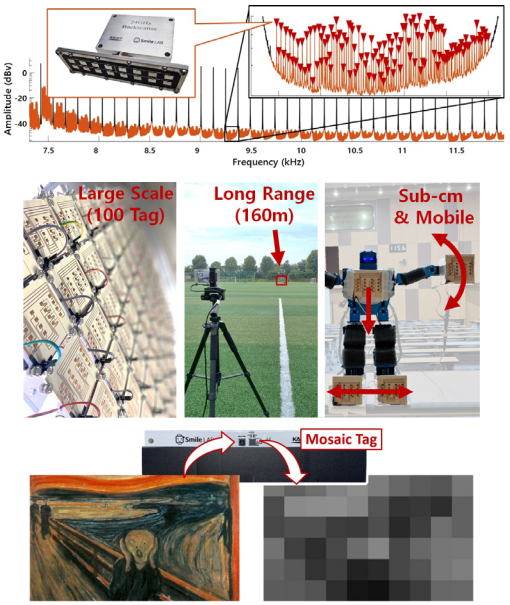
Postdoctoral Fellows : 0 PhD Students: 8 Master's Student: 2

■ **Research Areas**

Millimeter Wave 5G/6G Wireless Network: With 100 Gbps speed, mmWave is a key to heavy-traffic future applications such as virtual and augmented reality. We aim at realizing such services while tackling the unique issues of mmWave (e.g., blockage and high attenuation). Our research targets to achieve high throughput, long distance and low power consumption by innovative hardware and network protocols.

Batteryless Internet of Things: IoT without batteries is critical for (1) massive and pervasive IoT deployment and (2) a greener world. We design systems and algorithms for extremely low-power IoT operated by power harvesters (e.g., Solar-cell, RF, vibration).

Artificial Intelligence of Things: AI (training + inference) on low-power and low-cost IoT systems is a vital component for sustainable smart homes and healthcare applications. To realize this, we design efficient AI embedded systems (e.g., wearables) and algorithms with minimum computation, actuation, and sensing overheads, while achieving high accuracy.



■ **Recommended courses & Career after graduation**

Computer networks, network programming, system programming, probability theory, wireless communication and signal processing would be helpful (not required). You will have both top quality publications and rich experience in system implementation, offering freedom in career path: From academia and research labs to industry.

■ **Introduction to other activities besides research**

International trips to top conferences, get-together parties, and more. Any new suggestions are welcome. We are open to all kinds of new and fun activities! We value the relationship among members. As an academic family, we should be the strongest supporter for each other throughout the career.

■ **Introduction to the Lab.**

We are recruiting in the areas of (i) wireless networks and communication (ii) RF systems (iii) A.I. on edge devices! Please contact us if you are passionate in one or more of these areas.

Our research is about innovation and practicality. We enjoy creative and interesting designs and seeing it work in practice through hands-on implementation on everyday devices, such as smartphones and wearables. Our ideas lie in the intersection of networking, communications, and signal/data processing. We share our excitement with the world by publishing in top conferences. **SMILE lab is looking for enthusiastic students to join our journey!** If interested, please do not hesitate to contact Prof. Kim at songmin@kaist.ac.kr

■ **Recent research achievements ('18~'23)**

Many top conference and premier journal papers: MobiCom, SenSys, MobiSys, ICDCS, INFOCOM, USENIX Security, TON, TCOMM, TMC, and TOSN. Most students have published top conference papers within the first two years after joining, thanks to their hard-work. A student was nominated **MobiSys'22 Best Paper Award** (2/176), the second time in history from an Asian university. This work was selected as **SIGMOBILE Reseach Highlight**. Another student was nominated **ICDCS'18 Best Paper Award** (1/378). For details and videos please visit https://smile.kaist.ac.kr

<Professor Yongdae Kim's Lab.>

System Security Lab (SysSec)

■ **Contact information**

Professor : **yongdaek@kaist.ac.kr** TEL : **042-350-7430**

Lab. : **syssec@kaist.ac.kr** TEL : **042-350-7430**

Website : **http://syssec.kaist.ac.kr**

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 14 Master's Student: 7

■ **Research Areas**

o Security of Drones, Self-Driving Cars, and Embedded Devices

Security of all layers of Cyber Physical Systems (CPSs) such as drones, self-driving cars and embedded devices is one of the major research pillars. We have shown that EMI injection on analog sensing circuits of can manipulate actuation (to stop pacemaker). This paper is known to be the 1st sensor security paper. Since then, we have been leading sensor security research. Examples include dropping drone using sound (by causing resonation in gyroscopic sensors), causing over- and under-infusion in medical infusion pumps, faking and disabling LIDAR used for self-driving cars, faking and disabling fire detection sensor, hijacking drones using GPS spoofing. We also investigate communication channels of frequency hopping drones. To support fuzzing without hardware, we show how one can emulate firmwares automatically. Currently, we are exploring more advanced anti-drone technologies as well as security of self-driving cars.

o Security of Cellular Technologies

We use 4G and 5G cellular networks everyday. We have shown that these cellular technologies are not secure. In terms of cellular security research, our lab is known to be #1 in the world.

- Security Testing: Cellular standard does not include security testing causing many implementation vulnerabilities. We have developed testing tools for VoLTE, LTE core networks and smartphone modems. Using these tools, we found and reported several hundred vulnerabilities of commercial smartphones and operating cellular networks in Korea and the US. We also investigate how one can diagnose performance bugs as well.
- Cellular Privacy: In 2012, we showed that 2G and 3G networks leak location information. In 2018, we showed that 4G also leaks location information. In 2022, we show that one can track which video a victim is watching.
- Voice phishing: In 2021, Korea lost 0.7 Billion USD due to voice phishing. We have received funding from Korean police to develop technologies for track, prevent, and mitigate voice phishing.

■ **Recommended courses & Career after graduation**

As SysSec lab works in broad area, any kind of expertise are welcomed. In general, strong computer system (e.g. networking, OS, security, etc.), theoretical (cryptography, mathematics, information theory, etc) or electrical engineering (circuits, wave, signal processing) skills are all welcomed.

Graduates are currently working for the academia (Sungkyunkwan Univ., Kansas State, Univ of Central Florida, Liberty Univ), research institute (Qualcomm research, Samsung Research, National Security Research Institute, Electronics and Telecommunication Research Institute), companies (Samsung, LG, Naver, SDS, Microsoft), and start-ups (Looxid Labs, Theori, Krust, S2W).

■ **Introduction to other activities besides research**

Attend one international conference participation per year on average. Frequent (un)official get-together's. Extra money through bug bounties.

■ **Introduction to the Lab.**

Professor Yongdae Kim has been working on security for nearly 30 years. (21 years as a professor = 11 years at KAIST + 10 years in Univ of Minnesota). His paper was cited nearly 10,000 times (the most cited security professor in Korea). His work is very well-known internationally. He has been invited to companies (e.g. Qualcomm, Microsoft, Google, Samsung, SKT), research labs and government to give a talk or consult. SysSec lab has students from both the School of Electrical and Electronics Engineering and the Graduate School of Information Security.

■ **Recent research achievements ('21~'23)**

- LTESniffer: An Open-source LTE Downlink/Uplink Eavesdropper, 16th ACM Conference on Security and Privacy in Wireless and Mobile Networks (WiSec '23)
- Un-Rocking Drones: Foundations of Acoustic Injection Attacks and Recovery Thereof, Network and Distributed Systems Security Symposium (NDSS '23)
- Preventing SIM Box Fraud Using Device Fingerprinting, Network and Distributed Systems Security Symposium (NDSS '23)
- Paralyzing Drones via EMI Signal Injection on Sensory Communication Channels, Network and Distributed Systems Security Symposium (NDSS '23)
- Revisiting binary code similarity analysis using interpretable feature engineering and lessons learned, IEEE Transactions on Software Engineering (IEEE TSE '22)
- Watching the Watchers: Practical Video Identification Attack in LTE Networks, USENIX Conference on Security Symposium (USENIX Security '22)
- DoLTEst: In-depth Downlink Negative Testing Framework for LTE Devices, USENIX Conference on Security Symposium (USENIX Security '22)
- Enabling the Large-Scale Emulation of Internet of Things Firmware With Heuristic Workarounds, IEEE Security & Privacy (IEEE S&P '21)
- BaseSpec: Comparative Analysis of Baseband Software and Cellular Specifications for L3 Protocols, Network and Distributed Systems Security Symposium (NDSS '21)

<Professor Yong-Hoon Kim's Lab.>

Atomic-Scale Devices Simulation Lab

■ **Contact information**

Professor : y.h.kim@kaist.ac.kr TEL : 042-350-7423

Lab. : dndhdrnl@kaist.ac.kr TEL : 042-350-7523 / 7623

Website : http://nanocore.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows: 3 PhD Students: 5 Master's Students: 3 Secretary: 1

■ **Research Areas**

1. Theory & Computation

- physics of non-equilibrium open quantum systems
- novel 1st-principles & TCAD theory/methods for quantum transport & optical excitation processes
- artificial intelligence & high-performance computing technology for 1st-principles & TCAD simulations

⇩

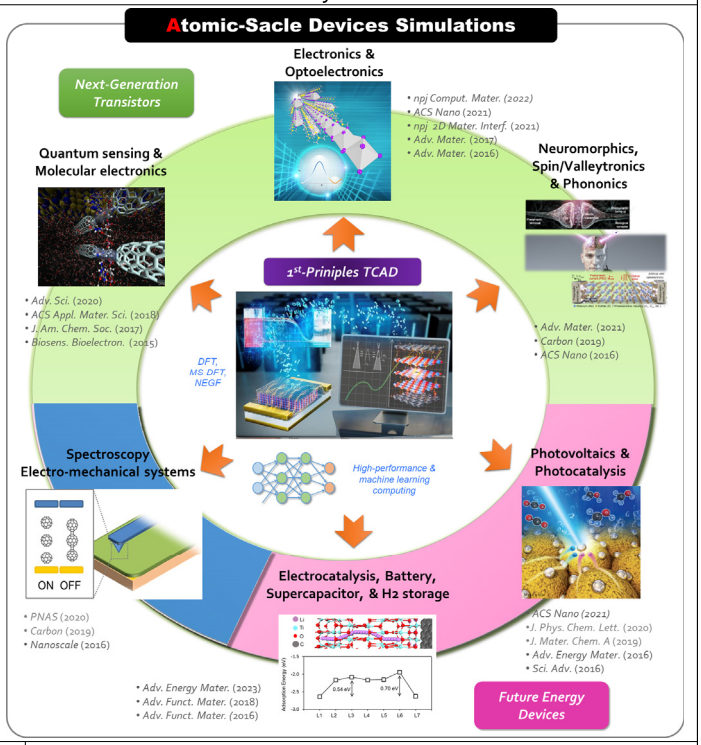
2. Functional Nano-Materials

- graphene, 2D vdW materials, & heterostructures
- semiconductor & oxide quantum dots, wires, & wells
- hybrid halide perovskites & bio/organic materials

⇩

3. More (than) Moore Nano-Devices

- "more Moore & more than Moore" devices (multi-value logic, neuromorphic computing, quantum computing)
- energy conversion & storage devices (solar cells, LED, electro/photocatalysis, supercapacitor)
- bio & electrochemical interfaces (chem-bio sensors)



■ **Recommended courses & Career after graduation**

- Lab members are expected to have strong interest in (1) advanced semiconductor device physics, (2) high-performance/AI computing, & TCAD
- In the past 5 years, 2 alumni were appointed as an assistant professor; 1 alumnus became permanent staff members in a National Lab; 2 alumni were hired at Samsung as research staff members

■ **Introduction to other activities besides research**


Daedunsan


Jeju island


Barcelona, Spain

- Annual winter schools at ski resorts, Annual summer schools at Jeju, Annual hiking trips, Weekly stroll+lunch
- Regular attendances to International conferences

■ **Introduction to the Lab.**

- According to *Nature* (http://nature.com/top100), among the top 100 most cited papers of all time in all fields, 12 of them are on density functional theory (DFT).
- Our group is leading the development of novel 1st-principles DFT, multiscale & AI nanodevice simulation formalism and softwares that can deal with quantum transport & optical excitations.
- This will have far-reaching implications for the understanding of the physics of non-equilibrium open quantum systems and the development of next-generation electronic/energy/bio-nanodevices.

■ **Recent research achievements ('21~'23)**

- *"Localized coherent phonon generation in monolayer MoSe2 from ultrafast exciton trapping ...",* Nanoscale Horiz. 8, 1282 (2023)
- *"Quantum hybridization negative differential resistance from non-toxic halide perovskite ...",* Nano Converg. **9**, 25 (2022)
- *"Gate-versus defect-induced voltage drop and negative differential resistance in vertical ...",* Npj Comput. Mater. **8**, 50 (2022)
- *"An optogenetics-inspired flexible van der Waals optoelectronic synapse and its application ...",* Adv. Mater. **33**, 2102980 (2021)
- *"Origins of genuine Ohmic van der Waals contact between indium and MoS_2",* NPJ 2D Mater. Appl. **5**, 9 (2021)

(17 papers of impact factor > 5 SCI journals in '21-'23; See http://nanocore.kaist.ac.kr for the full publication list)

- Samsung Next Generation ICT Project (2020-2023, http://samsungstf.org) & many other awards on group members.

<Professor Lee-Sup Kim's Lab.>

Multimedia VLSI Laboratory

■ Contact information

Professor	**Email:** leesup@kaist.ac.kr	**Tel:** 042-350-3460
LAb.	**Email:** cockatiel@kaist.ac.kr	**Tel:** 042-350-5460
Website	http://mvlsi.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 3 Master's Student: 5

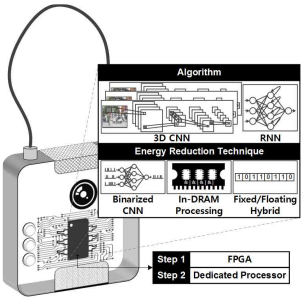
■ Research Areas

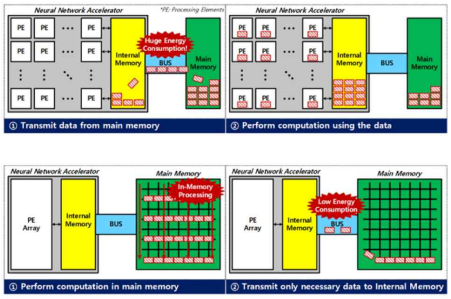
[Deep Learning & Neural Network Processor Design]

Deep learning algorithm is getting a huge attention recently. GPUs are widely used to run neural networks, but it is not appropriate to be integrated in mobile devices like smartphones, wearable devices, and drones because of its low energy-efficiency. We focuses on the design and implementation of a dedicated neural network processor in a both high-performance and energy-efficient way. To this end, researches on the datapath and memory architecture optimized for neural network, a flexible hardware architecture to handle a wide variety of neural network models, and hardware-friendly neural network algorithm are being performed. Finally, a neural network processor chip based on our ideas is designed, fabricated, and tested. We are performing state-of-the-art researches at the most recognized conference.

[Processing in-Memory for Deep Learning]

The conventional Von-Neumann architecture severely suffers from memory bottleneck issue in processing memory-dominant deep learning algorithms since massive amount of data should be transferred through the narrow bus from the main memory to the processor. Meanwhile, processing in-memory (PIM) technique which obeys Non-Von Neumann architecture processes data in the memory and transfers only necessary data to the processor, reducing the energy cost of memory transfers. Therefore, processing in-memory paradigm is the key direction and the next generation platform for efficient processing of large-scale deep neural networks.





■ Recommended courses & Career after graduation

▷ Recommended courses: Digital System, Computer Architecture, Digital Integrated Circuit, Computer Vision, Courses related to Deep Learning & Neural Network

▷ Career: Semiconductor Industries and Institutes (Samsung, SK hynix, Qualcomm, NVIDIA, ETRI, etc.)

■ Introduction to other activities besides research

▷ Coffee break after lunch
▷ Various hobbies with members
▷ Annual summer/winter field trips

■ Introduction to the Lab.

We perform a wide range of researches that covers whole SoC design parts including digital processors, memory architectures. This is our own unique strength that you never see in other laboratories. Therefore, we have a great research environment to bring yourself to a brilliant processor engineer with a capability to design a whole processor system. Our members are encouraged to perform their own researches with freedom in a family-like atmosphere. As a result, we produce the state-of-the-art research performances with international conference and journal papers.

■ Recent research achievements (2023)

[1] The most recognized journal: Myeonggu Kang, Hyein Shin, Junkyum Kim, Lee-Sup Kim, "MGen: A Framework for Energy-Efficient In-ReRAM Acceleration of Multi-Task BERT", *IEEE Transactions on Computers,* accepted, 2023

[2] The most recognized conference: Junkyum Kim, Myeonggu Kang, Yunki Han, Yanggon Kim, Lee-Sup Kim "OptimStore: In-Storage Optimization of Large Scale DNNs with On-Die Processing", *IEEE International Symposium on High-Performance Computer Architecture,* Feb 2023

<Professor Joungho Kim's Lab.>

TeraByte Interconnection and Package Laboratory

■ Contact information

Professor: S-114-1, Nanofab Center E-mail: joungho@kaist.ac.kr
Lab: S-112, Nanofab Center E-mail: keeyoung@kaist.ac.kr
Website: http://tera.kaist.ac.kr

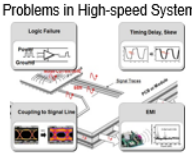
■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 14 Master's Student: 15

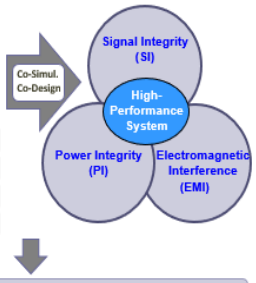
■ Research Areas

Core Research Field

Problems in High-speed System



Core Technologies

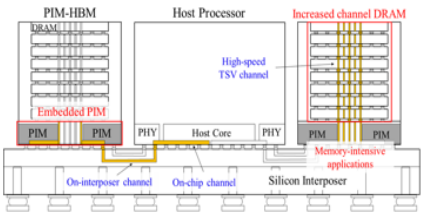


System on Chip (Chip Level)
System in Package (Package Level)
Module & PCB (Board Level)
Cable & System (System Level)

Improvement of Performance, Reliability, Cost Design Cycle

R&D Application: Next Gen. HBM for AI Server

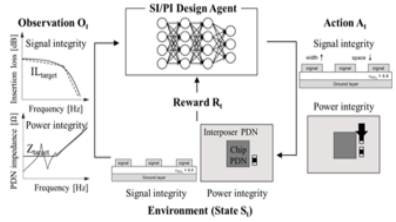
◆Major R&D Area
- ➢SI & PI design of next gen. High Bandwidth Memory (HBM)
- ➢Processing-in-Memory (PIM) Architecture in HBM (PIM-HBM)
- ➢SI & PI of Silicon interposer for HBM chiplet
- ➢SI of TSV (Through Silicon Via) at Stacked Die



< PIM-HBM Architecture on Silicon Interposer for AI Server >

R&D Application: ML-based SI/PI Design

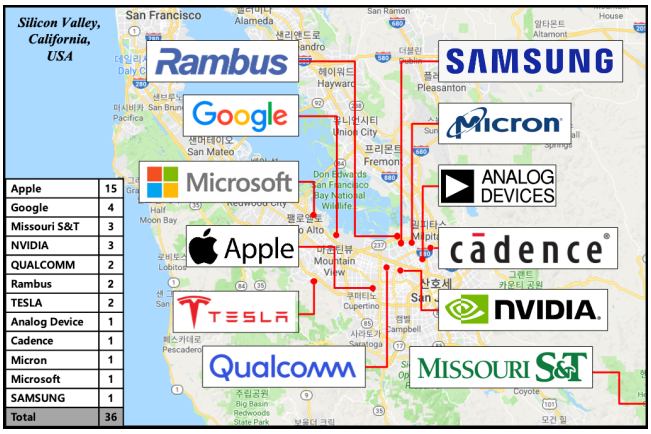
◆ Major R&D Area
- ➢ Machine learning-based SI/PI design of 2.5-D/3-D ICs
- ➢ Deep neural network (DNN)-based eye-diagram estimation
- ➢ Deep reinforcement learning-based decoupling capacitor design for HBM



< Machine Learning-based SI/PI Design >

■ Recommended courses & Career after graduation

- Fundamental of electromagnetics and circuit theory.
- Graduates are currently in various global companies: Samsung Electronics, SK Hynix, Apple, Google, Nvidia, Intel, Tesla, Rambus, and etc.



Apple	15
Google	4
Missouri S&T	3
NVIDIA	3
QUALCOMM	2
Rambus	2
TESLA	2
Analog Device	1
Cadence	1
Micron	1
Microsoft	1
SAMSUNG	1
Total	36

■ Introduction to other activities besides research

We encourage various extra-activities. We participate in activities such as soccer, e-sports and running. Every summer, we go to the beach for a laboratory workshop. Moreover, we are continuing good relations with graduates through frequent meetings and interactions.

■ Introduction to the Lab.

The TERA Lab aims to develop global talent, and many graduates have already entered the world's leading companies. The professor actively leads them to conduct creative research, and there is an atmosphere in which members of the lab can discuss freely. In the field of research, it deals with a lot of future-oriented and practical issues.

■ Recent research achievements ('21~'23)

[1] Best Paper Award, Seonguk Choi and et al, "Deep Reinforcement Learning-based Channel-flexible Equalization Scheme: An Application to High Bandwidth Memory" 2022 DesignCon

[2] Best Paper Award, Hyunwook Park and et al, "Scalable Transformer Network-based Reinforcement Learning Method for PSIJ Optimization in HBM" 2022 Electrical Performance of Electronic Packaging and Systems (EPEPS)

<Professor Joo-Young Kim's Lab.>

CastLab

■ Contact information

Professor : E3-2 #4202 TEL : 042-350-7461
Lab. : E3-2 #4209 TEL : N/A
Website : https://castlab.kaist.ac.kr

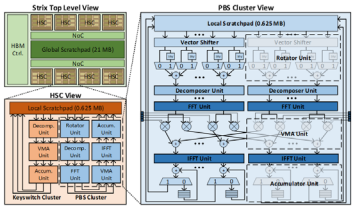
■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 14 Master's Student: 16

■ Research Areas

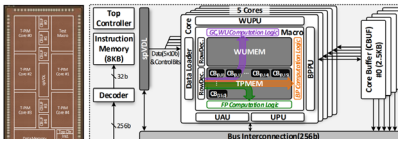
1. Neural Processing Unit

Neural Processing Unit (NPU) is AI-specialized hardware vital for edge and cloud computing. As AI usage grows, dedicated hardware becomes crucial for faster computations. In the cloud, Fully Homomorphic Encryption (FHE) enhances data privacy through encrypted computation, complementing AIaaS. However, current hardware acceleration is insufficient for FHE due to complexity, necessitating specialized architecture. Similarly, in edge scenarios like robotics, reinforcement learning demands real-time, energy-efficient processing, highlighting the need for dedicated hardware solutions.



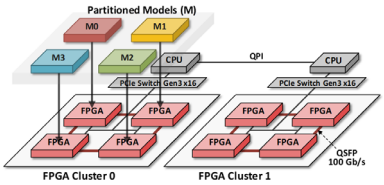
2. Processing in Memory

Traditionally, CPUs performed arithmetic and logic calculations, while memory stored data. However, technology scaling now results in compute units outpacing memory in speed, making data movement the bottleneck. The memory-centric approach, such as Processing – in - Memory (PIM), integrates computation into memory to avoid data movement, visible across hardware levels like main memory and cache using DRAM and SRAM devices. This trend aims to alleviate the data movement problem and enhance system efficiency.



3. Server Appliance

Cloud computing is reshaping enterprise operations with virtualized internet-based infrastructure. Data centers play a pivotal role in this, hosting myriad servers and storage. The surge in AI services necessitates high-efficiency systems, driving data centers toward multi-FPGA appliances for acceleration. In multi-FPGA research, the goal is a flexible server infrastructure that speeds up data center services and enables customized system design, offering re-programmable hardware for evolving operations at lower redesign and cost compared to ASIC or GPU-based solutions.



■ Recommended courses & Career after graduation

- **Recommended Courses:** Digital System Design (EE303), Computer Architecture (EE312), Digital Electronic Circuits (EE372), Courses related to deep learning algorithms.
- **Career:** Silicon companies (Samsung, Apple, IBM) and IT companies (Microsoft, Google, Meta).

■ Introduction to other activities besides research

Beyond research, we enjoy a lot of activities including gatherings like strawberry parties, lunch buddies, and hiking; celebratory events for graduations and birthdays; sports like football and basketball.

■ Introduction to the Lab.

We aim to innovate modern computing systems through hardware specialization. To this end, we are focusing on co-design of multiple layers of computing system such as application, architecture, circuit, and technology.

■ Recent research achievements ('21~'23)

"Strix: An End-to-End Streaming Architecture with Two-Level Ciphertext Batching for Fully Homomorphic Encryption with Programmable Bootstrapping," IEEE/ACM Symposium on Microarchitecture (MICRO), 2023.

"PRIMO: A Full-Stack Processing-in-DRAM Emulation Framework for Machine Learning Workloads," IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2023.

"South Korea's Nationwide Effort for AI Semiconductor Industry," Communications of the ACM (CACM), 2023.

"SP-PIM: A 22.41TFLOPS/W, 8.81Epochs/Sec Super-Pipelined Processing-In-Memory Accelerator with Local Error Prediction for On-Device Learning," Symposium on VLSI Technology and Circuits (VLSI), 2023.

"LightTrader: A Standalone High-Frequency Trading System with Deep Learning Inference Accelerators and Proactive Scheduler," IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2023.

"DFX: A Low-latency Multi-FPGA Appliance for Accelerating Transformer-based Text Generation," IEEE/ACM Symposium on Microarchitecture (MICRO), 2022.

"T-PIM: An Energy-Efficient Processing-In-Memory Accelerator for End-to-End On-Device Training," IEEE Journal of Solid-State Circuits (JSSC), 2022.

"A Dual-Mode Similarity Search Accelerator based on Embedding Compression for Online Cross-Modal Image-Text Retrieval," IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM), 2022.

〈Professor. Junmo Kim 〉

Statistical Inference and Information Theory Lab (SIIT)	■ Contact information		
	Professor	Email: junmo.kim@kaist.ac.kr	
	Lab.	N1 214	
	Website	siit.kaist.ac.kr	

■ **Current state of the Lab. (in 2023 Fall Semester)**

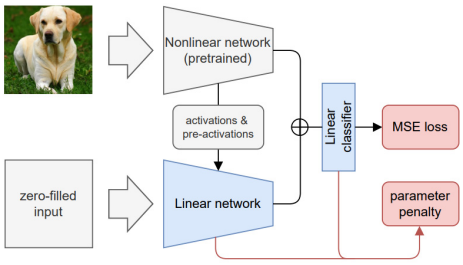
Postdoctoral Fellows : 1 PhD Students: 25 Master's Student: 7

■ **Research Areas (RP: Recent Publication)**

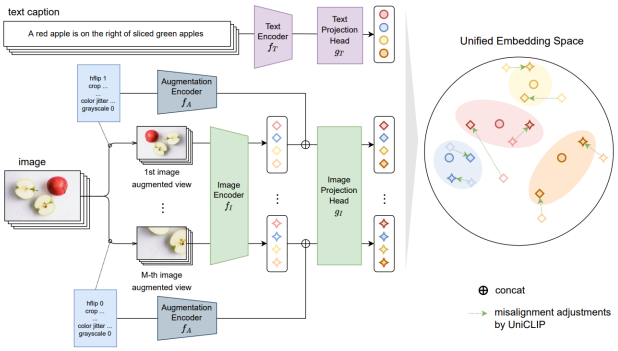
As many students are enrolled in our laboratory, various research topics are being conducted as below

- Continual Learning(RP: ECCV 2022, ICCV2023)
- Human Pose Estimation(RP: ICCV 2021)
- Depth Estimation(RP: IROS 2022, AAAI 2021)
- Representation Learning(RP: NeurIPS 2022)
- Domain Adaptation/Generalization(RP: ICRA 2022)
- Hyper-parameter Tuning(RP: ECCV 2022)
- Geneartive Model(RP: [Best Paper] CVPRW 2022)
- Point Cloud, 3D model(RP: ICCV 2021)
- Augmentation Strategy
- Deep Learning Theory(RP: ICCV 2021)
- Fairness

In addition, you can freely choose topics in areas of interest, and there is a lot of collaboration between the students in the lab.



(Figure 1) Overview of DLCFT (Continual Learning)



(Figure 2) Overview of UniCLIP (Multi-modal Representation Learning)

■ **Recommended courses & Career after graduation**

Recommended courses: AI & Computing course

Career after graduation(2020~): LG AI Research, SAIT, Samsung Research, NAVER CLOVA AI, etc.

■ **Introduction to other activities besides research**

- Birthday party(monthly)
- MT, Various activities(movie, ping-pong, ...)

■ **Introduction to the Lab.**

In our lab, students study in a field of interest in a very free atmosphere. Team meetings are held every two weeks in the lab, and students choose a team to attend according to the research topic they are interested in. Also, many students are conducting internships at research center, and start-up such as NAVER, LG AI Research, KAKAO, and ETRI. In addition, the lab is conducting projects with various companies and incentives are paid according to the amount of participation in the project.

■ **Recent research achievements (2020-2023)**

2023: CVPR 3, ICCV 2, AAAI 1, ICRA 2, WACV 1, ICIP 3

2022: NeurIPS 1, ECCV 2, IROS 2, UAI 1, ICIP 2, CVPR 1, ICRA 1, WACV 1, ACSAC 1

2021: ICCV 3 , ICRA 1, CVPR 1, WACV 1, AAAI 3

<Professor Changick Kim's Lab.>

CILAB Computational Intelligence Laboratory

■ **Contact information**

Professor : changick@kaist.ac.kr TEL : 042-350-7421

Lab. : suminlee94@kaist.ac.kr TEL : 042-350-7521

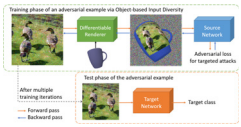
Website : https://cilabs.kaist.ac.kr/

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 16 (full-time) / 8 (part-time) Master's Student: 8

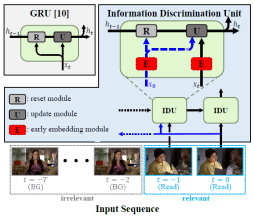
■ **Research Areas**

▶**Adversarial Attack & Defense**



- Protecting AI systems against malicious users who tries to fool the system.
- Creating adversarial perturbations exploited in real-world physical environments.

▶**Action Detection and Anticipation**

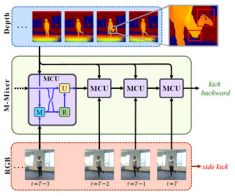


- Discriminating relevant actions for online action detection.
- Forecasting unseen future actions from the pseudo action labels obtained by online action detection.

▶**Image segmentation**

- Human face parsing & body part segmentation.
- Exploring diverse research topics (e,g, domain adaptive or few-shot segmentation).

▶**Video Understanding**



- Understanding actions in a video based on multiple modalities.
- Localizing an object of an action.

▶**Long-Tail Recognition**

- Resolving the data imbalance problem in machine learning
- Important for real world applications such as wild animal classification

▶**Short-term Weather Forecast**

- Predicting total precipitation image for Korean Peninsula
- Presenting new Total Precipital Water (TPW) benchmark

■ **Recommended courses & Career after graduation**

We recommend taking courses related to **computer vision (CV) and deep learning**. Depending on your area of interest, the courses of **computer graphics and signal processing** can be helpful. Those are not mandatory but it would be better to get used to computer vision and deep learning. About career, based on steady research and various industry-academic cooperation experiences, you can have great research capabilities and industrial adaptability.

■ **Introduction to other activities besides research**

Smooth teamwork must precede innovative research. With this conviction, through outside activities, we build feelings of empathy and compassion for each other, and recharge our energy for research. We celebrate birthdays every month to make good memories of our lab life. Also, on fine days, we go on a picnic together. If you would like to see more pleasant memories of ours, please visit our homepage.

■ **Introduction to the Lab.**

Professor Kim has advised his students at KAIST since 2005 and serves as the head of the Center for Security Technology Research. The mission of the CI Lab. is to analyze computer vision systems and develop the systems for various applications. Our lab collaborates with many industries and institutions to perform innovative research work and has published our research in top-tier conferences and journals.

■ **Recent research achievements ('21~'23)**

- 15 top-conference papers (CVPR, ECCV, ICCV, and etc.)
- 8 international journals (TPAMI, IJCV, and etc.)

<Professor Hyun-Sik Kim's Lab.>

Circuit Lab

Electrical Engineering | KAIST

■ **Contact information**

Professor : hyunskim@kaist.ac.kr TEL : 042-350-7457

Lab. : (Chief Student) dunk789@kaist.ac.kr

Website : https://www.ICdesignLab.net/

■ **Current state of the Lab. (in 2023 Fall Semester)**

Ph.D. Students : 13 Master/Ph.D.-Integrated Students: 1 Master's Student: 7

■ **Research Areas**

Our research group is focused on innovations in the CMOS integrated chip designs of analog IC, DDI, PMIC, ROIC, and CIS. And, ultimately we plan to build a complete system-on-a-chip solution by incorporating our knowledge in those fields.

☐ **Power Conversion and Management IC (PMIC)**

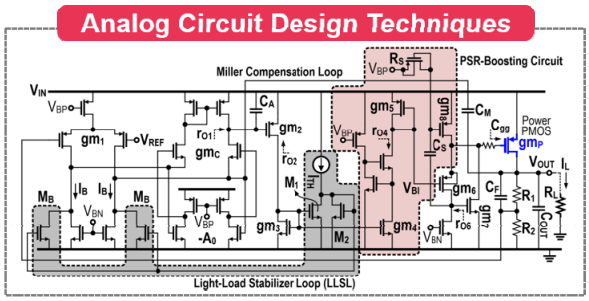
- Switch-mode DC-DC power converter using inductive, capacitive, and hybrid techniques
- Fully-monolithic high-speed switching PMIC for modern SoCs
- Energy-harvesting interface circuit and system
- Fast-response high-PSR low-dropout (LDO) regulator
- Battery charger and management circuit

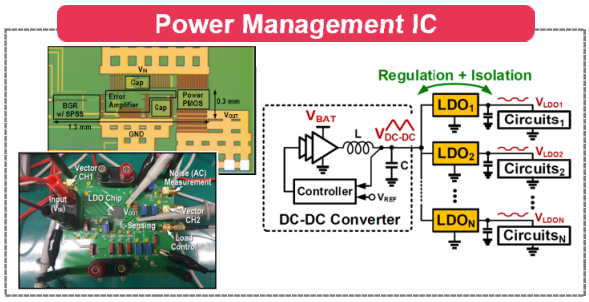
☐ **Display Driving Circuits and Systems**

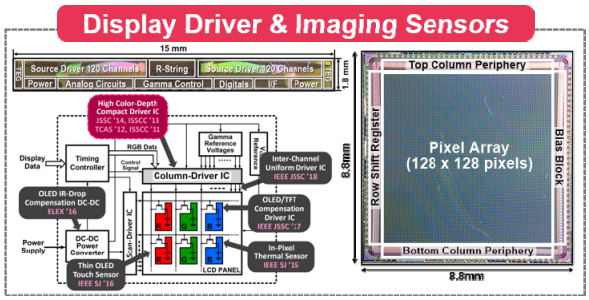
- High-resolution area-efficient digital-to-analog converter (DAC)
- OLED display driver with pixel-readout and active-compensation
- Low-power high-speed output driving buffer amplifier
- Fully-integrated system-on-wafer (SoW) for micro-LED displays
- Displays with touch-sensing functionality

☐ **Readout IC (ROIC) and Imaging Sensor**

- Low-noise high-sensitivity readout circuit and system
- Ultra-high-speed time-delayed integration (TDI) image sensor
- Photon-counting detector for nuclear particles and X-ray







■ **Recommended courses :** Circuit Theory, Electronic Circuits, Analog Electronic Circuits, Analog Integrated Circuits, Power Electronics, Digital Circuits

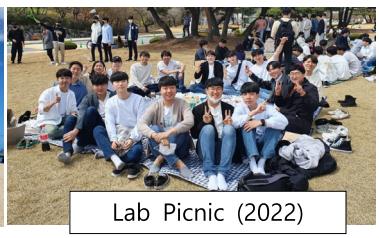
■ **Careers after graduation :** Samsung, LG, SK-Hynix, Research Institute, Silicon-Valley, Academia, University

■ **Introduction to our laboratory**

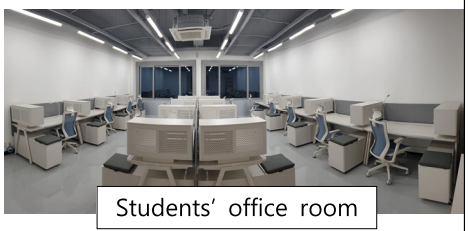
Young and active research environments, Horizontal peer relationship, 24-hours academic discussion, Opened and wide opportunities to attend international conference, Summer/Winter workshop, Refreshed clean office room

■ **Lab. Photo**

VLSI 2022 (Hawaii)



Lab Picnic (2022)



Students' office room

■ **Recent research achievements (2020~2023)**

- Conference Presentations: (top) ISSCC 7편, (top-tier) VLSI Symposium 11편, (major) CICC 1편, (major) ESSCIRC 1편
- Journal Publication: IEEE JSSC 9편, IEEE TPEL 1편, IEEE SSC-L 5편, IEEE SSC-M 1편
- Awards: 반도체설계대전 국무총리상, 삼성휴먼테크 은상(21) & 동상(22), 삼성디스플레이논문대회 금상(22) & 금상(21)

<Professor Hoirin Kim's Lab.>

SSSC
Statistical Speech & Sound Computing Lab.

■ **Contact information**

Professor : 2111, LG Innovation Hall (N24) TEL : 7417
Lab. : 2105, LG Innovation Hall (N24) TEL : 7617
Website : https://sites.google.com/site/kaistsssclab/

■ **Current state of the Lab. (in 2023 Fall Semester)**

PhD Students : 4 Master's Student : 4

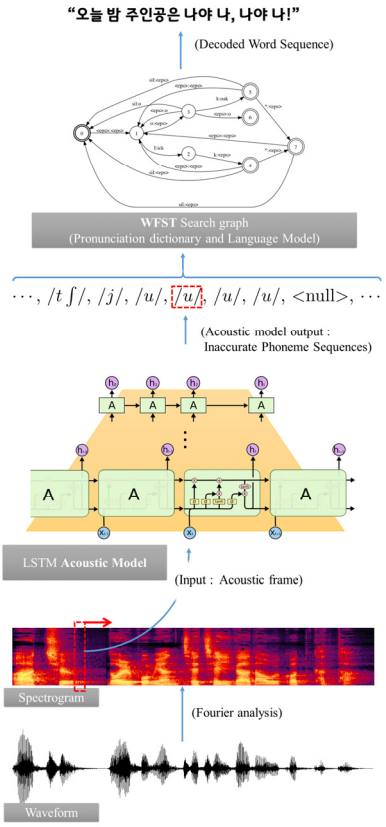
■ **Research Areas**

SSSCLAB has been researching machine learning and deep learning for speech and sound signals. In recent years, with the advance of smart devices & AI, our research fields have attracted much interest day by day.

Speech recognition is a technology that converts human speech into words or sentences. We are also studying **speech synthesis** technology (familiar as **TTS**) that generates a human-like voice from any text. They help humans communicate with computers or machines naturally.

In addition, we have studied natural language processing-based **language modeling** to complement the syntactic consistency of recognized strings and **speaker recognition** to recognize the user's identity. We are also studying **voice conversion** technology that mimics a specific speaker's voice as felt non-artificial.

There are many interesting researches such as **speech enhancement** that restores noisy speech to clean, **wake-up word detection** (ex. Hey Siri, OK Google), **voice activity detection**, **speaker diarization**, **acoustic event detection**, etc.



Current Research Projects
Research on Unified Interactive Learning Schemes of End-to-End Speech Recognition and Synthesis based on Deep Learning of Speech Chain Mechanism
Development of Voicepishing Prevention Technology Based on Speech and Text Deep Learning
Development of Speech Technology for Machine Learning Diagnosis of Cognitive-Affective Disorder Patients

■ **Recommended courses & Career after graduation**

- Recommended : Signals and Systems, Digital Signal Processing, Probability and Random Processes, Linear Algebra, Information Theory, ML or DL related course.
- Alumni have been entering IT companies, research institutes, or universities. (Samsung Electronics, Samsung Research, LG Electronics, etc.)

■ **Introduction to other activities besides research**

Through summer MT, welcome party, year-end party, and homecoming day, we promote friendship among students. In addition, we encourage attendance at domestic/international conferences in related fields, so that students can get various research experiences.

■ **Introduction to the Lab.**

SSSCLAB was founded in 2000 and carries out various projects related to speech and sound signal processing. We accumulates rich practical experience achieving excellent academic research results. Also, we provide stable and strong financial support and a comfortable research environment so that students can continue their studies and research activities. SSSCLAB has produced out 11 Ph.D. and 29 Master graduates for 20 years.

■ **Recent research achievements ('22~'23)**

[1] Kangwook Jang, *et al.,* "Recycle-and-Distill: Universal Compression Strategy for Transformer-based Speech SSL Models with Attention Map Reusing and Masking Distillation" Interspeech2023.

[2] Myunghun Jung, *et al.,* "AdaMS: Deep Metric Learning with Adaptive Margin and Adaptive Scale for Acoustic Word Discrimination" Interspeech2023.

[3] Yeunju Choi, *et al.,* "Learning to Maximize Speech Quality Directly Using MOS Prediction for Neural Text-to-Speech" IEEE ACCESS, Vol. 10, pp. 52621-52629, May 2022.

<Professor Hoon Kim's Lab.>

PHOTONICS SYSTEMS RESEARCH LAB

■ **Contact information**

Professor : Bldg. E3-2 Room 4204 TEL : 042-350-7433

Lab. : Bldg. E3-2 Room 4210 TEL : 042-350-7633

Website : http://psrl.kaist.ac.kr

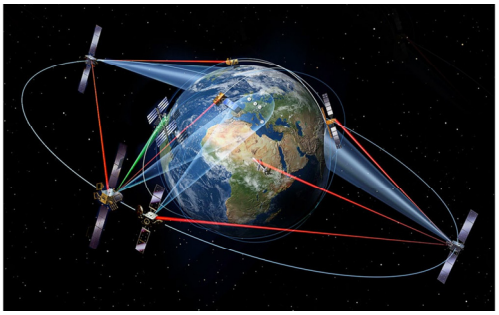
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 12 Master's Student: 4

■ **Research Areas**

Our research is centered around photonic systems and related technologies, including free-space optical communications, high-capacity fiber-optic transmission systems, optical access networks, and lightwave subsystems.

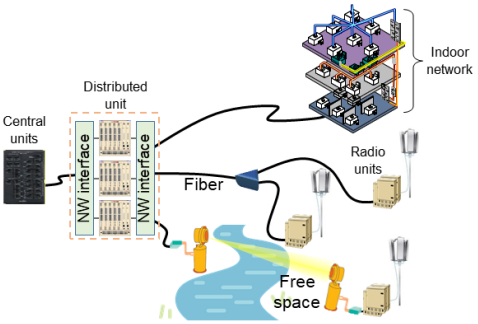
High-speed free-space optical transmission system



In an era of expanding commercial satellite networks and frequent satellite launches, it is expected that we will soon reach a point of radio frequency (RF) saturation. Furthermore, there's a growing need for instant, large-scale data transfer from satellites to ground stations, which existing RF communications struggle to meet. To address these challenges, laser optical communication emerges as a transformative solution. By harnessing light in the hundreds of terahertz range, laser optical communication enables high-speed signal transmission with minimal losses, distinguishing it from RF systems. It can achieve data transmission rates of over tens of gigabits per second, making it a promising option for space communication. Our research focuses on leveraging free-space optical communication technology for various applications.

Transmission technologies for 6G

Optical networks form the backbone of our communication systems. To enable the next generation (6G) mobile communication services, the optical network must evolve into a low-delay, high-speed network, with speeds reaching up to tens of terabits per second. Our research is focused on investigating various cost-effective technologies to achieve this goal.



■ **Recommended courses & Career after graduation**

- Recommended courses include Introduction to Optical Communication (EE441), Introduction to Optical Engineering (EE352), and Digital Signal Processing (EE432).
- Potential career paths after graduation include national research institutes, major companies, and academia.

■ **Introduction to other activities besides research**

- Every spring, we have our annual strawberry party and homecoming event.
- We plan to have a regular sports day with other lab members in KAIST working on photonics.

■ **Introduction to our Lab.**

- Welcome to the Photonics Systems Research Lab, founded in 2014 and led by Prof. Hoon Kim. Prof. Kim has accumulated 22 years of experience in photonics systems, with a career that has included positions at renowned organizations like Bell Labs, Lucent Technologies., Samsung Electronics, and National University of Singapore. Our main focus lies in exploring the fundamental limits of various photonics systems and developing practical implementation methods. Prof. Kim currently serves as the Editor of *Optics Communications* and the Senior Editor of *IEEE Photonics Technology Letters.*
- We actively engage in academic exchanges with international research institutes and universities. We also participate in prominent international conferences such as OFC and OECC.

■ **Recent research achievements ('21~'23)**

- International journal publications : 20, International conference presentations: 18.
- Best Student Paper Awards : Photonics Conference 2021, 2022, COOC2022.

⟨Professor Yong Man Ro⟩

INTEGRATED VISION LANGUAGE Lab.

IMAGE & VIDEO SYSTEMS Lab. since 1998 Empowered by Deep Learning

Image and Video Systems Laboratory
Integrated Vision and Language Laboratory

■ Contact information

Professor	Email: ymro@kaist.ac.kr	Tel: 042-350-3494
Lab.	ITC building (N1) #418	Tel: 042-350-8094
Website	http://ivylab.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 14 (Full) 2 (Part) Master's Student: 7

■ Research Areas

Generic AI via integrating vision, Language, and speech

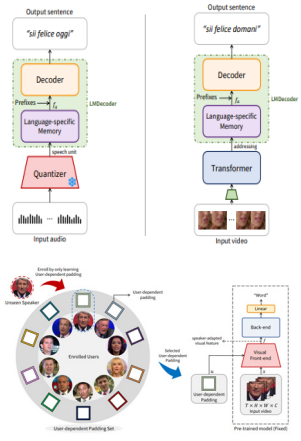
Generic AI via integrating vision, language, and speech vision and language analysis is an emerging research subject in the IVY Lab, where AGI deep learning approach is our current research interest. We investigate various new algorithm and devise novel network structures to analyze vision, language, and speech. Current research works include vision language co-learning, visual prompt learning, visual speech language translation, and low resource deep learning. Some of our research results have been published in international journals (such as IEEE TIP) and international conferences (such as CVPR, ICCV, ECCV, AAAI, ICASSP, etc.).

Multi-modal learning in Deep Learning

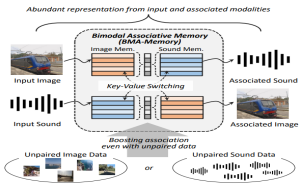
IVY Lab research the principle of multi-modal data analysis (video, audio, language, etc). Recently, we investigate the characteristic of multi-modal data, fusion method and adversarial robustness. Our research interests include adversarial robustness with multi-modal data (RGB, IR, Hyper-spectral, etc), multi-modal data relation/causality, and learning representation of multi-modal data.

Robust and Explainable Deep learning

Current research interest on deep learning-based processing is to design robust networks and further disclose them for explanation, which are strongly demanded in the defense/security applications. Deep learning-based studies for attention network, adversarial learning, generative model, and explainable AI have been done on secure-required image data. Currently, we are conducting deep learning researches for analyzing robustness and interpretability of deep neural networks.



ICCV 2023, ECCV 2022



CVPR 2022

■ Recommended courses & Career after graduation

Recommended courses include probability, digital signal processing, machine learning, introduction to multimedia, image processing/computer vision, various programming courses. Graduates have jobs in various places such as professor, post-doc (EPFL, TUM, GIT, CMU, META), national research institutes (ETRI, ADD, KIST), and companies (Samsung, LG, Naver, Hyundai, SKT, etc.)

■ Introduction to other activities besides research

IVY Lab regularly holds common activities such as mountain tracking, summer/winter MT, etc. Please see various activities in http://ivylab.kaist.ac.kr/base/Gallery/Gallery.php

■ Introduction to the Lab.

IVY laboratory is currently focusing on Vision-Language research. Our lab has achieved outstanding achievements such as this year's Science Prize (Association of Scientific Journalists), Best Paper Awards, and IT Mark. The researchers have strong bonds with each other, and they help/encourage each other while researching and living in an autonomous atmosphere with stable support. We also encourage students to have research experience in an international sense through visiting research with world-class research institutes (e.g., University of Toronto, Technical University of Munich, Ecole Polytechnique Federale de Lausanne, FAIR, CMU, Amazon, etc.) in our interesting research field.

■ Recent research achievements (`21-`23)

- We have published 149 SCI journal papers (SCI-indexed, referee peered), 347 International conference papers (referee peered). In the recent 3 years, 20 AI top tier conferences (CVPR, ICCV, ECCV, NeurIPS, AAAI, etc)) have been published.
Recent AI top tier publication: https://ivylab.kaist.ac.kr/base/Publication/toptier.php

<Professor Seung-Tak Ryu's Lab..>

MSICL
Mixed Signal IC Laboratory

Mixed Signal Integrated Circuits Laboratory

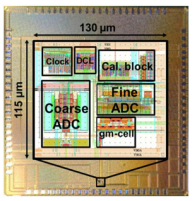
■ **Contact information**

Professor : Seung-Tak Ryu TEL : 042-350-7425
Lab. : E3-2 #4230, 4224 TEL : 042-350-7525, 7625
Website : http://msicl.kaist.ac.kr

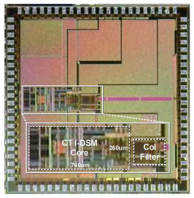
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 14 Master's Student: 7

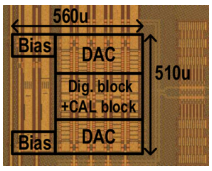
■ **Research Areas**



<10b 500MS/s Pipelined SAR ADC>



<400kS/s 4-ODE CT I-DSM ADC>



<12b 1GS/s CS-DAC w/ cal.>

MSICL researches Analog/Mixed signal circuit design. The major research topic is data converters, which converts analog signal to digital signal or vice-versa. This research area has gained significance along with semiconductor advancements. As digital circuits gain popularity for their enhanced computational capabilities and reduced power consumption, analog circuits assume a pivotal role in transferring natural signals to digital systems. Since numerous signals in human-related contexts remain analog, the research on analog circuits is essential with the development of circuit systems. However, the number of analog circuit designer is insufficient compared to analog circuit demands.

The research scope of MSICL encompasses a range of subjects including: High-speed ADCs (SAR/Pipeline/Flash/Time-domain/Time-Interleaved/etc.) and DACs (Current-domain), High-resolution ADCs (Delta-Sigma Modulator/Noise-shaping SAR), Radiation-tolerant Data converters, Synthesizable Data converters, Design Automation, Random Number Generator, and more.

■ **Recommended courses & Career after graduation**

Since the research of MSICL deals with both analog and digital circuits, the recommended courses are Electronic Circuits (EE304), Digital Electronic Circuits (EE372), and Analog Electronic Circuits (EE403).

■ **Introduction to other activities besides research**

To foster the friendship of lab members, numerous events are organized throughout each season. During spring and fall, outings are arranged, while in summer and winter, regular workshops take place.

■ **Introduction to the Lab.**

As aforementioned, MSICL researches Analog/Mixed signal circuit designs. Data converters which is the major topic of our Lab becomes more important in IC system and undergoes lack of manpower. Since our circuit design treats both analog and digital circuits, the students who have interests in circuit design can get a good chance to study IC circuits. Also, MSICL performs the many projects with companies and researching institute such as Samsung, Hynix, ETRI and so on. So the students can improve the executive ability as well.

■ **Recent research achievements ('21~'23)**

[1] Kent Edrian Lozada*, Dong-Hun Lee*, "A 25kHz-BW 97.4dB-SNDR 100.2dB-DR 3rd-order SAR-Assisted CT DSM with 1-0 MASH and DNC," IEEE ASSCC, 2023.
[2] Jae-Hyun Chung, "An 81.2dB-SNDR Dual-Residue Pipeline ADC with a 2nd-Order Noise-Shaping Interpolating SAR ADC," IEEE CICC, 2023.
[3] Chang-Un Park, "A 12-bit 1GS/s Current-Steering DAC with Paired Current Source Switching Background Mismatch Calibration," IEEE CICC, 2023.
[4] Kent Edrian Lozada, "A 4th-Order Continuous-Time Delta-Sigma Modulator with Hybrid Noise-Coupling," IEEE TCAS-II, 2022.
[5] Kent Edrian Lozada, "A 4th-Order Continuous-Time Delta-Sigma Modulator with Hybrid Noise-Coupling," IEEE MWSCAS, 2022.
[6] Dong-Jin Chang, "A Relative-Prime Rotation Based Fully On-Chip Background Skew Calibration for Time-Interleaved ADCs," IEEE VLSI-C, 2022.
[7] Dong-Ryeol Oh, "A 7-bit Two-Step Flash ADC With Sample-and-Hold Sharing Technique," IEEE, JSSC, 2022.
[8] Dong-Jin Chang, "MixedNet: Network Design Strategies For Cost-Effective Quantized CNNs," IEEE, Access, 2021.
[9] Ye-Dam Kim, "A 4th-Order CT I-DSM with Digital Noise Coupling and Input Pre-Conversion Method for Initialization," IEEE ASSCC, 2021.
[10] Seungyong Lim, "An Input-Buffer Embedding Dual-Residue Pipelined-SAR ADC with Nonbinary Capacitive Interpolation," IEEE ASSCC, 2021.
[11] Dong-Jin Chang, "A 28-nm 10-b 2.2-GS/s 18.2-mW Relative-Prime Time-Interleaved Sub-ranging SAR ADC with On-Chip Background Skew Calibration," IEEE, JSSC, 2021.

<Professor Hyun Myung's Lab.>

URL URBAN ROBOTICS LAB @ KAIST

■ **Contact information**

Professor : Hyun Myung TEL : 042-350-7451

Lab. : Urban Robotics Lab TEL : 042-350-7551

Website : https://urobot.kaist.ac.kr/

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 31 Master's Student: 14

■ **Research Areas**

- Autonomous robot navigation (SLAM, self-driving car, mobile robot, legged robot, drone, etc.)
- Spatial artificial intelligence & Machine learning
- Intelligent robots
- Monitoring & inspection for smart cities
- Swarm robots

■ **Recommended courses & Career after graduation**

- Recommended courses: EE381, EE581, EE585
- Career after graduation: Robotic researcher for gov. research institutes, industries (Samsung Elec., Hyundai Motor Company, Naver labs, etc.); Professor in academia

■ **Introduction to other activities besides research**

- Summer/winter workshop
- Lab tour
- Strawberry party

■ **Introduction to the Lab.**

Our lab focuses on the research and development of robotics technologies for smart cities. The research fields include autonomous robot navigation, spatial AI, machine learning, monitoring, inspection, control, and rehabilitation for smart cities and civil infrastructures. We also deal with big data informatics supporting sensing, analysis, and design activities needed to construct and operate smart and sustainable built environments.

■ **Recent research achievements ('21~'23)**

- **Published Journal/Conference Papers**

2023 (published paper: 32)

Hyungtae Lim, Beomsoo Kim, Daebeom Kim, and Hyun Myung†, "Quatro++: Robust Global Registration Exploiting Ground Segmentation for Loop Closing in LiDAR SLAM," International Journal of Robotics Research, (accepted. in-press), Aug. 2023.

I Made Aswin Nahrendra, Byeongho Yu, and Hyun Myung†, "DreamWaQ: Learning Robust Quadrupedal Locomotion With Implicit Terrain Imagination via Deep Reinforcement Learning," in Proc. IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 5078-5084, London, UK, May 2023.

2022 (published paper: 49)

Hyunjun Lim, Jinwoo Jeon, Hyun Myung†, "UV-SLAM: Unconstrained Line-Based SLAM Using Vanishing Points for Structural Mapping," in Proc. IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 1518-1525, Philadelphia, USA, May 2022.

Wooju Lee, Hyun Myung†, "Adversarial Attack for Asynchronous Event-based Data," in Proc. The 36th AAAI Conference on Artificial Intelligence (AAAI 2022), pp. 1237-1244, Virtual, Jun. 2022.

2021 (published paper: 44)

Hyungyu Lee, Byeongho Yu, Christian Tirtawardhana, Chanyoung Kim, Myeongwoo Jeong, Sumin Hu, and Hyun Myung†, "CAROS-Q: Climbing Aerial RObot System Adopting Rotor Offset With a Quasi-Decoupling Controller," IEEE RA-L (Robotics and Automation Letters), vol.6, no.4, pp.8490-8497, Oct. 2021.

Hyungtae Lim, Minho Oh, and Hyun Myung†, "Patchwork: Concentric Zone-based Region-wise Ground Segmentation with Ground Likelihood Estimation Using a 3D LiDAR Sensor," IEEE RA-L (Robotics and Automation Letters), vol.6, no.4, pp.6458-6465, Oct. 2021.

- **Awards**

First place at Quadruped Robot Challenge (QRC) hosted at the 2023 IEEE Conference on Robotics and Automation (ICRA), London, UK.

First place overall in LiDAR session & first place in academia (second place overall) in the vision-only session at HILTI SLAM Challenge 2023 held at 2023 IEEE International Conference on Robotics and Automation (ICRA), London, UK

The only one to complete the entire course and win a prize in the autonomous flight technology contest hosted by the Defense Acquisition Program Administration and Daejeon City, sponsored by the Agency for Defense Development and Daejeon Techno Park, 2023.

<Professor Gun-Woo Moon's Lab.>

■ **Contact information**

Professor : gwmoon@kaist.ac.kr TEL : 042-350-3475

Lab. : fptmvj@kaist.ac.kr TEL : 042-350-8075

Website : http://power.kaist.ac.kr

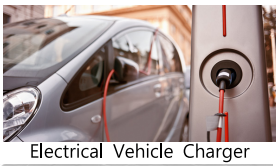
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : PhD Students: 9 Master's Student: 4

■ **Research Areas**

Electrical Vehicle Charger

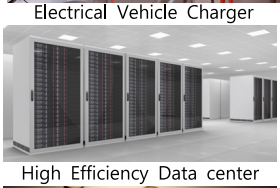
Electrical vehicles essentially have rechargeable batteries that can be fully charged by connecting the vehicle plug to and external electric power source. Therefore, battery charger is one of the key components of EV.



Electrical Vehicle Charger

Power Supply for Data Center

Data center is increasing rapidly due to the extension of internet. Accordingly, power consumptions of data center is rising as a global issue. Therefore, this research proposes new technologies to obtain high efficiency and high power density of data center.



High Efficiency Data center

Battery Management System with Cell Balancing Circuit

As the number of charging and discharging periods increase, the unbalanced cells are faced to the limit with the use of the battery power. Therefore, the cell balancing circuit is required to prevent the unbalance between the cell.

Battery Management System

Wireless Power Transfer System

Wireless Power Charging System for large-capacity battery in electrical vehicles, and dual-band wireless power architecture for multiple load conditions.

Wireless Power Transfer

■ **Recommended courses & Career after graduation**

Recommended courses : Circuit theory, Electronics circuits, Control system, Power electronics systems, Electro-magnetics

Career after graduation: Professors, Research institute (ADD, KARI, KERI, KRRI, KISTI, etc.), Industry (Samsung Electronics, Hyundai Motors, Intel, etc.)

■ **Introduction to other activities besides research**

Exercise Activity : Soccer, Futsal, Basket ball, Foot volleyball,

Workshop : Summer and Winter workshop.

Etc. : Year-end party and Home coming day.

■ **Introduction to the Lab.**

KPEL is leading world-class power electronics researches. Main research area contains power supply for data center, charging system for electrical vehicle, wireless power transfer system, battery management systems. KPEL is contributing domestic company's sales with technical transfer by linking with industry. KPEL published 203 SCI journals, 279 international conferences, and 206 patents.

■ **Recent research achievements ('21~'23)**

International Journal (Total 16)

2023 : 7. (IEEE Trans. Power Electronics [I.F : 6.663 / IEEE Trans. Industrial Electronics [I.F : 9.59])
2022 : 4. (IEEE Trans. Power Electronics [I.F : 6.373 / IEEE Trans. Industrial Electronics [I.F : 7.515])
2021 : 5. (IEEE Trans. Power Electronics [I.F : 7.224 / IEEE Trans. Industrial Electronics [I.F : 8.7])

International Conference (Total 17)

2021-2023 : 17. (ECCE Asia – Japan / ECCE Asia – Singapore / ECCE Asia – Korea)

Award

[1] "Highlighted Paper", IEEE Transactions on Power Electronics
[2] Human Tech Paper Award (Samsung Electronics)
[3] Outstanding Presentation Award, IEEE APEC
[4] Korea Power Electronics Conference : 4 Best Paper

<Professor Seong-Ook Park's Lab.>

Micro Millimeter wave and Antenna Laboratory

■ Contact information

Professor	**Email: soparky@kaist.ac.kr**	**Tel: 010-3412-1451**
LAB.	**Email:**gksthf30638**@kaist.ac.kr**	**Tel: 010-4622-3402**
Website	http://ma.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

PPhD Students: 14, Master's Student: 4

■ Research Areas

Research at Microwave (Millimeter-wave) and Antenna Laboratory includes electromagnetic theories for antenna analysis, active beam scanning antennas, Radar systems, and synthetic aperture radar.

[Antenna Theory Analysis]

We theoretically and numerically analyze electromagnetic phenomena induced by new materials like nano-materials and metasurface to apply a novel antenna technology.

[5G and 6G Antenna Technologies]

We develop a core technology of active antenna systems to design wide beam scan enhanced gain antenna, 5th and 6th generation mobile channel sounder system, and an accurate calibration with mmWave Antenna Measurement.

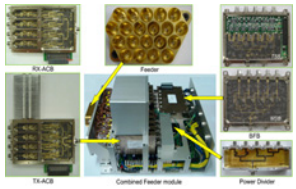
[Radar Surveillance System and Synthetic Aperture Radar(SAR)]

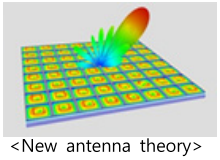
We have realized and develop various radar systems, such as drone detecting system, an active electronic scanning radar, Synthetic Aperture Radar System, and radar target classification using deep learning technologies.

■ mm-wave antenna and SAR Radar Research Center,

The synthetic aperture radar(SAR) enables high-resolution, day-and-night, and weather-independent observation which enables to observe a particular location. Our research focuses on X/Ka-band antenna and SAR radar payload on a 50 kg microsatellite. Ultimately, we are going to apply the SAR data to AI and Deep Learning technologies to predict and monitor natural disasters.

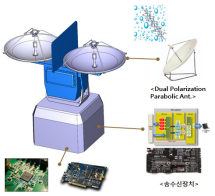
<Antenna System>



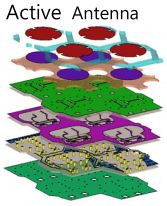


<New antenna theory>

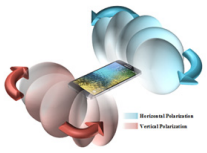
<Radar antenna & System>



Active Antenna

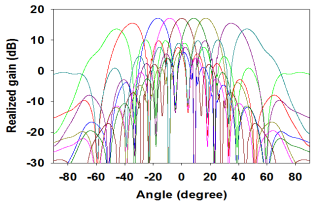


<5G & 6G Beam-forming antenna >

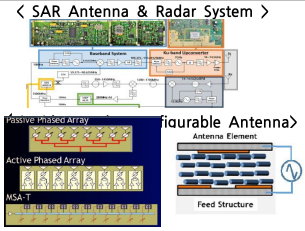


<SAR Radar Image>

<Active Beam-forming Antenna>



< SAR Antenna & Radar System >



■ Recommended courses & Career after graduation

Electromagnetics, Electronic Circuits, and Antenna are recommended for undergraduate courses.
For graduate courses, Electromagnetic Theory, Microwave Engineering, and Antenna Engineering are recommendable. After graduation, there are a wide range of career opportunities such as research institutes, University's professor, military institutes, & companies, *etc.*

■ Introduction to other activities besides research

We hold an annual Homecoming Day to promote interaction between students and alumni, and share information about academic research and industrial trends. Also, there are plenty of soccer matches to maintain a sound body and mind.

■ Introduction to the Lab.

Microwave (Millimeter-wave) and Antenna Laboratory have undertaken a number of government-sponsored projects. Based on the accumulated research experiences, we pursue creative and future-oriented research. Prof. Seong-Ook Park makes leads us to write decent papers on key technologies of our fields. Moreover the lab's atmosphere is fairly friendly and supportive which is the greatest strength of our lab.

■ Recent research achievements (2019~2023)

[1] International referred journal papers about 200, international conference papers about 160, domestic journals about 20, domestic conference about 50, and international/domestic patents of 28.
[2] IEEE AP-S, IEEE EMC Korea Chapter, and *etc*, best paper awards
[3] Drone Detection Radar System : Drone detection radar developed by Our lab (KAIST) was deployed and operated successfully at 2018 Pyeongchang Olympics. and currently operating at Jeju international Airport

⟨Professor In-Cheol Park's Lab⟩

Integrated Computer Systems Laboratory

■ **Contact information**

Professor	**Email: icpark@kaist.edu**	**Tel: 042-350-3461**
LAb.	**Email: hjjang@ics.kaist.ac.kr**	**Tel: 042-350-9884**
Website	**http://ics.kaist.ac.kr/**	

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 1 Master's Student: 5

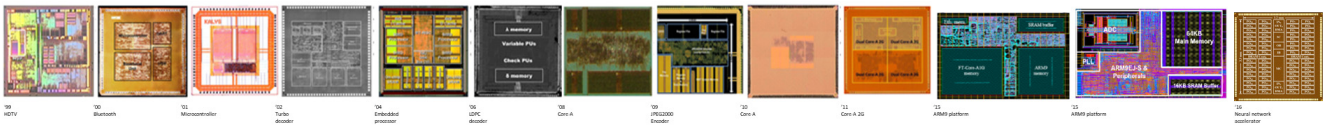
■ **Research Areas**

Intelligence Computing Systems Laboratory (ICSL) was established in 2000 by Professor In-Cheol Park. The research focus of ICSL is on computer architecture, embedded processors, and VLSI architectures for computationally intensive function blocks, such as multimedia signal processing and communication system. The current research scope of ICSL is VLSI designs for error correcting code blocks, deep neural networks, and communication systems.

• Design of microprocessors: Many kinds of processors were developed such as single-chip programmable SoC platform, and multithread embedded processor. A SoC platform based on 32-bit embedded processor and on-chip bus was developed together with its corresponding development environment including software.

• VLSI design for error-correcting codes: Error correction is one of the most important techniques used in communication and storage systems to recover messages corrupted in noisy environments. In addition, low-power LDPC decoders optimized for NAND flash were devised. Also, LDPC and polor decoders for communication standards such as 5G-NR were developed to achieve near-optimal error-correcting performance with high throughput.

• VLSI design for neural networks: The neural network accelerators were proposed to achieve high energy efficiency while supporting the scalable structure, which can compute a neural network algorithm in multiple processors. In addition, processing-in-memory hardware architecture was designed to achieve high energy efficiency.



■ **Recommended courses & Career after graduation**

'Digital system design', 'Digital signal processing', 'Signals and systems', 'Introduction to computer architecture', and 'Electronic circuits' are recommended as prerequisite courses. Most graduates are employed as professors or as researchers in major companies such as Samsung Electronics, SK Hynix, Google, Meta (Facebook), and Apple or national research centers such as ETRI and ADD.

■ **Introduction to other activities besides research**

Our laboratory members enjoy out-of-study activities. We usually go out for dinner. We sometimes go out for drinks.

■ **Introduction to the Lab.**

ICSL provides one personal PC (Intel Core i7, 32GB RAM), two FULL HD monitors, 512GB SSD, and 1TB HDD per person, and servers for simulations and EDA tools. We have one project and one research meetings every week, which provide proper guidance for works and researches. Our research topics focus on everything related to VLSI architectures including communications systems, storage systems, neural networks and error-correction codes.

■ **Recent research achievements (2021-2023)**

[1] Suchang Kim et al, "A CNN Inference Accelerator on FPGA With Compression and Layer-Chaining Techniques for Style Transfer Applications", IEEE Transactions on Circuits and Systems-I: Regular Papers, vol. 70, no. 4, pp. 1591-1604-982, Jan. 2023.

[2] Seongjin Lee et al, "Multi-Mode QC-LDPC Decoding Architecture With Novel Memory Access Scheduling for 5G New-Radio Standard", IEEE Transactions on Circuits and Systems-I:, vol. 69, no. 5, pp. 2035-2048, Feb 2022.

[3] Suchang Kim et al, "Real-time SSDLite Object Detection on FPGA", IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. 29, no. 6, pp. 1192-1205, June 2021.

〈Professor Joonwoo Bae 〉

QIT@KAIST **Quantum Information Teory Lab**	**■ Contact information**		
	Professor	**Email: joonwoo.bae@kaist.ac.kr**	**Tel: 7446**
	Lab.	**E3-2 3215, 3216, 3203**	**Tel: 7646**
	Website	**https://sites.google.com/view/qitkaist/home**	

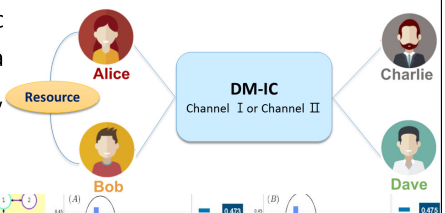
■ Current state of the Lab. (in 2023 Fall Semester)

Research Professor :1 Postdoctoral Fellows : 2 PhD Students: 9 Master's Student: 2

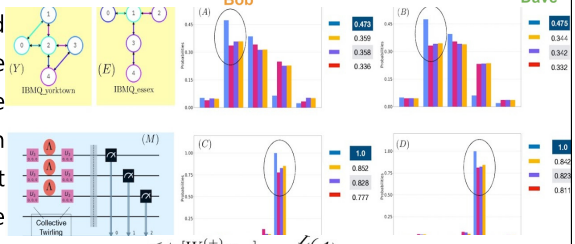
■ Research Areas : Quantum Information Theory - Fundamentals to Applications

We're working on fundamental problems in quantum information theory to understand the information processing in the most fundamental level and to break the limits in today's technologies

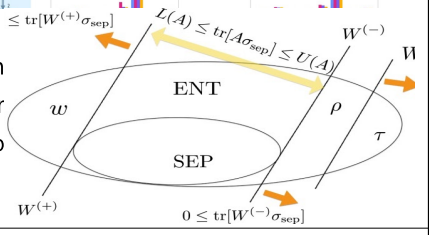
- Quantum protocols : Quantum protocols can realize the information-theoretic security, enhance channel capacities, and open monogamous correlations in a network theory. Quantum protocols are based on resources, entanglement, quantum steering, and non-local probabilities.



- Quantum Computing (Algorithms and Hardware Interface): Quantum dynamics is special in that it is restricted to linear and invertible transformations, allowing exponential increase of the dimension. This defines non-standard computation based on the laws of quantum mechanics and solve hard problems appearing in cryptographic applications. We develop quantum algorithms that are better fitted with curren quantum technolgoies, and also devote our effots to deal quantum noise.



- Entanglement Theory : Entanglement is a resource in quantum information processing. We are interested in the verification of entangled states, their structure, and the usefulness. We apply various mathematical tools to characterize and prove entanglement properties.



■ Recommended courses & Career after graduation

Courses: EE480, EE547

All careers related with quantum ICT are open for future positions, academic jobs, business, and related companies.

■ Introduction to other activities besides research

The group is international. We often have visitors from Europe, Asia, and the US. We enjoy going out to eat. We will discover nice restaurants nearby.

■ Introduction to the Lab.

Quantum Information Theory (QIT) studies how information is processed in the most fundamental level and characterizes capabilities of quantum systems in information processing. The group aims to advance QIT in a practical point of view. We're interested in feasible quantum information applications, developing its fundamentals, and theoretical tools to solve problems. We interact with computer scientists, mathematicians, and physicists.

■ Recent research achievements (2020-2022)

[1] Contextual advantages and Certification for Maximum Confidence Discrimination, K. Flatt, et. al., PRX Quantum 3 030307 (2022).

[2] Quantum vs. Noncontextual Semi-Device-Independent Randomness Certification, C. Roch i Carceller et. al.,, Physical Review Letters 129 050501 (2022).

[3] Measurement crosstalk errors in cloud-based quantum computing, Seungchan Seo and Joonwoo Bae, IEEE Internet Computing Vol 26 Issue 1 page 26-33 (2022).

[4] A hybrid quantum-classical approach to mitigating measurement errors in quantum algorithms, Hyeokjea Kwon and Joonwoo Bae, IEEE Transactions on Computers, Vol 70 (9) 1401 (2021)

[5] Non-Local Network Coding in Interference Channels, Jiyoung Yun, Ashutosh Rai, and Joonwoo Bae, Physical Review Letters 125 150502 (2020).

[6] Channel Coding of a Quantum Measurement, S. Kechrimparis, et. al., IEEE Journal on Selected Areas in Communications, Vol 38, No 3, 439 (2020), Erratum IEEE JSAC Vol 38 No 5 980 (2020)

[7] Mirrored Entanglement Witnesses, J. Bae, D. Chruscinski, B. Hiesmayr, npj Quantum Information 6 15 (2020)

<Professor Hyeon-min Bae's Lab.>

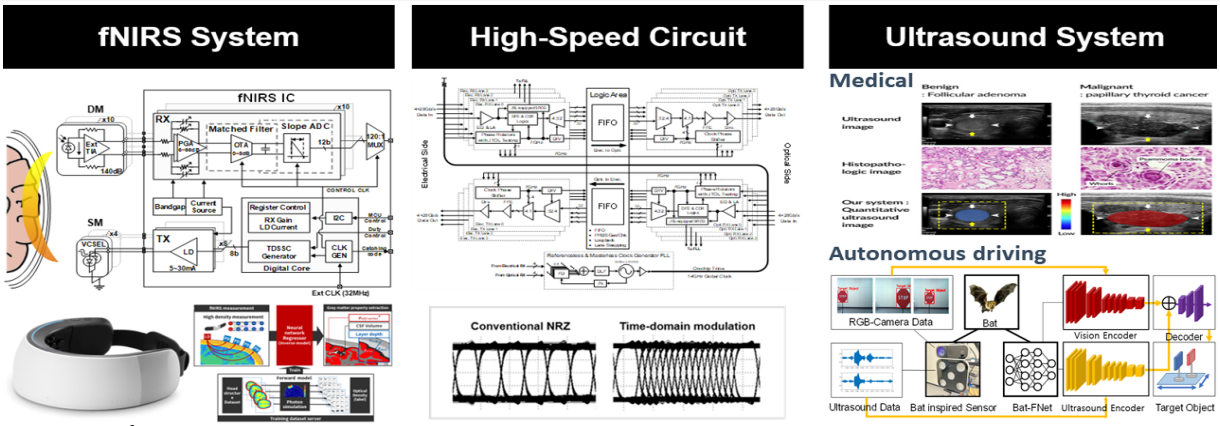
NAIS Nanoscale Advanced Integrated Systems LAB

■ **Contact information**

Professor : hmbae@kaist.ac.kr TEL : 042-350-3489
Lab. : baelab@kaist.ac.kr TEL : 042-350-5489
Website : http://nais.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 5 Master's Student: 10



■ **Research Areas**

At NAIS lab, we engage in a wide range of research regarding various application fields based on high-speed communication integration circuit technology. As the research topics take system-wide approach, students will be able to experience and accumulate broad spectrum of knowledge during the process of completing the research. The objective of all research performed at NAIS lab is to implement and commercialize innovative systems through disruptive technology. NAIS lab encourages students to experience venture ecosystem by getting involved in establishing ventures based on the research performed during the graduate school years. OBELAB and Poin2Tech are start-ups that were established, based on the research conducted during the graduate school years at NAIS lab. Alumnis are strongly involved in those companies.

■ **Recommended courses & Career after graduation**

One of the most important virtue at NAIS lab is 'craftsmanship'. For this, NAIS lab focuses on research and development involving communication circuits, and it is recommended that students take courses in circuit, digital, and communication-related subjects. Graduates of NAIS lab pursue careers both in industry and academia. They seek to enhance the degree of completion of their own research carried out at NAIS lab.

■ **Introduction to other activities besides research**

We like to explore famous restaurants around Daejeon. Lab members are also active in physical activies.

■ **Introduction to the Lab.**

NAIS lab was established in 2009. It is constantly challenging and pursuing progress in many areas of research. The doctorate and the masters degree students are working in a friendly atmosphere. Students enjoy athletic activities and other hobbies. The lively atmosphere of the lab makes it possible for the students to devote themselves to research and to enjoy school life.

■ **Recent research achievements ('21~'23)**

[1] Woohyun Kwon, Hyosup Won, Taeho Kim, Ha-Il Song, Hanho Choi, Sejun Jeon, Soon-Won Kwon, Bongjin Kim, Huxian Jin, Jun-Gi Jo, Tai-Young Kim, Jake Eu, Jinho Park, Hyeon-Min Bae, "A 25.78125Gbps Bi-directional Transceiver with Frame-Pulsewidth Modulation(FPWM) for Extended Reach Optical Linkds in 28nm CMOS", 2022 IEE Symposium on VLSI Tchnology and Circuits, June 2022.

[2] Seok-Hwan Oh, Myeong-Gee Kim, Youngmin Kim, Guil Jung, Hyuksool Kwon, Hyeon-Min Bae, "Sensor geometry generalization to untrained conditions in quantitative ultrasound imaging", International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI), Sept.2022

[3] Myeong-Gee Kim, Seok-Hwan Oh, Youngmin Kim, Hyuksool Kwon, Hyeon-Min Bae, "Learning-based attenuation quantification in abdominal ultrasound", International Conference on Medical Image Computing & Computer Assisted Intervention (MICCAI), Sept.2021. - (early accept, top 13%)

〈Professor Youngchul Sung's Lab〉

SISReL
Smart Information Systems Research Lab

■ **Contact information**
Professor : **Email:** ycsung@kaist.ac.kr TEL : **042-350-3484**
Lab. : ms.cho@kaist.ac.kr TEL : **042-350-5484**
Website : **https://sisrel.kaist.ac.kr**

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 8 Master's Student: 4

■ **Research Areas**

▷ **Reinforcement Learning**

Statistical inference and machine learning are basic tools for making decision or prediction based on incomplete data. This field has been an important branch in systems area and has gained a recent interest in the era of big data and artificial intelligence. In this field, SISReL is investigating new possibilities and invention of more efficient inference and machine learning algorithms based on sparsity, information geometry, statistical methods, and optimization tools. Currently, SISReL is focusing on reinforcement learning, which will be a major tool for AI robots, smart cities and autonomous vehicle, from various research perspectives such as

- multi-agent reinforcement learning / partially-observable Markov decision processes (POMDP)
- enhancing exploration / intrinsic reward design for sparse-reward reinforcement learning
- meta and multi-task reinforcement learning / domain adaptation / imitation learning / parellel learning

▷ **6G, Internet-of-Things, and Smart Machine Intelligence Systems:**

In this area, SISReL is conducting research on 6G and its fusion with internet-of-things and smart machine intelligence systems like connected vehicle from the perspective of real applications with extensive real world experience of the advisor. We are trying to come up with new algorithms, multi-access methods or system architectures with significant performance improvement for wireless communication networks.

■ **Recommended courses & Career after graduation**

We recommend interested students to take basic courses in mathematics such as Analysis, Linear Algebra, Optimization Techniques, and Probability and Statistics; and machine learning related courses such as Introduction to Big Data and Reinforcement Learning. SISReL graduates are playing active roles in research and development activities as professors in academia, as researchers in national research institutes such as ETRI, ADD, NSRI, or as researchers in industry.

■ **Introduction to other activities besides research**

We have a lab seminar to learn various basic theories every week. In addition, we exercise together for harmony and health. For example, we run or play badminton in the sports complex.

■ **Introduction to the Lab.**

The Smart Information Systems Research Lab. (SISReL) is a part of the School of Electrical Engineering and Graduate School of AI at KAIST, and headed by Professor Youngchul Sung. The research of SISReL focuses on signal processing, statistical inference, machine learning, reinforcement learning, and communication, with applications to internet-of-things, smart machine intelligence systems, and next generation communication systems.

■ **Recent research achievements ('21~'23)**

▷ Published 11 papers / 5 workshop papers in the top AI/ML conferences (NeurIPS, ICML, ICLR, AAAI, AAMAS)

▷ Published 4 papers in SCI journals

⟨Professor Youngik Sohn⟩

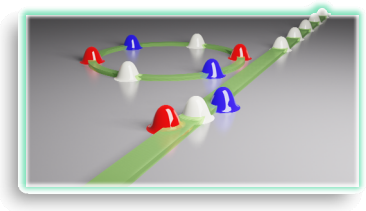
Quantum Device Lab

■ Contact information		
Professor	Email: youngik.sohn@kaist.ac.kr	Tel: 042-350-7466
Lab.	Email: qdlab@kaist.ac.kr	Tel: -
Website	https://qdlab.kaist.ac.kr	

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 3 Master's Student: 5

■ **Research Areas**

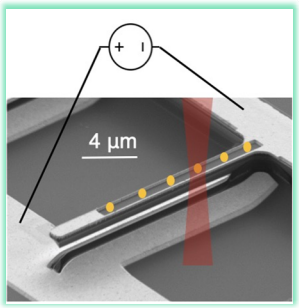


Quantum computing with integrated photonics

Quantum computing is a novel technology that is expected to become a game changer in the field of Chemistry, Material Science, Machine Learning for Artificial Intelligence.

However, building reliable hardware for fault-tolerant quantum computer is an extremely challenging task due to the fragile nature of quantum information. In our lab, we aim to build error-corrected, powerful quantum computer based on integrated photonics platform.

By combining optical circuit, superconducting electronics and RF amplifier altogether on a single integrated photonics platform, it is possible to realize the basic building block of a quantum computer.



Chip-scale quantum repeater for long distance entanglement

Having quantum mechanically pure entangled pair at a far distance is a key milestone pursued by many researchers all around the world. Based on our expertise in diamond color centers and nonlinear quantum photonics, we are working on realizing scalable quantum repeaters.

■ **Recommended courses & Career after graduation**

course: electromagnetics, quantum mechanics, solid-state physics, photonics, optics, fabrication

career: Research scientist or engineers for quantum technologies, Integrated photonics engineer

■ **Introduction to other activities besides research**

All of our members use motion desk! We care about your health and spirit more than anything else.

■ **Introduction to the Lab.**

We have a focused goal of building on-chip feedforward system, which is the most basic component for photonic quantum computer. Reliable, fault-tolerant quantum computer does not exist in the world yet! We want to become a pioneer who builds one.

■ **Recent research achievements (2018-2023)**

- First SCI journal paper produced from QDLAB (Koh et al. (2022))
- Pioneering MEMS fabrication for quantum emitter in diamond (Sohn et al. (2018))
- Professor Sohn is an early member of world's only quantum computing unicorn (PsiQuantum Corp)

⟨Professor Mincheol Shin's Lab.⟩

Computational Nanoelectronics Laboratory
http://cnl.kaist.ac.kr

■ Contact information

Professor	Email: mshin@kaist.ac.kr	Tel: 042-350-7418
LAb.	Email: cnl.kaist.lab@gmail.com	Tel: 042-350-7618
Website	http://cnl.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

PhD Students: 5 Master's Student: 5

■ Research Areas

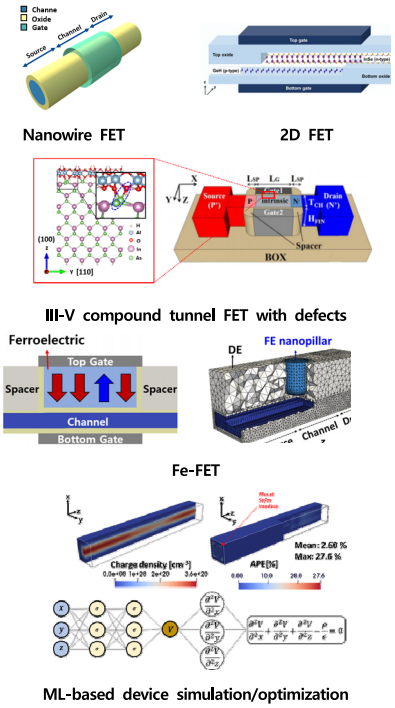
As the feature size of conventional planar metal-oxide-semiconductor field-effect transistors (FETs) shrinks into the nanometer regime, novel devices such as nanowire and tunnel FET have emerged as the next generation devices. The classical or semi-classical approach is no longer valid for the nano-sized devices so quantum-mechanical, atom-level treatment is required.

In our laboratory, we have been developing **simulators for advanced nano scaled logic devices** based on the quantum mechanical principles. Si-based as well as non-Si devices such as 2D materials and III-V compounds are being considered. To treat the devices in the atomistic level, density functional theory and the non-equilibrium Green's function method are employed to calculate the quantum charge transport.

We have also studied **the next generation memory devices**, such as ferroelectric FET (FeFET) and magnetic random access memory (MRAM). For **FeFET**, we use in-house Phase-field-based simulator.

For an optimization of nanoscale devices, we have developed **machine learning(ML)-based device optimization framework** where TCAD simulator and Bayesian optimization algorithm are combined.

We are currently developing advanced transport models through **physics-informed neural networks** and more. Through this approach, we aim to construct advanced transport models and explore solutions to complex real-world problems by enhancing predictions and modeling.



■ Recommended courses & Career after graduation

Prospective students should have good background knowledge on semiconductor physics and devices. Basic/advanced courses on the quantum mechanics, solid-state physics, and C language are also recommended to take. After graduation, they may continue their research career in universities or research institutes or work in semiconductor companies in Korea and overseas.

■ Introduction to other activities besides research

It is strongly encouraged that students set aside time for regular physical exercises. Besides research, it is emphasized that students acquire ability to develop and express their idea, thinking, opinions through reading, writing and presentation (scientific or non-scientific).

■ Introduction to the Lab.

Computational science/engineering is a new, a third way of doing research, besides the traditional way of doing research which is theory or experiment. Remarkable progress in the computer power and increasing needs for computation has led to the era of computational science/engineering. To meet the needs of the times, CNL provides its members with environments and experiences, which help them become the experts in semiconductor device physics and computational electronics. At the time of graduation, they are expected to be capable of handling all the semiconductor-device related issues that become more and more complex and ready to work both in industry and academia.

■ Recent research achievements (2021-2023)

[1] "Ferroelectric nanopillar field-effect transistors: Quantum transport simulations based on a three-dimensional phase-field", Hyeongu Lee, Yoon-suk Kim, and Mincheol Shin, Physical Review Applied, vol. 19, p. 054061, May. 2023

[2] "Efficient device simulations using density functional theory Hamiltonian and non-equilibrium Green's function: heterostructure mode space method and core charge approximation," Seonghyeok Jeon and Mincheol Shin, Journal of Computational Electronics, May 2023.

[3] "First-Principles-based Quantum Transport Simulations of Interfacial Point Defect Effects on InAs Nanowire Tunnel Field-Effect Transistors", H. Lee, et al., IEEE Transctions on Electron Devices, vol. 68, no. 11, pp. 5901 - 5907, Nov. 2021.

[4] "Bayesian Optimization of MOSFET Devices Using Effective Stopping Condition", B. Kim and M. Shin, IEEE Access, vol. 9, 108480-108494, Aug. 2021.

<Professor Seungwon Shin's Lab.>

NS² Network and System Security Laboratory

■ **Contact information**

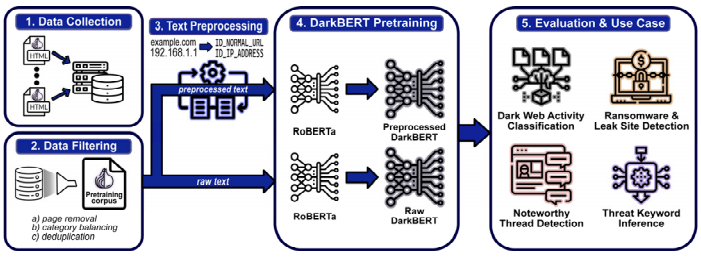
Professor : ITC Building (N1-910) TEL : 042-350-8323
Lab. : ITC Building (N1-919) TEL : 042-350-7538
Website : http://nss.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

PhD Students: 13 Master's Student: 2

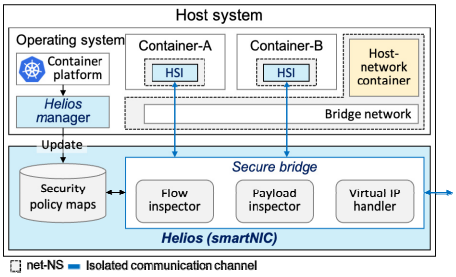
■ **Research Areas**

1) Large Language Model (LLM) Security



The Dark Web has always been a domain of interest for cybersecurity researchers looking to gain insight into emerging cybercriminal activities such as scams, malware, etc. We perform textual analysis on the dataset to uncover unique characteristics on how language might be used in the Dark Web, such as underground slangs and jargons. The insights gained on the language used in the Dark Web are then used to create DarkBERT, a language model pretrained on Dark Web data. We design multiple new use case scenarios on cybercriminal activities in the Dark Web to illustrate the benefits that DarkBERT can offer in Dark Web research.

2) Cloud/Container Security



Recently, containerization has emerged as the predominant paradigm for cloud-based virtualization. Notwithstanding its widespread adoption, the incorporation of containers has expanded the potential attack vectors, rendering cloud systems susceptible to compromises. In response to this challenge, our research endeavors to introduce various security systems tailored for container-based cloud systems. Specifically, we ensure strict isolation of both inter-containers and between the host and its containers to enhance system-level security. Also, our focus extends to inspecting and orchestrating container communication, a critical component of network-level security.

3) Cyber Threat Intelligence

As NFTs continue to grow in popularity, NFT users have become targets of NFT stealers, called NFT drainers. Although their presence remains a serious threat to the NFT trading space, no work has yet comprehensively investigated their behaviors in the NFT ecosystem. This research aims to collect large-scale NFT transaction data and analyze behavioral patterns of drainers targeting NFTs. Based on the analysis, we design an automatic drainer detection system, called DRAINCLoG, that uses GNN to effectively capture the complex relationships in the NFT ecosystem.

■ **Recommended courses & Career after graduation**

The recommended courses include computer networks, network programming, operating system, system programming, machine learning. Most graduates were employed by global IT companies or appointed as professors at domestic universities.

■ **Introduction to other activities besides research**

We aim for stress-free life, and studies can be done with no bounds on time and place. Additionally, every member of our laboratory is encouraged to partake in a variety of group sports activities (e.g., football, swimming, and table tennis) fostering both physical wellness and team cohesion.

■ **Introduction to the Lab.**

We take pride in our significant academic contributions to top-tier conferences within the domains of security, machine learning, and systems. All of the lab members are suggested to read their research project and to submit a paper to a conference or journal even a master's degree student. Furthermore, we provide various research facilities generously.

■ **Recent research achievements ('21~'23)**

[1] PassREfinder: Credential Stuffing Risk Prediction by Representing Password Reuse between Websites on a Graph, IEEE S&P 2024 (to appear)
[2] HELIOS: Hardware-assisted High-performance Security Extension for Cloud, ACM SoCC 2023
[3] Cryonics: Trustworthy Function-as-a-Service using Snapshot-based Enclaves , ACM SoCC 2023
[4] Evolving Bots: The New Generation of Comment Bots and their Underlying Scam Campaigns in YouTube, IMC, 2023
[5] AVX Timing Side-Channel Attacks against Address Space Layout Randomization, DAC, 2023
[6] DarkBERT: A Language Model for the Dark Side of the Internet, ACL, 2023

<Professor Youngsoo Shin's Lab.>

DT LAB
Semiconductor Design Technology

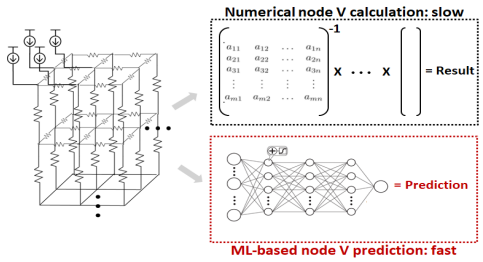
■ Contact information

Professor	**Email:** youngsoo@kaist.edu	**Tel:** 042-350-3479
Lab.	**Email:** sg.lee@kaist.ac.kr	**Tel:** 042-350-5479
Website	http://dtlab.kaist.ac.kr	

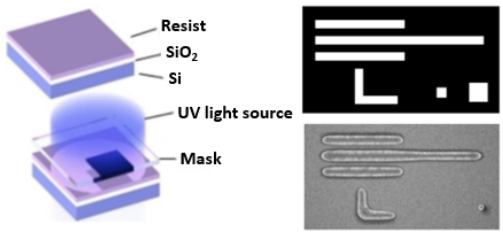
■ Current state of the Lab. (in 2022 Fall Semester)

Postdoctoral Fellows : 1 PhD Students: 6 Master's Student: 7

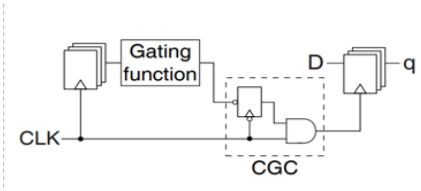
■ Research Areas



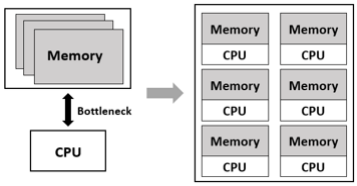
• **AI-EDA** Address challenges in electronic design automation (EDA) by using machine learning



• **Computational Lithography** Correct and verify mask to prevent distorted patterning by diffraction on wafer



• **Low Power Design** Reduce power consumption by supplying clock power only when clock is needed



• **Processing In Memory** Accelerate CPU operation without bottleneck between memory and CPU

■ Recommended courses

- Digital System (EE303) for undergraduate students
- CAD for VLSI (EE574) and Digital Integrated Circuit (EE678) for graduate students

■ Career after graduation

Most alumni entered leading semiconductor (**IBM, NVIDIA, Samsung Electronics, SK Hynix, and LG Electronics**) and EDA (**Synopsys, Cadence**) companies.

■ Introduction to other activities besides research

- Internship opportunities in **IBM, Synopsys, Siemens, Cadence (USA), and IMEC (Belgium)**
  - Ph.D. students had a chance to work abroad for the last few years
- Research sharing with Samsung S.LSI
- Workshop once a year (held in Jeju for this summer)
- Monthly social gatherings (coffee time, sports activities)

■ Introduction to the Lab

We all pursue excellent achievement with mutual encouragement. Our lab is the **top laboratory in the EDA research field** in Korea. Professors and students have extensive EDA-related knowledge. Also, **Mentoring system** is well established, so you can receive a lot of help in selecting research topics. Through our **collaborated projects with leading semiconductor companies**, we can research current hot issues of industry. Prof. Shin always welcomes personal meeting for detailed discussion on research topic, and he enthusiastically supports and motivates students.

■ Recent research achievements (2018-2023)

- Ph.D. Outstanding Dissertation Award in 2023, 2016, 2012
- Best paper award (including nominate): TSM'22, TSM'21, ASP-DAC'20, GLSVLSI'20
- Prof. Shin has been elected as IEEE Fellow and KAIST ICT Endowed Chair

<Professor David Hyunchul Shim's Lab.>

EE USRG
Unmanned Systems Research Group

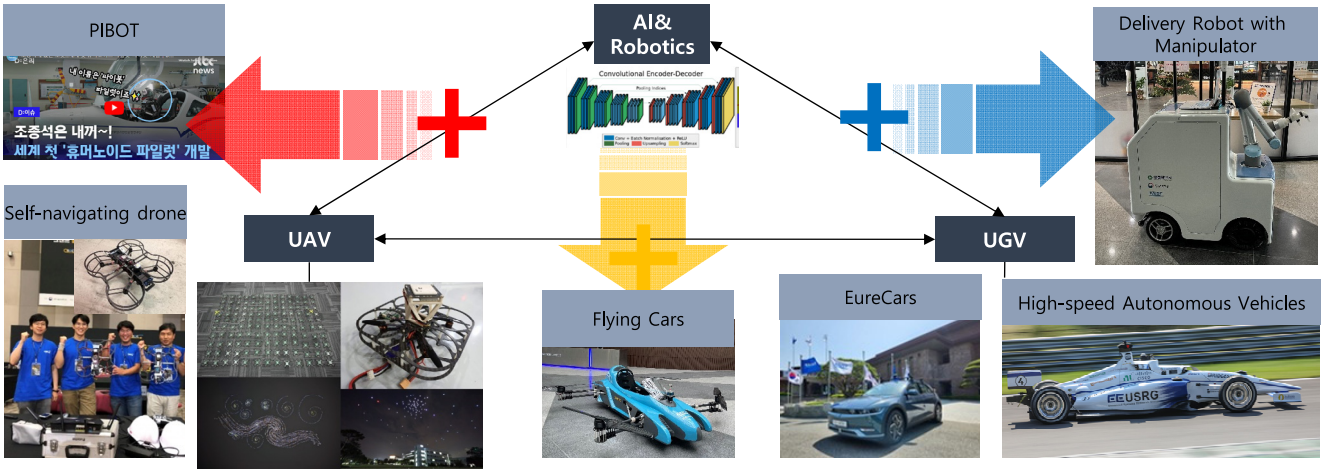
■ **Contact information**

Professor : D. Hyunchul Shim(심현철) TEL : 042-350-7445
Lab:Unmanned Systems Research Group(무인시스템연구실)
Website : **http://unmanned.kaist.ac.kr**

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 11 Master's Student: 10

■ **Research Areas**



Autonomous Flight	Multidisciplinary Research	Autonomous Driving
In-house fight controller Drone swarms 3D SLAM based Indoor flight for DARPA Subterranean Challenge Anti-drone Tech Korea RPAS Research Center	AI-equipped General Purpose Humanoid Robot (Pibot) Fully autonomous flying car Automation of vehicles using Humanoid robots	In-house fully autonomous driving Indy Autonomous Challenge Deep learning-based sensing and decision making End-to-end Self-driving Delivery Robots

■ **Recommended courses & Career after graduation**

We welcome backgrounds in robotics, control, computer vision, AI, and basic linux knowledge. Our alumni have joined NASA Jet Propulsion Laboratory(3), Hyundai Supernal(1), LG Electronics(2), Naver Labs(1) 42.com(2) and Hyundai Motors(2), ETRI, ADD, KARI, KETI. MIT (Ph.D.), TU Delft(Ph.D) and more.

■ **Introduction to other activities besides research**

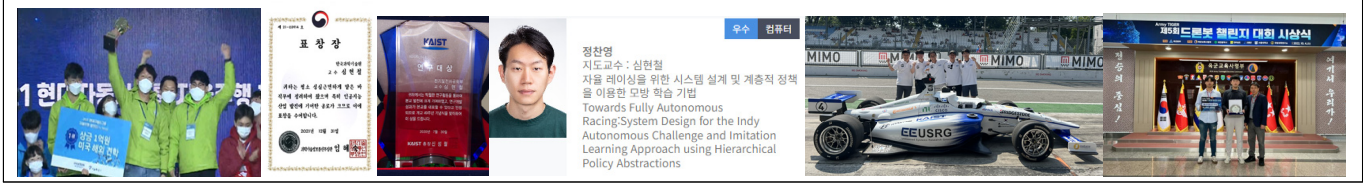
We are committed to the excellency of intelligent aerial and ground robots research. We are participating in various drone and self-driving car related competitions such as AI Grand Challenge, Hyundai Motor Company, and most notably, Indy Autonomous Challenge. Yes, we do go to nice group dinners at fancy places too!!

■ **Introduction to the Lab.**

Our lab focuses on the research and development of robots that work in the real world. Our lab has been well-funded and equipped, and students will be given with a lot of opportunities to pursue cutting-edge AI&Robotics research. We have six autonomous cars (including one Indy race car), 2 full-size aircraft, 3 ground station trucks, 1 DGX station, Optitrack, 200+ drones, and much more.

■ **Recent research achievements ('21~'23)**

We won 1st Prizes at Hyundai Autonomous Vehicle Competition('21) and Korean Army Dronebot Challenge('22). Prof. Shim received Minister Award from Ministry of Science and ICT('21) and International Collaboration Award from KAIST('22). Our Alum Dr. Chanyoung Jung received outstanding paper award from School of EE, KAIST('23). We have been a strong contender at Indy Autonomus Challenges.



<Professor Heejin Ahn's Lab.>

CONTROL AND INTELLIGENT SYSTEMS LABORATORY

■ **Contact information**

Professor : heejin.ahn@kaist.ac.kr TEL : 042-350-7471
Lab. : Room 3240, E3-2 TEL : 042-350-7571
Website : cis.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 0 Master's Students: 6

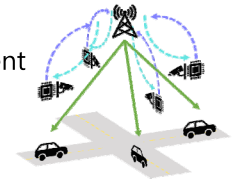
■ **Research Areas**

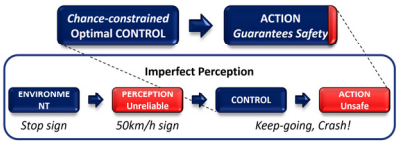
Our lab aims to design control & decision-making algorithms for complex dynamical systems via integration of control theory with computer science. In particular, we use optimization, game theory, and machine learning to develop safe, robust, and efficient control systems.

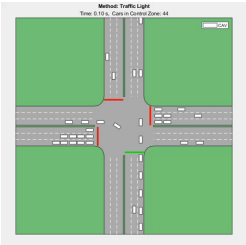
We apply our control & decision-making algorithms to different areas of intelligent transportation systems, ranging from a single autonomous vehicle to multiple autonomous vehicles and to transport network. In addition to theoretical design and analysis of control systems, we put great emphasis on the validation of the theories through computer simulations and hardware tests.

Some current fields of research are:

- Smart City Project
- Smart Intersection Management
- Collaborative Perception
- Uncertainty Quantification







■ **Recommended courses & Career after graduation**

Recommended courses: Linear algebra, differential equations, optimization, signals and systems, feedback control, machine learning

Career after graduation: Academia, industry (e.g., autonomous vehicles), national labs.

■ **Introduction to other activities besides research**

Students are encouraged to participate in other activities, including national/international internships and exchange programs.

■ **Introduction to the Lab.**

We are hiring motivated graduate students! Student who want to study and perform research on control theory and its application are encouraged to apply.

■ **Recent research achievements ('21~'23)**

- "Chance-constrained trajectory planning with multimodal environmental uncertainty", K. Ren, **H. Ahn,** and M. Kamgarpour, *IEEE Control Systems Letters, June 2022*
- "Optimal dynamic transmission scheduling for wireless networked control systems", Y. Ma, J. Guo, Y. Wang, A. Chakrabarty, **H. Ahn,** P. Orlik, and C. Lu, *IEEE Transactions on Control Systems Technology, Nov. 2022*
- "Safe motion planning against multimodal distributions based on a scenario approach", **H. Ahn,** C. Chen, I. M. Mitchell, and M. Kamgarpour, *IEEE Control Systems Letters, June 2021*

⟨Professor Kyounghoon Yang's Lab (양경훈 교수 연구실)⟩

High Speed Nano Electronics Laboratory

■ **Contact information**

Professor	**Email:** khyang@kaist.ac.kr	**Tel:** 042-350-3471
Lab.	**E3-2, 1227**	**Tel:** 042-350-5471
Website	**http://hsnl.kaist.ac.kr**	

■ **Current state of the Lab. (in 2024 Spring Semester)**

PhD Student: 1 & Master's Students: Openings now available for Spring semester 2024.

■ **Research Areas**

● Quantum-effect High-speed Nanodevices/Integrated Circuits

A **resonant tunneling diode (RTD),** which is a semiconductor nonlinear diode with a double-barrier quantum-well structure for electrons to resonantly tunnel through, has been regarded as one of the most mature quantum-effect devices for practical low-power integration circuit (IC) applications. The resonant tunneling diode (RTD) which is the fastest electronic device has inherent negative differential resistance (NDR), nonlinearity, and multifunctional/bistable characteristics, so it has been actively researched in signal sources, detectors, and mixed-signal circuits in THz monolithic integrated circuits (TMICs) for next-generation mmW and THz cutting-edge applications.

● Wide-bandgap High-power Semiconductor Devices

For power electronics applications, the wide-bandgap semiconductors such as gallium nitride (GaN) and silicon carbide (SiC) have benefits of high breakdown voltage, lower on-resistance, and higher current. In particular, **GaN-based HEMTs are ideal for the next generation of high-frequency, high-power power electronics applications** because the GaN HEMTs generate a high concentration of two-dimensional electron gas (2-DEG) owing to the strong polarization difference and high conduction band offset at the interface and have on-resistance lower than SiC devices. Our current focus is on **enhancement-mode (E-mode) GaN HEMTs grown on Si substrate with Vds,max>150 V and Ids>25 A.** The enhanced GaN HEMT is safer and more energy efficient because the device is in the off state at zero bias, essential for recent rapidly growing high-power electronics markets.

● Nano-CMOS / III-V HEMT RF Device Modeling & mm-Wave IC Design

Mm-wave wireless T/R Front-end phased-array ICs have been developed at the frequencies ranging from 28GHz, 60GHz up to W-band (77GHz, 94GHz). With the increase of frequencies, the resolution of beam-forming and the capacity for signal data rates enhance, which is a major research focus for the next-generation wireless system development. **The research on D-band (110-170GHz) RF-ICs** is in progress and **sub-THz bands (170-300GHz)** will be also pursued towards 5G+/6G systems.

■ **Recommended courses**

► Basic Physical Electronics, Semiconductor Devices, Electronic Circuits, Microwave Engineering, etc.

■ **Career after graduation**

► Samsung Electronics/SK Hynix/ETRI/KIST/ADD/NNFC/KANC/Academia

■ **Introduction to other activities besides research**

► Laboratory workshop & picnic / Casual group meetings in open atmosphere

■ **Introduction to the Lab.**

► HSNL is currently getting into the 2nd-phase of lab research activities, moving towards ***more diversified & bigger-scale co-research with other laboratories to develop mmW/THz Devices & Wireless Comm-Radar Core & Future Quantum System IC/Modules*** from high-speed/high-frequency nano/quantum devices to Full-scale IC/Systems based on enhanced mutual-lab collaborations, which will ***provide new joining students with more in-depth & broader research opportunities from device to circuit & system levels.***

■ **Recent research achievements (2020-2023)**

[1] X. Yang et al., "Systematic characterization for RF small-signal parameter extraction of 28 nm FDSOI MOSFETs up to 110 GHz," Microelectronics Journal, 2023.

[2] K. Yang, "Status and Perspective of Resonant Tunneling Diode Technology for Future mm-Wave and Terahertz (THz) Electronics," Keynote Invited Speech, CSW2023, 2023.

[3] M. Park et al., "200 mm Si CMOS Process-compatible Integrated Passive Device Stack for Millimeter-wave Monolithic 3-D Integration," IEEE TED, 2023.

[4] X. Yang et al., "RF Characterization and Small Signal Extraction of 28nm FDSOI MOSFETs up to 110GHz," IEEE APMC, 2022.

[5] J. Lee et al., "Area-Efficient Series-Connected Resonant Tunneling Diode Pair as Binary Neuron in Cellular Neural Network", IEEE EDL, 2020.

<Professor Youjip Won's Lab.>

OSLab
Operating Systems Laboratory

■ **Contact information**

Professor : ywon@kaist.ac.kr TEL : 042-350-7456

Lab. : TEL : 042-350-7613

Website : https://oslab.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 8 Master's Student: 8

■ **Research Areas**

We hack.

1. Operating System Design

We overhaul the operating system kernel for performance and scalability under newly emerging hardware; manycore system, ultra-low-latency storage device and byte-addressable non-volatile memory. We redesign the memory management module, the filesystem, the block device layer and the storage device firmware for manycore and Ultra-low-latency storage device.

2. Bigdata system

We optimize the big-data storage engine such as MongoDB, Rocksdb and levelDB. The log-structured merge and graph DB lie at the core of the key-value management system. These data structures cannot well be used in large scale big data system due to its frequent storage interaction and flush overhead. Industry and academia altogether seek for a new solution to meet the demand from the big-data application.

3. Machine Learning System

The entire machine learning pipeline consists of data ingestion, data cleaning, data tagging, learning and inference. The current machine learning pipeline suffers from a fair amount of redundant data copies, the coarse grain CPU/graph scheduling, unnecessary synchronization among the heterogeneous GPU devices with widely different computing capability. As a system developer, we orchestrate the behaviors of the individual software components in the machine learning pipeline and eliminate all inefficiencies in the existing ML system.

■ **Recommended courses & Career after graduation**

- Recommended courses to join the group: C/C++, Data Structure and Algorithms, Operating Systems
- Career: Professor at academia, researcher at government funded research organization, system software developer at the software company such as Google, Facebook, at the smartphone manufacturers such as Samsung and LG, or at the semiconductor Industry such as Samsung and Intel

■ **Introduction to other activities besides research**

- Sports: The group members do lots of sporting activities together; including basket ball, swimming, running around campus, and going to the gym for workout a few times a week.
- Travel: Each student has the opportunity to attend international conferences a few times a year (USENIX FAST, USENIX ATC, EuroSys and etc.).
- Leisure: Once a month, the group members dine out and enjoy drinks together. We often visit an excellent beer pub near the KAIST campus to spend quality time.

■ **Introduction to the Lab.**

OSLab@KAIST is the world's leading research group at the forefront of operating system design for Flash storage and NVRAM. OSLab has been leading the IO stack optimization for the smartphone for several years. The techniques proposed by OSLab have been adopted by Google Android platform (Best Paper, USENIX ATC 2013). OSLab has also contributed numerous open-source tools that are widely utilized in Android research worldwide.

One of OSLab's significant achievements is their successful proposal of a new IO subsystem design for Flash storage, which provides separate support for ordering guarantees (Best Paper, USENIX FAST 2018). Separating the ordering guarantee from the durability guarantee has been a long-standing challenge in the systems research community for more than 50 years.

For passionate kernel developers and system hackers, OSLab offers an ideal environment to expand their limit and contribute to pioneering research.

■ **Recent research achievements ('21~'23)**

International journals: 0, International conferences: 9, Domestic journals: 1, Domestic conferences: 0

< Professor Kyoungsik Yu's Lab. >

<Integrated Nanophotonics Laboratory>

■ Contact information

Professor	Email:ksyu@kaist.edu	Tel: 042-350-7415
Lab.	E3-3 #2302	Tel: 042-350-7515
Website	https://kaist-yu.notion.site	

■ Current state of the Lab. (in 2023 Fall Semester)

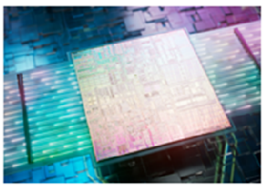
PhD Students: 4 Integrated MS-PhD Student: 2 MS Students: 3

■ Research Areas

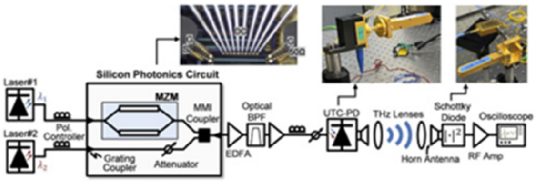
The Integrated Nanophotonics Laboratory is working on both fundamental aspects and practical applications of modern photonics / optoelectronics with special emphasis on integration techniques. Especially, we are interested in device-level integration of photonics / optoelectronics for 5G-optical data transmission, advanced information processing, display, smart sensor, and energy applications.

Integrated photonics

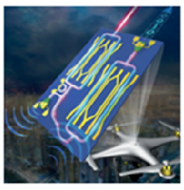
Silicon is the most well known material for electronics, but is also a promising optical medium at near-infrared wavelengths. By taking advantages of advanced fabrication and design techniques developed for electronic circuits, we can now design and build integrated photonic circuits that can complement and sometimes overcome the electronics in a number of cutting-edge applications, such as 'large-scale high-speed interconnects for chiplets', 'optical/wireless communication convergence for beyond 5G, photonic radar and terahertz era', 'high-precision time and frequency reference for quantum sensing', 'energy-efficient optical engines for large-scale information processing and quadratic optimization', and smart sensing – LiDAR (Light Detection And Ranging).



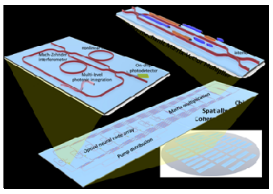
Integrated Photonic circuit



THZ Optical Data Transmission



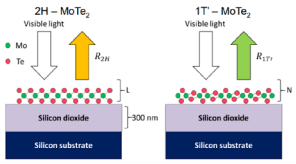
photonic Radar



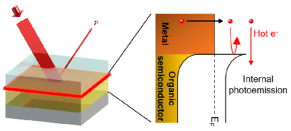
photonic Ising machine

Innovative photonic materials

In addition to conventional group IV semiconductors and III-V compound semiconductor materials, recent innovations in materials research have significantly broadened the scope of modern photonics / optoelectronics. Our group is interested in various emerging materials, such as 2D materials, hybrid materials, and metamaterials.



< 2D phase change material >



< Photodetectors >

■ Recommended courses & Career after graduation

We recommend wave- and device-related courses, such as electromagnetics, semiconductor physics, and optoelectronics. Our alumni members are currently working at universities (**Stanford, UC Berkeley, Toronto, Oxford**), national research institutes (**ETRI, ADD**), and industries (**Samsung, SK Hynix, and PsiQuantum**).

■ Introduction to other activities besides research

We have regular summer and winter retreats, and workshops with domestic & overseas conferences. We also regularly play soccer and badminton. These extracurricular activities are sometimes done with other laboratories with similar research interests.

■ Introduction to the Lab.

Our research group is generally interested in micro-/nano-photonics and optoelectronics, a highly interdisciplinary area with emerging applications in information processing and quantum technologies. Starting from micro-sized optical resonators to subwavelength-scale metamaterials, we cover a wide range of photonic/optoelectronic devices and systems.

■ Recent research achievements (2023)

[1] Kwon, Kyungmok, et al. "Heterogeneously integrated light emitting diodes and photodetectors in the metal-insulator-metal waveguide platform." Nanophotonics 0 **(2023).**

[2] Jin, Yeonghoon, Jongeun Seok, and Kyoungsik Yu. "Highly Efficient Silicon-Based Thin-Film Schottky Barrier Photodetectors." ACS Photonics **(2023).**

[3] Park, Jongwoo, et al. "300-Gb/s/λ IM/DD Transmission Using Integrated SiP OTDM Transmitter." IEEE Photonics Technology Letters 35.10 **(2023)**

[4] Rah, Yoonhyuk, et al. "Low Power Coherent Ising Machine Based on Mechanical Kerr Nonlinearity." Physical Review Letters 130.7 **(2023)**

[5] Son, Gyeongho, et al. "Highly efficient broadband adiabatic mode transformation between single-mode fibers and silicon waveguides." Journal of Lightwave Technology **(2023).**

⟨Professor Minsoo Rhu's Lab⟩

Vertically Integrated Architecture (VIA) Research Group

■ **Contact information**

Professor : Bldg. N1, #809 TEL : 042-350-7547

Lab. : Bldg. N1, #818

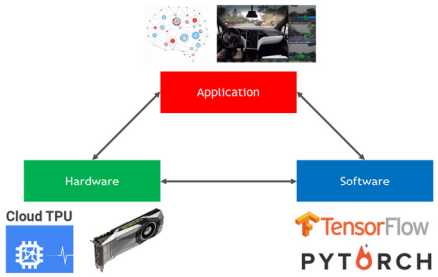
Website : https://sites.google.com/view/kaist-via

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 10 Master's Student: 9

■ **Research Areas**

Vertically Integrated Architecture (VIA) research group conducts research in the domain of computer architecture with a vertically integrated approach. By co-optimizing VLSI circuit technology, computer system architecture, and application & algorithms (with an emphasis on machine learning and computer vision), our research mission is to build high-performance computing platform for future "intelligent" systems that are programmable, robust, reliable, secure, and energy-efficient.



■ **Recommended courses & Career after graduation**

- Courses: computer architecture, data structures, system programming, digital logic design, compilers, operating systems, computer networks
- Careers: During your graduate studies, we strongly encourage you to take internships in the industry (preferably in bleeding-edge IT companies like Google, Facebook, NVIDIA, Samsung, Microsoft, and Intel) so that you get practical, hands-on experience within the electrical and computer engineering discipline.

■ **Introduction to other activities besides research**

Professor Rhu is a huge sports fan and encourages students to engage in extra-curricular activities as means to pursue a (mentally & physically) healthy graduate school life. We also encourage lab members to get together outside of the laboratory so that they maintain good social relationships with each other. There are frequent (un)official get-togethers and we plan on having regular team-building events during summer & winter breaks.

■ **Introduction to the Lab.**

Professor Minsoo Rhu has spent three years working at NVIDIA Research as a Senior Research Scientist. He worked in several domains within the computer system stack, including ASIC designs, computer system architecture, runtime systems, and application & workload characterization with an emphasis on machine learning (ML) and computer vision (CV). As such, our research mission is to train students to become computer system architects that understands *both* the hardware and software system, enabling you to optimize any target application (e.g., ML or CV) for the underlying computing stack. Our group is currently funded by several *research-oriented* projects, for instance, the ERC-AI (by National Research Foundation), Neural Processor Research Center (by Samsung Research), Samsung Future Research Funding and Incubation Center for Future Technology, and others.

■ **Recent research achievements ('21~'23)**

[1] Ranggi Hwang*, Minhoo Kang*, Jiwon Lee, Dongyun Kam, Youngjoo Lee, and Minsoo Rhu, "GROW: A Row-Stationary Sparse-Dense GEMM Accelerator for Memory-Efficient Graph Convolutional Neural Networks," The 29th IEEE International Symposium on High-Performance Computer Architecture (**HPCA-29**), Montreal, Canada, Feb. 2023

[2] Beomsik Park*, Ranggi Hwang*, Dongho Yoon, Yoonhyuk Choi, and Minsoo Rhu, "DiVa: An Accelerator for Differentially Private Machine Learning," The 55th IEEE/ACM International Symposium on Microarchitecture (**MICRO-55**), Chicago, IL, Oct. 2022

[3] Yunjae Lee, Jinha Chung, and Minsoo Rhu, "SmartSAGE: Training Large-scale Graph Neural Networks using In-Storage Processing Architectures," The 49th IEEE/ACM International Symposium on Computer Architecture (**ISCA-49**), New York, NY, June 2022

[4] Youngeun Kwon and Minsoo Rhu, "Training Personalized Recommendation Systems from (GPU) Scratch: Look Forward not Backwards," The 49th IEEE/ACM International Symposium on Computer Architecture (**ISCA-49**), New York, NY, June 2022

[5] Youngeun Kwon, Yunjae Lee, and Minsoo Rhu, "Tensor Casting: Co-Designing Algorithm-Architecture for Personalized Recommendation Training," The 27th IEEE International Symposium on High-Performance Computer Architecture (**HPCA-27**), Seoul, South Korea, Feb. 2021

[6] Yujeong Choi, Yunseong Kim, and Minsoo Rhu, "LazyBatching: An SLA-aware Batching System for Cloud Machine Learning Inference," The 27th IEEE International Symposium on High-Performance Computer Architecture (**HPCA-27**), Seoul, South Korea, Feb. 2021

<Professor Seunghyup Yoo's Lab>

IOEL
Integrated Organic Electronics Lab

■ Contact information

Professor	**Email: syoo_ee@kaist.ac.kr**	**Tel: 042-350-3483**
Lab.	**Email: pirds@kaist.ac.kr**	**Tel: 042-350-3483**
Website	**https://ioel.kaist.ac.kr/**	

■ Current state of the Lab. (in 2023 Fall Semester)

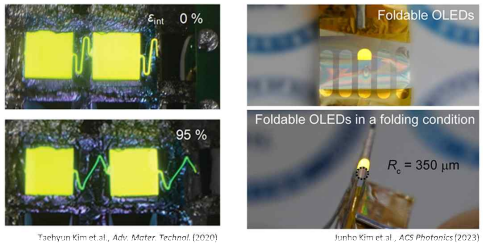
PhD Students: 12 Integrated MS/PhD Students: 2 Master's Students: 6

■ Research Areas

Organic Light-Emitting Diodes (OLED)

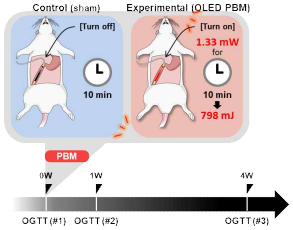
As future display panels and other applications, OLEDs are promising due to their advantages such as high color purity, applicability on versatile designs including flexible and transparent devices, and low power consumption.

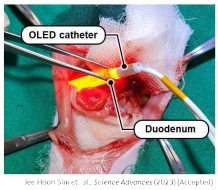
- Highly efficient flexible and stretchable OLEDs



Taehyun Kim et al., *Adv. Mater. Technol.* (2020)
Junho Kim et al., *ACS Photonics* (2023)

- OLEDs for phototherapy



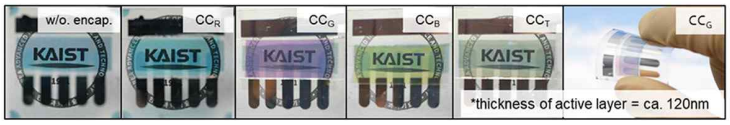


Jee Hoon Sim et. al., *Science Advances* (2023) (Accepted)

Organic photovoltaics (OPV)

Significant advances are being made in the commercialization of solar cells for building-integrated and vehicle-integrated photovoltaics by developing flexible and semi-transparent characteristics of solar cells.

- Semitransparent and flexible OPVs



Hyunwoo Lee et.al., *Advanced Energy & Sustainability Research* (2020)

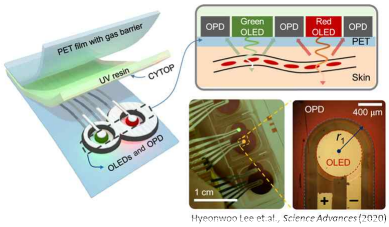
Organic electronic devices

State-of-the-art applications for future electronics including wearable/patched devices require not only various functions but also diverse form factors.

- Organic thin-film transistors

Hanul Moon et.al., *Advanced Materials* (2014)

- Wearable sensors



Hyeonwoo Lee et.al., *Science Advances* (2020)

■ Recommended courses

- Introduction to Physical Electronics (EE211)
- Semiconductor Devices (EE362)
- Organic Electronics (EE568)
- Display Engineering (EE563)

■ Career after graduation

- Research and development field in electronics (national institute or private company)
- Academic fields

■ Introduction to the Lab.

Integrated Organic Electronics Lab (IOEL) focuses on developing novel device architectures and processes based on organic and other emerging semiconductors in the following areas: display & lighting, energy, and flexible low-cost electronics. Recent research trends no longer centralize on device performance enhancement, but focus more on the realization of various functionalities. For students with knowledge in electronics and great interest in interdisciplinary fields, we hope you will join IOEL and seize the chance to apply your electrical engineering skills to various areas.

■ Introduction to other activities besides research

- IOEL encourages good interpersonal relationship through regular lab workshops and exhilarating sports days held every semester

■ Recent research achievements (2023)

[1] Hyung Suk Kim, Hyung Jin Cheon, Donggyun Lee, Woochan Lee, Junho Kim, Yun-hi Kim, and Seunghyup Yoo, "Toward highly efficient deep-blue OLEDs: Tailoring the multiresonance-induced TADF molecules for suppressed excimer formation and near-unity horizontal dipole ratio." *Science Advances,* 2023

[2] Junho Kim, Eungjun Kim, Jaehyeok Park, Jinouk Song, Subon Kim, Hanul Moon, and Seunghyup Yoo, "Toward Near-Foldable Surface Light Sources with Ultimate Efficiency: Ultrathin Substrates Embedded with Micron-Scale Inverted Lens Arrays", *ACS Photonics,* 2023

[3] Palanisamy Rajakannu, Woochan Lee, Sanghoon Park, Hyung Suk Kim, Hanif Mubarok, Min Hyung Lee, Seunghyup Yoo, "Molecular Engineering for Shortening the Pt···Pt Distances in Pt(II) Dinuclear Complexes and Enhancing the Efficiencies of these Complexes for Application in Deep-Red and Near-IR OLEDs", *Advanced Functional Materials,* 2023

[4] Hyeonwook Chae, Yongjin Park, Yehhyun Jo, Yongmin Jeon, Hyunjoo Jenny Lee, Seunghyup Yoo, and Kyung Cheol Choi, "Blue Transparent OLEDs with High Stability and Transmittance for Modulating Sleep Disorders." *Advanced Materials Interfaces,* 2023

[5] Ji Hun Choi, Chan Woo Park, Bock Soon Na, Jong-Heon Yang, Jeho Na, Jae-Eun Pi, Hee-Ok Kim, Chi-Sun Hwang, Seunghyup Yoo, "Highly stable Mo/Al bilayer electrode for stretchable electronics", *Journal of Information Display,* 2023

<Professor jaemin Yoo's Lab.>

Data AI Lab	■ Contact information		
	Professor	jaemin@kaist.ac.kr	N1, Room 914
	Website (Prof.)	https://jaeminyoo.github.io	
	Website (Lab.)	https://dai.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 0 Master's Student: 0

■ Research areas

1. Graph Neural Networks & Recommender Systems

- Graphs depict dynamic interactions between entities
- Recommender systems are a popular application of GNNs
  - User history is typically represented as a large graph

Q: *How can we design effective GNNs for noisy real-world data?*

Q: *How can we perform accurate graph-based recommendations?*

2. Self-supervised Anomaly Detection

- Anomaly detection (AD) aims to identify unseen anomalies
  - E.g., defect detection in manufacturing systems
- Self-supervised learning (SSL) enables a model to self-train using data augmentation without the need for labeled data

Q: *How can we develop effective SSL-based methods for AD?*

3. Multivariate Time Series Analysis

- Most time series data comprise multiple correlated variables
  - Stock prices, traffic patterns, sensor data, etc.
- Understanding such correlations or causalities is vital

Q: *How can we accurately learn and utilize these relationships?*

4. Interpretable, Scalable, and Robust ML

- Implementing ML models in real-world scenarios introduces numerous challenges, e.g., interpretability and scalability
  - Interpretability is crucial in areas like medicine or military

Q: *How can we design ML models for critical domains?*

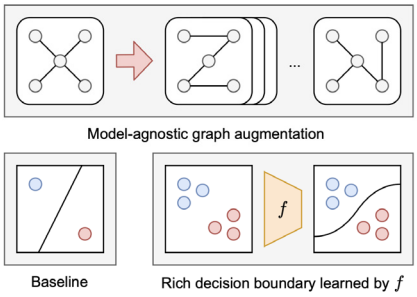


Fig 1. Graph augmentation

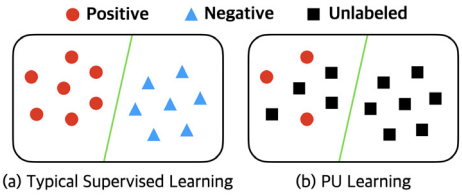


Fig 2. Positive-unlabeled learning

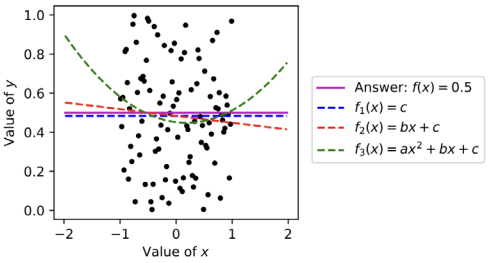


Fig 3. Strength of simplicity

■ Recommended courses & Career after graduation

- **Recommended courses:** Data structures, Algorithms, Linear algebra, Probability theory, Big data analytics
- **Career after graduation:** Software engineers, Data scientists, ML engineers, ML research scientists

■ Introduction to the Lab.

Our research group has just started in August 2023 when Prof. Jaemin Yoo began to work as an Assistant Professor in KAIST EE. Our primary goal is to enhance the generalizability and practicality of machine learning algorithms for real-world challenges, covering a variety of data representations and applications.

■ Recent research achievements (2020-2023)

- DSV: An Alignment Validation Loss for Self-supervised Outlier Model Selection. **ECML PKDD 2023**
- Less is More: SlimG for Accurate, Robust, and Interpretable Graph Mining. **KDD 2023**
- Accurate Node Feature Estimation with Structured Variational Graph Autoencoder. **KDD 2022**
- Model-Agnostic Augmentation for Accurate Graph Classification. **TheWebConf 2022**
- Accurate Graph-Based PU Learning without Class Prior. **ICDM 2021**
- Accurate Multivariate Stock Movement Prediction via Data-Axis Transformer. **KDD 2021**

<Professor **Jong-Won Yu**'s Lab.>

RF System and Solution Lab

■ Contact information

Professor	Email: drjwyu@kaist.ac.kr	Tel: 042-350-3478
Lab.	rfsslab@kaist.ac.kr	Tel: 042-350-5478
Website	https://rfss.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

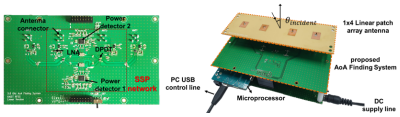
Postdoctoral Fellows : 0 PhD Students: 9+3 (part time) Master's Student: 4

■ Research Areas

RF System Development

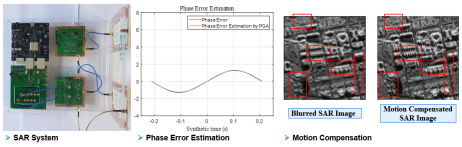
<Direction Finding System>

▶ Multiple Spacing Scheme, Few Antenna Elements, High Accuracy and Wide Coverage, Reduced Output Ports with Switched Six-Port Network



<SAR Motion Compensation Algorithm>

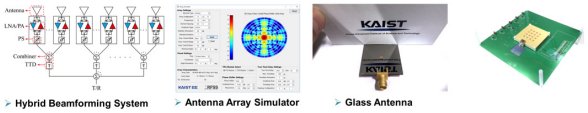
▶ Compact SAR System Design, Phase Error Estimation Method, Motion Compensation Algorithm, Compressive Sensing



Phased Array Antenna System

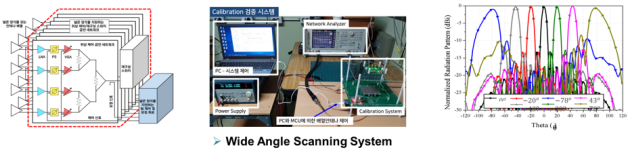
<mmWave Beamforming System>

▶ Beam Squinting Frequency Dependency of Delay Circuits, Hybrid(PS/TTD) BeamformingArray, mmWavePhased Array Antenna Using Glass, Design of Antenna Array Simulator



<Wide Angle Scanning Antenna Array System>

▶ V2V Communication, Wide Beam Scanning Coverage in Phased Array, 8×8 Phased Array Antenna for Beamforming, Compact Calibration Algorithm

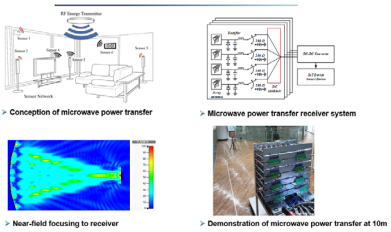


Wireless Power Transfer System

<Near-Field WPT System>

▶ 1:N Charging (Multi-Receiver Charging), Free-Positioning Charge, Assemble the Simple Receiver Module, Maximum Efficiency Tracking Control Scheme

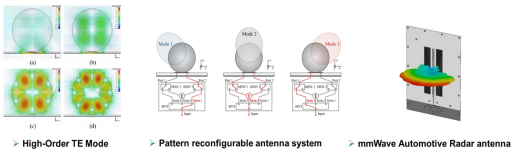
<Microwave Power Transfer System>



RF Antenna Development

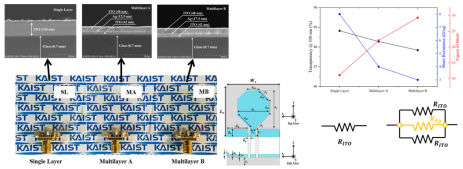
<mmWave/Sub-THz 3D High-Gain Multi-Beam Pattern>

▶ Superdirectivity, Electrically Small Antenna, Electrical Beam-Steering with Simple Feeding Network, Various Applications



<Invisible Antenna>

▶ Efficiency-Improved Material, Invisible Antenna Using ITO/Ag/ITO Multilayer Electrode Films, High Quality Transparent Material



■ Recommended courses & Career after graduation

- Postdoctoral Courses
- Various Government-funded/Government-contributed Research Institute (ex. KISTEP, KRISS, KINS, ETRI, KRRI, ADD etc.)
- Various Major Company (ex. Samsung Electronics, LG Electronics etc.)

■ Introduction to other activities besides research

- Working out with other Lab or Running various programs once a month.

■ Introduction to the Lab.

For the next generation networks, we are trying to make it possible to have above characteristics of the RF systems more appropriate, more reliable, more efficient for the future wireless environment.

■ Recent research achievements (2020-2023)

- International Journal 30, International Conference 15, Award 17, Patent 11

<Professor Chang D. Yoo's Lab.>

■ Contact information

Professor : Chang D. Yoo TEL : 042-350-8070

Lab. : U-AIM Lab TEL : 042-350-5470

Website : http://sanctusfactory.com/u-aim/

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 12 Master's Student: 6

■ Research Areas

Machine Learning, Signal Processing, Deep Learning, Computer Vision, 3D Point Cloud, Speech/Audio Processing, Language Model, Vision-language multi-modal processing, Image Generation/Editing, Causality, Fairness, Reinforcement Learning, Robot Manipulation, etc.

■ Recommended courses & Career after graduation

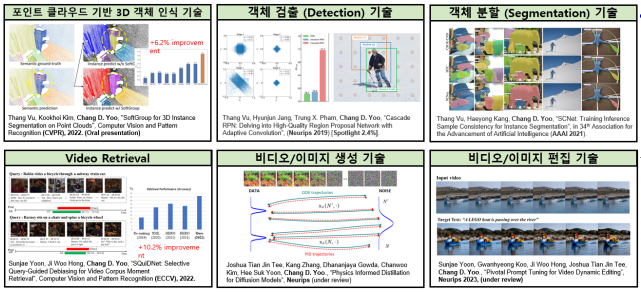
AI Researcher, Professor, etc.

■ Introduction to other activities besides research

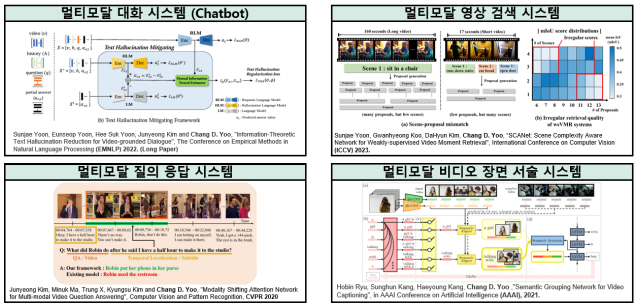
MTs every year, Happy Hours every week, International Conference, etc.

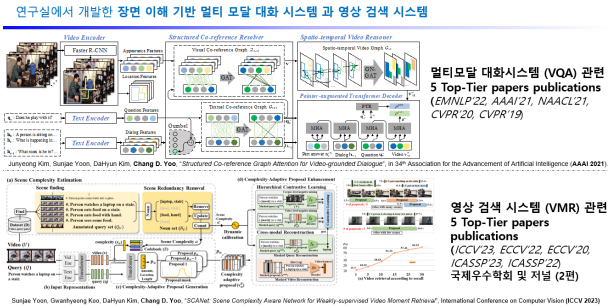
■ Introduction to the Lab.

Image and Video Processing

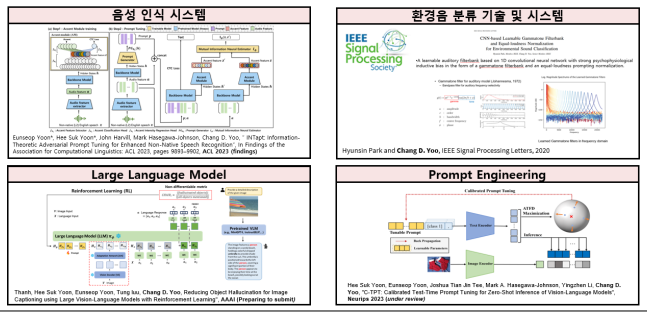


Multimodal Signal Processing





Audio and Natural Langauge Processing



Robot Manipulation (강화 학습)

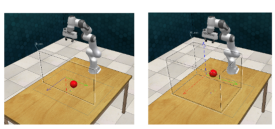


Fig. 1. Reaching to target task in RLBench [23].

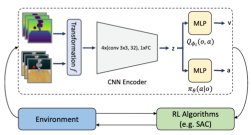


Fig. 4. The overview of our system. The observation including RGB and depth image is fed into the proposed transformation. Then augmented version is plugged into networks.

"Efficient Reinforcement Learning For Robot Manipulation With Augmented Rgb-d Data", Tung M. Luu*, Sanzhar Rakhimkul*, Thanh Nguyen, Chang D. Yoo Submitted for publication.

■ Recent research achievements ('21~'23)

International Conferences(23): CVPR:2, ECCV:2, ICCV:1, ICML:1, AAAI:3, ACL:4, EMNLP:2, Interspeech:1 ICASSP:1, NAACL:1

International Journals(20): Nano Energy:1, Science Advances:1, Advanced Materials:1, IEEE/ACM TASLP:1, Bayesian Analysis:1, IEEE Access:7, MDPI Sensors:6, Speech Communication:1, MDPI MLKE:1

⟨Professor Hoi-Jun Yoo⟩

Semiconductor System Laboratory

■ Contact information		
Professor	hjyoo@kaist.ac.kr	Tel: 042-350-3468
Lab.	sslmaster@kaist.ac.kr	Tel: 042-350-8068
Website	https://ssl.kaist.ac.kr	

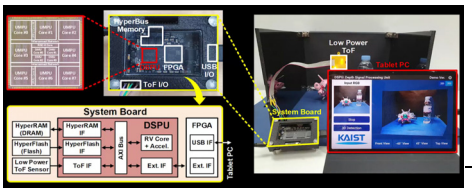
■ **Current state of the Lab. (in 2023 Fall Semester)**

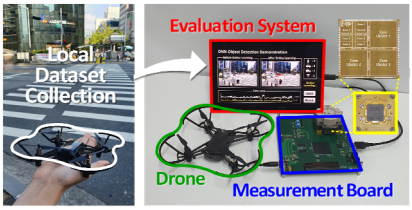
Postdoctoral Fellows : 0 PhD Students: 11 Master's Student: 10

■ **Research Areas**

Humanistic Intelligence System

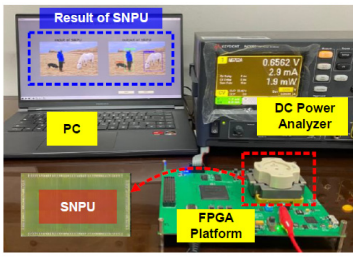
- Energy-Efficient Mobile DRL Training Processor
- World-First Floating-point Computing-in-Memory Architecture
- Multi-DNN Training Processor for Generative Adversarial Networks
- 3D Point Cloud-based Neural Network Processor
- CNN Super Resolution Processor for Full HD 60fps Video
- Mobile Neural 3D Rendering Processor
- eDRAM-based In-Memory-Computing Chip





Neuromorphic

- Always-on Face Recognition Spike Domain CNN Processor
- Neuromorphic Computing-in-Memory Processor
- Energy-efficient Analog-Digital Hybrid Computing Architecture
- Biological Neural Network System
- Complementary CNN/SNN Processor



■ **Recommended courses**

Circuit related courses (analog & digital), computer architecture, and digital systems will be helpful, but you can learn everything you need through OJT.

■ **Career after graduation**

Companies & research institutes all over the world (Apple, IBM, IMEC, Samsung, LG, etc.) or Universities (KAIST, UNIST, etc.)

■ **Introduction to other activities besides research**

In SSL, you will get a chance to explore international companies and research facilities like Samsung, IMEC, IME, Apple every year. Moreover, a joint workshop with Chinese (Tsinghua Univ.) and Japanese (Tokyo Univ.) universities is held every year. There are also lab workshops and parties with lab members.

■ **Introduction to the Lab**

Privilege of SSL Members

- Pride from world leading researches
- Business trip abroad average of 2 times per year
- Accepted to various international conferences/journals
- Project leading skills and presentation skills
- Semiconductor Chips with your name inscribed on

SSL Wants

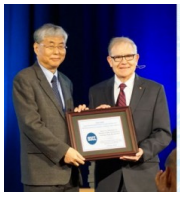
- Who has passion to be the best
- Who wants to become a world leading engineer

Statue of SSL

- You can directly feel it at international conferences

■ **Recent research achievements (2020-2023)**

- Top class international conferences: **6** ISSCC / **12** S. VLSI / **9** HotChips papers presented
- Major international papers: **46** journal / **62** conference papers accepted
- Awards: 2022 AICAS best paper/demo award, 2022 CICC outstanding paper award, 2020 ISSCC Demo Award, 2020 Humantech Gold Prize, etc.



<2022 AICAS Demo Award> <2020 ISSCC Demo Award> <2020 Humantech Gold Prize>

<Professor Young-Gyu Yoon's Lab.>

Neuro-Instrumentation & Computational Analysis Lab

Neuro-Instrumentation and Computational Analysis Lab

■ Contact information

Professor : ygyoon@kaist.ac.kr TEL : 7449

Lab. : nicalab@kaist.ac.kr TEL : 7549

Website : nica.kaist.ac.kr

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 4 Master's Student: 5

■ Research Areas

< Acquiring Big Data from Brain >

Imaging Brain Activity With genetic engineering, neurons can be modified to change their brightness as a function of the their activity (i.e., neurons "blink" as they fire) which makes the brain activity visible. The main challenge is to record the optical signals at a high spatiotemporal resolution and we develop optical imaging techniques to tackle this.

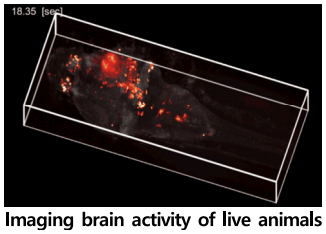
Computational Imaging The performance of imaging systems is impacted by a range of factors, including physics, biology, information theory, and the sampling theorem. To mitigate these limitations, we're utilizing computational imaging methods that leverage machine learning to predict more information from limited data.

Multiplexed Imaging Fluorescence microscopy is limited to imaging only four proteins simultaneously due to the broad emission spectra of fluorescent molecules. To surpass this limitation and visualize a larger number of proteins, we are developing multiplexed imaging technologies that use machine learning algorithms for blind signal separation.

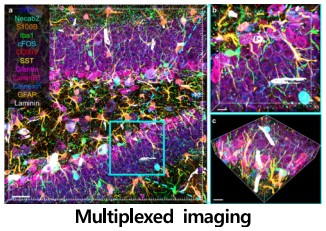
< Analyzing Big Data from Brain >

Neuro-image Processing State-of-the-art functional imaging methods generate more than a gigabyte of data per second, necessitating the development of automated analysis algorithms. We develop fast and scalable machine learning algorithms capable of processing such brain images without the need for labeled data.

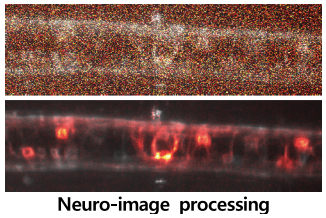
Neuro-data Mining Neural activity underlies many functions in our brain, but our understanding of the fundamental principles of neural signal processing remains limited. To gain greater insight, we apply computational methods to analyze brain activity data and quantify information flow, uncovering the functional connections between neurons. Our aim is to identify repeating patterns, discover local circuits that operate together, and extract synaptic strength information from brain activity, leading to a deeper understanding of the brain.



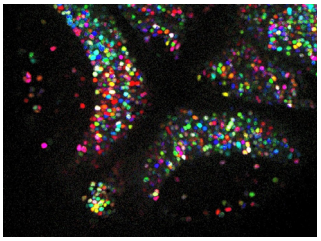
Imaging brain activity of live animals



Multiplexed imaging



Neuro-image processing



Neuro-data Mining

■ Recommended courses & Career after graduation

Recommended courses Signals and Systems (EE), Digital Signal Processing (EE), Machine Learning (CS), Linear Algebra (MA), Optics (PH), Biomedical Optics (ME), Biophotonics (BiS), Brain Science Fundamentals (BiS)

Career All experiences and knowledge acquired during the graduate study can be directly transferred and applied to many data scientist positions and biomedical jobs (both academia and industry).

■ Other activities besides research

NICA members communicates with each other through lab dinners and strawberry parties. Lab members maintain good relationships through outside activities on a regular basis.

■ Introduction to the Lab.

Our mission is to develop optical and computational technologies for brain and biomedical applications. More specifically, we think of a brain as a circuit that consists of neurons and devise new strategies to reverse engineer this circuit – through imaging/analyzing brain activity/structure. We are looking for the prospective students who are (a) self-motivated and (b) eager to explore new things.

■ Recent research achievements ('21~'23)

[1] Statistically unbiased prediction enables accurate denoising of voltage imaging data, ***Nature Methods***, 2023. (featured on the cover of Nature Methods)

[2] Robust and efficient alignment of calcium imaging data through simultaneous low rank and sparse decomposition, ***WACV***, 2023.

[3] Three-dimensional fluorescence microscopy through virtual refocusing using a recursive light propagation network, ***Medical Image Analysis***, 2022.

[4] PICASSO allows ultra-multiplexed fluorescence imaging of spatially overlapping proteins without reference spectra measurements, ***Nature Communications***, 2022. (selected as KAIST Breakthroughs 2022)

[5] 3DM: Deep decomposition and deconvolution microscopy for rapid neural activity imaging, ***Optics Express***, 2021. (featured on Optica main page)

[6] Efficient Neural Network Approximation of Robust PCA for Automated Analysis of Calcium Imaging Data, ***MICCAI***, 2021.

[7] RLP-Net: A recursive light propagation network for 3-D virtual refocusing, ***MICCAI***, 2021. (received MICCAI Young Scientist Award)

<Professor Insu Yun's Lab.>

Hacking Lab

■ **Contact information**

Email: insuyun@kaist.ac.kr TEL : 042-350-7469

Lab. : ITC Building (N1) 812

Website : https://hacking.kaist.ac.kr

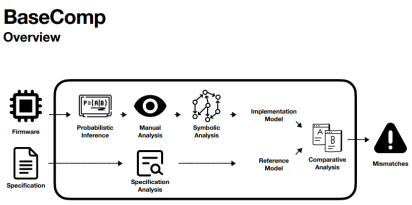
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 2 Master's Student: 5

■ **Research Areas:** Understanding hacking in a scientific manner!

Automatic bug finding:

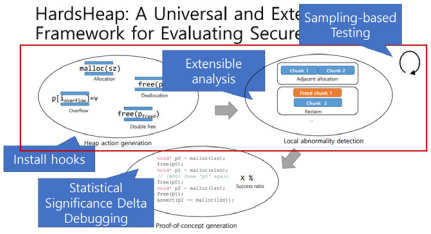
How do hackers find vulnerabilities?



BaseComp: A Comparative Analysis for Integrity Protection in Cellular Baseband Software (Security '23)

Automatic exploit generation:

How do hackers build exploits?



HardsHeap: A Universal and Extensible Framework for Evaluating Secure Allocators. (CCS '21)

Offensive research:

What do real hackers do?

CVE-2023-3390: UAF on Linux Netfilter nftables MFT_MSG_NEWRULE leads to LPE (Google KCTF '23)

■ **Recent research achievements ('21~'23)**

27 ▼ KAIST 6.2 8

Faculty	# Pubs	Adj. #
Yongdae Kim SECURITY	6	1.0
Sooel Son SECURITY,WEB+IR	5	1.1
Min Suk Kang SECURITY	4	0.9
Insu Yun SECURITY	4	0.7
Insik Shin EMBEDDED,MOBILE	3	0.5
Seungwon Shin SECURITY	2	0.5
Sang Kil Cha SECURITY,SE	1	0.3
Kihong Heo PL,SE	1	0.3

3rd place (tie) in csranking.org (KAIST security research)

■ **Introduction to other activities besides research**

Hacking competition for fun & profit!

■ **News!**

- [07/17/2023] QSYM got a Frontiers of Science Award from ICSB!
- [06/06/2023] BaseComp is accepted to Usenix Security'23!
- [01/19/2023] $7K Bug Bounty from Google (V8/CVE-2023-0696)
- [11/11/2022] QueryX is accepted to IEEE S&P'23!
- [11/04/2022] ScaleTrust is accepted to ToN'22!
- [06/11/2022] FuzzCoin is accepted to RAID'22!
- [09/04/2021] DoLTEst is accepted to Usenix Security'22!
- [07/21/2021] HardsHeap is conditionally accepted to CCS'21!

■ **Recommended courses**

- EE209 Programming Structures for Electrical Engineering
- EE309: Advanced Programming Techniques for Electrical Engineering
- EE415: Introduction to Operating System
- EE517: Software Hacking Theory and Practice
- EE515: Security of Emerging Systems

■ **Career after graduation (2 Alumni)**

- Postdoc @ Georgia Tech (PhD)
- Security researcher @ S2W (MS)

■ **Introduction to the Lab.**

Our lab is one of the best labs that study ***hacking.*** If you are interested in understading and analyzing systems, finding vulnerabilities, and exploiting them, don't hesitate to contact us!

<Professor Jun-Bo Yoon's Lab.>

3D Micro-Nano Structures Laboratory

■ Contact information

Professor: Nanofab Center 513 (E19) TEL :042-350-3476
Lab.: Nanofab Center 523 (E19) TEL :042-350-5476
Website: http://MEMS.kr/

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 1 PhD Students: 6 Master's Student: 3

■ Research Areas

▷We focus on the **high-performance 3-dimensional micro/nano-electro-mechanical systems (M/NEMS)**.
▷We research on **unique device-design, fabrication, and demonstration** technologies.
▷Based on our superior abilities in overall device-technology, we have developed the **world-best electrical devices, such as nano/micro-mechanical switches (DC/RF), nano-sensor devices and optical components.**
▷We have also **widen the research-field** into bio-sensor, health-care monitoring, energy harvesting devices and so on, **with lab members having various undergraduate majors (EE, ME, MSE, Chemistry, etc.)**

■ Nano/micro-switch for DC & RF applications ----------

Utilizing micro/nano-mechanical switches, we achieve zero leakage current and infinite sub-threshold swing. We're advancing high-performance switches to address CMOS transistor limitations, aiming to enhance **autonomous driving and space industry memory**, **advanced back end of line (BEOL) interconnects**, **circulator for quantum computing**, and **DC & RF applications**

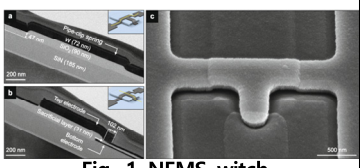


Fig. 1 NEMS witch

■ Commercial-Grade Reliable High-Performance Nano Devices ----------

Utilizing our advanced large-area, high-resolution nano-fabrication techniques, we uncover groundbreaking phenomena, leading to the creation of high-performance **gas(chemical) sensors**, **pressure, strain and temperature (physical) sensors**, as well as **bolometer (optical)**, pivotal for Industry 4.0

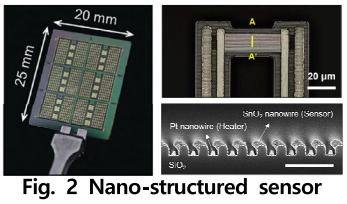


Fig. 2 Nano-structured sensor

■ Soft Electronics for Next-Generation Devices (Health Care, Human-Machine Interaction) ----

Leveraging the advantages of nanostructures, we develop high-performance and highly reliable physical sensors, including **pressure, strain and temperature sensors**. By integrating circuitry, communication, and AI technologies, we design systems for applications in health monitoring and human-machine interaction.

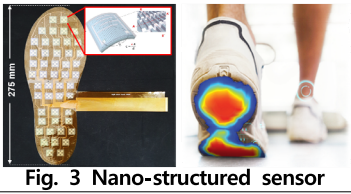


Fig. 3 Nano-structured sensor

■ Recommended courses & Career after graduation

Semiconductor devices, integrated circuit devices, and MEMS in EE perspective are recommended.

So far, 25 PhDs and 47 MS degrees have been conferred. Many of our graduates have pursued careers in global industry leaders such as **Samsung, SAIT, Broadcom, SK Hynix, and LG**. Additionally, some have gone on to conduct postdoctoral research at esteemed institutions like **Northwestern, MIT, Purdue Johns Hopkins, and NIH**, and later secured positions at national research institutes (**KIST, ADD, KIMM, NIH**) and as professors (**Hanyang, Pusan national**).

■ Introduction to other activities besides research

Quarterly workshop :
- Summer: Pension
- Winter: Ski Resort
- Research Direction sharing

Annual Homecoming Day :
- Last homecoming day @ Japan ski resort

Leisure Activity :
- Enjoy sports regularly (Soccer, Bowling, running)

■ Recent research achievements ('21~'23)

- **In total, 110 international journals, 108 international conference, 38 international and 102 domestic patents.**
  (Journals : Nature Nanotechnology, Nature Communications, Advanced Materials, ACS Nano, Small etc.)
- **Awarded for our researches from IEEE, Samsung Electronics, Society of Micro and Nano Systems, and KAIST.**
- **Professor Jun-Bo Yoon won 2023 KAIST Educator Award (윤준보 교수님 '2023 KAIST 교육자상' 수상).**
- **Selected as a 'Healthy Laboratory' by the Ministry of Science and ICT in 2021 (2021 건강한 연구실 선정)**

<Professor Kayoung Lee's Lab>

Low-dimensional Electron Systems Lab.	■ Contact information	
	Professor	Email: kayoung.lee@kaist.ac.kr
	Lab.	Email: kleegroup@kaist.ac.kr
	Website	https://lesl.kaist.ac.kr/

■ Current state of the Lab. (in 2023 Fall Semester)

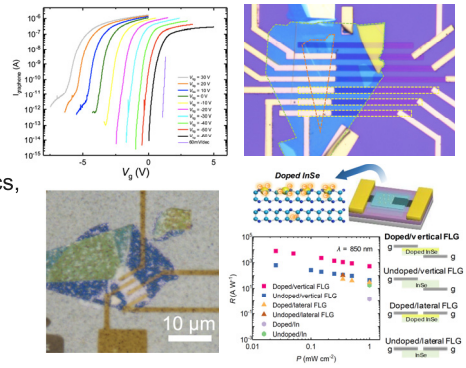
Postdoctoral Fellows : 0 PhD Students: 4 Master's Student: 5

■ Research Areas

Electrical Characterization of High-mobility Emerging Semiconductors:
- Transport spectroscopy; measurements of band structure information
- Electron transport and quantum phenomena in semiconductor nanostructures

Nanostructure Electronic/Optoelectronic Device Applications:
- High mobility transistors, steep-slope transistors, low-power tunneling electronics, multi-valued logics, electronic sensors, contact property optimization etc.

Vertical Electron Transport in Heterostructures Based on van der Waals Materials:
- Dynamic modulation of band alignment and tunneling properties
- Ballistic transport along the vertical direction in van der Waals materials
- Band modulation by Morie-induced superlattices



■ Recommended courses & Career after graduation

- Introduction to Physical Electronics, Semiconductor Devices, Semiconductor Nanostructures, Semiconductor IC Technology
- Academia: National research institutes and universities
- Industry: Semiconductor-related companies such as Samsung, SK Hynix, LG, LX Semicon, Intel, Apple, Micron, etc.

■ Introduction to other activities besides research

There are few group activities, however individual freedom and hobbies are respected. In addition, there is a good relationship between the members of the laboratory and the atmosphere in the laboratory is friendly.

■ Introduction to the Lab.

We perform vigorous research for highly functional electronics enabled by physical uniqueness in low-dimensional electron systems! Our major research goals are (1) to understand fundamental electronic properties of emerging low-dimensional materials and their novel heterostructures, and (2) to realize unprecedented high-performance nanoscale device applications based on such basic study. Using advanced transport measurement techniques, we explore how electrons transport and interact each other in nanostructured electron systems, and aim to broaden our fundamental understanding of emerging materials and physics. Our biggest motivation is curiosity, but we also have the ambition to bring unprecedented future computing with high speed and low power nanoelectronics!

■ Recent research achievements (2020-2023)

- Hanbyeol Jang, Yumin Song, Yongwook Seok, Heungsoon Im, Tae Hyung Kim, Joo-Hyoung Lee, Yong-Hoon Kim, and Kayoung Lee*, "Zero power infrared sensing in 2D/3D-assembled heterogeneous graphene/In/InSe/Au," *Nanoscale* (**2022**).
- Sang-Hoo Cho, Hanbyeol Jang, Heungsoon Im, Donghyeon Lee, Je-Ho Lee, Kenji Watanabe, Takashi Taniguchi, Maeng-Je Seong, Byoung Hun Lee, and Kayoung Lee*, "Bias-controlled multi-functional transport properties of InSe/BP van der Waals heterostructures," *Scientific Reports* (**2021**).
- Sanghyun Kim, Donghyeon Lee, Binbin Wang, Shangjie Yu, Kenji Watanabe, Takashi Taniguchi, Jonathan A. Fan, Jiamin Xue, and Kayoung Lee*, "Raman spectroscopic study of artificially twisted and non-twisted trilayer graphene," *Applied Physics Letters* (**2021**).
- Hanbyeol Jang, Yongwook Seok, YiTaek Choi, Sang-Hoo Cho, Kenji Watanabe, Takashi Taniguchi, and Kayoung Lee*, "High performance near-infrared photodetectors based on surface-doped InSe," *Advanced Functional Materials* (**2021**).
  ** Highlighted in Hot Topic: Surfaces and Interfaces*
- YiTaek Choi, Yongwook Seok, Hanbyeol Jang, Arvind Kumar, Kenji Watanabe, Takashi Taniguchi, Xuan Gao, and Kayoung Lee*, "Multiterminal transport measurements of multilayer InSe encapsulated by hBN," *ACS Applied Electronic Materials* (**2021**)
- Sang-Soo Chee, Won-June Lee, Yong-Ryun Jo, Min Kyung Cho, DongWon Chun, Hionsuck Baik, Bong-Joong Kim, Myung-Han Yoon*, Kayoung Lee*, and Moon-Ho Ham*, "Atomic vacancy control and elemental substitution in a monolayer molybdenum disulfide for high performance optoelectronic device arrays," *Advanced Functional Materials* (**2020**).
  ** Highlighted on the cover*
- Sang-Soo Chee, Joo-Hyoung Lee*, Kayoung Lee*, and Moon-Ho Ham*, "Defect-assisted contact property enhancement in a molybdenum disulfide monolayer," *ACS Applied Materials and Interfaces* (**2020**).

<Professor Donghwan Lee's Lab.>

Machine Decision Intelligence and Learning	■ **Contact information** Professor : donghwan@kaist.ac.kr TEL : 043-350-7462 Lab. : TEL : Website : https://sites.google.com/site/donghwanleehome

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 5 Master's Student: 7

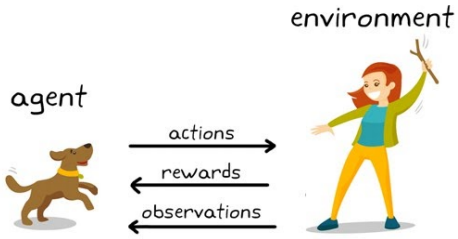
■ **Research Areas**

▶ Reinforcement learning

⇒ What is reinforcement learning? Algorithms to control unknown system by interacting with unknown environments

⇒ Applications: Covers broad area such as robot motion planning, self-driving car, general artificial intelligence, natural language processing, and chatbot

⇒ Our research directions: development of advanced reinforcement learning algorithms, theory and applications, such as robots and self-driving cars



▶ Other research areas:

Control theory and applications, machine learning algorithms, interplay among control, reinforcement learning, and optimization, optimization algorithms and theories.

■ **Recommended courses & Career after graduation**

Recommended courses: control system engineering, linear system, nonlinear system, optimal control, machine learning, reinforcement learning, probability theory, real analysis, measure theory

Career after graduation: national labs, start up, industry, silicon valley, academia

■ **Introduction to other activities besides research**

Conferences

■ **Introduction to the Lab.**

Our research covers theory and application of control, machine learning, reinforcement learning, and interplay among them.

■ **Recent research achievements ('21~'23)**

Donghwan Lee, Han-Dong Lim, Jihoon Park, and Okyong Choi, "New versions of gradient temporal-difference learning," IEEE Transactions on Automatic Control, vol. 68, no. 8, 2023

Han-Dong Lim, Donghwan Lee, "Backstepping temporal-difference learning " ICLR2023, Kigali, Rwanda, May 1-5, 2023

Donghwan Lee, Jianghai Hu, and Niao He, "A discrete-time switching system analysis of Q-learning," SIAM Journal on Control and Optimization, vol. 61, no. 3, 2023

Donghwan Lee, "Convergence of dynamic programming on the semidefininte cone for discrete-time infinite-horizon LQR," IEEE Transactions on Automatic Control, vol. 67, no. 10, pp. 5661-5668, 2022

<Professor Sung-Ju Lee's Lab.>

■ **Contact information**

Professor : profsj@kaist.ac.kr TEL : 042-350-7413
Lab. : nmsl@kaist.ac.kr TEL : 042-350-7766
Website : https://nmsl.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 8 Master's Student: 5

■ **Research Areas**

- ◆ Mobile computing (ubiquitous computing, mobile sensing, wearable computing, AR/VR)
- ◆ Mobile AI/ML (test time adaptation, domain adaptation, unsupervised learning, on-device ML, federated learning)
- ◆ Mobile Human-Computer Interaction (novel interaction methods, digital health and wellbeing, human/AI interaction)
- ◆ Wireless networking (networking for robots and drones, protocols for emerging spectrum, ML for networks)

■ **Recommended courses & Career after graduation**

- ◆ Recommended courses are: EE323 Computer Networks, EE331 Introduction to Machine Learning, EE415 Operating Systems and System Programming for Electrical Engineering.
- ◆ Career paths after graduation include (1) continuing studies in KAIST or overseas (e.g., MIT, University of Washington, Carnegie Mellon University), (2) working in tech giants (e.g. Google, Youtube, Nokia, Naver, Samsung Electronics, SK), (3) government research labs (e.g., Agency for Defence Development), and (4) start-ups.

■ **Introduction to other activities besides research**

- ◆ We have various leisure activities to refresh the atmosphere in the lab as well as to build solid companionship among lab members. Strawberry parties, birthday parties, playing board games, playing online games, pilates exercises, playing futsal are examples.
- ◆ Our lab also has study groups and workshops to improve the skills needed for professional careers (e.g., writing, presenting, relationship management).
- ◆ We also offer international internship opportunities to instututes such as Carnegie Mellon University, Microsoft Research Asia, Nokia Bell-Labs Cambridge, Google, Cisco, Nanyang Technological University, and University of Buffalo.

■ **Introduction to the Lab.**

Networking and Mobile Systems Laboratory (NMSL) utilizes expertise in mobile computing, network systems, human-computer interactions, and machine learning to build innovative mobile services & applications. To enrich the quality of life of mobile users, we (i) identify challenging real-world problems, (ii) design novel solutions, protocols, algorithms, systems, applications, software, and interfaces, and (iii) build our solutions in working systems for practical validation and deployment. We are interested in interdisciplinary, high impact research, and seek collaboration with other academic research groups, industry and government worldwide.

■ **Recent research achievements ('21~'23)**

- ◆ Our lab has published in top international venues in mobile computing, machine learning, and human-computer interactions, such as NeurIPS, MobiSys, MobiCom, UbiComp, UIST, SenSys, CHI, CSCW, IEEE INFOCOM, as well as Transactions on Mobile Computing.
- ◆ Our Research has won awards at ACM CHI, ACM CSCW, and ACM MobiSys.

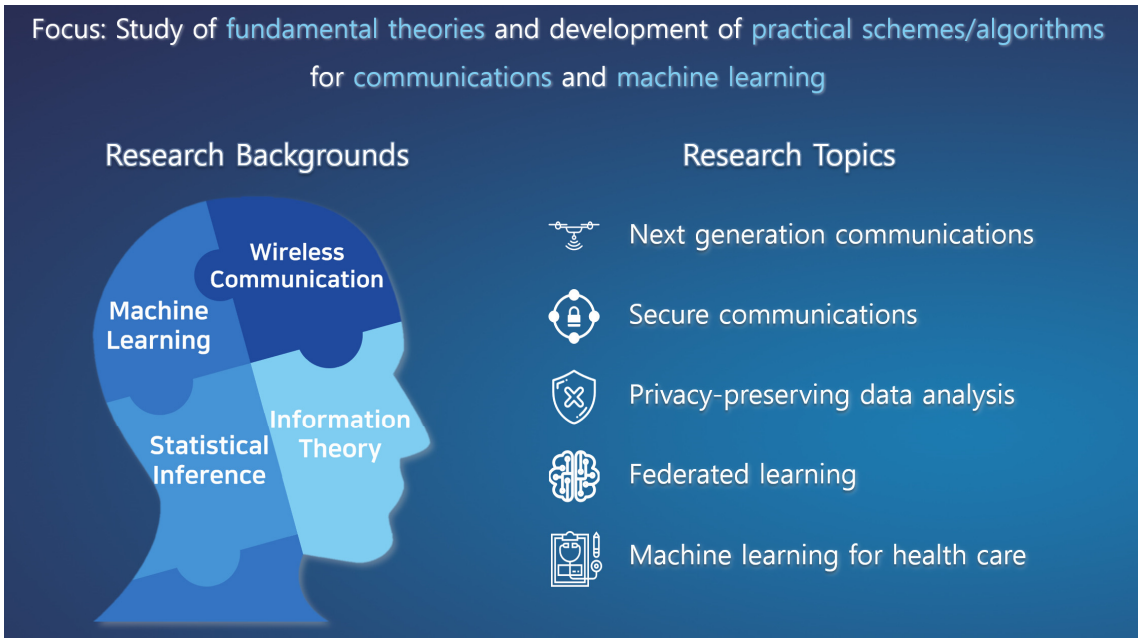
<Professor Si-Hyeon Lee's Lab>

InfoLab: Information and Communication Research Lab	■ Contact information		
	Professor	sihyeon@kaist.ac.kr	**Tel:** 042-350-7463
	Lab.	jaemin.park@kaist.ac.kr	**Tel:** 042-350-7563
	Website	https://info-lab.kaist.ac.kr	

■ **Current state of the Lab. (in 2023 Fall Semester)**

PhD Students: 6 Master's Student: 7

■ **Research Areas**



Our lab is working both on the study of fundamental theories and on the development of practical schemes and algorithms for communication and machine learning. For the theoretical part, we are interested in the characterization of information-theoretic capacities and fundamental trade-offs for various communication and learning problems. For the practical part, we are interested in designing practical schemes for next-generation communications, improving the state-of-art machine learning algorithms such as federated learning, and developing machine-learning algorithms for various applications such as communication, health care, and NAND flash memory.

■ **Career after graduation**

Communications and machine learning technologies are highly demanded research areas both in industry and academia.

■ **Introduction to the Lab.**

InfoLab started in 2017 at POSTECH and moved to KAIST in 2020. We welcome students who are passionate about fundamental theories and developments of communication systems and machine learning algorithms.

■ **Recent research achievements**

Our lab published 25 SCI journal papers and 28 international conference papers, including several papers in IEEE Trans. Information Forensics and Security (impact factor top 5%) and IEEE Trans. Information Theory (#1 in information theory).

<Professor Ian Oakley's Lab.>

Wearable and Interactive Technology Lab

■ **Contact information**

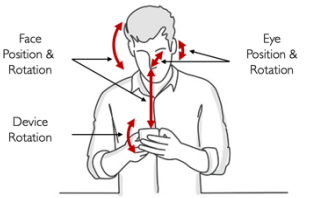
Professor : Ian Oakley TEL : 010-4531-6693

Website : https://sites.google.com/view/kaist-witlab/

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 0 Master's Student: 0

■ **Research Areas:**



WIT Lab conducts research on **Human-Computer Interaction** (**HCI**). Specifically:

Sensing and Input for AR and VR: Smartglasses are an emerging computational platform that demands new input forms based on sensing finger and body motions and gestures. WIT Lab designs, develops, and evaluates novel interactive technology in this space for critical use scenarios such as typing, selection or navigation.

Wearable Authentication: Wearable devices increasingly sense, store, or access sensitive user data or services relating to health, communications, or transactions. However, securing access to these devices poses new challenges regarding reliable entry of passcodes or the design of practical design and integration of biometric sensing. WIT lab develops novel systems and user studies behaviors during authentication to wearable devices.

Digital Phenotyping: Smart and wearable devices have unprecedented capabilities to monitor their wearers. WIT Lab explores the user of novel data (e.g., gaze or other physiological signals) generated by mobile and wearable devices to detect key affective states, such as the feelings experienced during social media use, and how these may contribute to mental health issues, such as depression. Wearables have the potential to track our mental health, as well as our physical health.

■ **Recommended courses & Career after graduation**

KAIST offers a world-class environment in which to study HCI, with a network of faculty engaged in and around core HCI topics (https://hci.kaist.ac.kr/) and courses across CS, ID, GSCT and EE.

HCI offers many opportunities for future careers, with burgeoning opportunities in academia, strong demand from established industry research labs (e.g., Google, Microsoft), and high relevance to most tech startups.

■ **Introduction to other activities**

Lab members can expect to attend top international and national HCI conferences and have regular lab social events (organized mainly around lunches) and periodic workshop trips.

We are a new lab and open to ideas - join us and propose and/or organize your own events and social activities!

■ **Introduction to the Lab.**

WIT Lab was founded in August 2023. Grab an opportunity to join a rapidly growing lab as a founding member! **We are recruiting!** We're happy to speak to candidates interested in any area of HCI, but are currently focusing on sensing, input, and interaction design for wearable and augmented reality. Also, note that although we are a new lab, we are also a mature one - the lab builds on Professor Ian Oakley's 20+ years of experience as an HCI researcher and faculty member, so expect projects and publications to ramp up quickly. Come join us as we grow!

■ **Recent research achievements ('21~'23)**

We published five papers at ACM CHI and two papers at ACM IMWUT (Ubicomp). Come join our lab and contribute to top tier research in Human-Computer Interaction!

<Professor Jung-Yong Lee's Lab.>

Advanced devices for Energy Conversion Lab (ADEC)

■ **Contact information**

Professor : jungyong.lee@kaist.ac.kr TEL : 010-9341-1834

Lab. : lmh063@kiast.ac.kr TEL : 010-3086-2804

Website : http://adec.dsso.kr

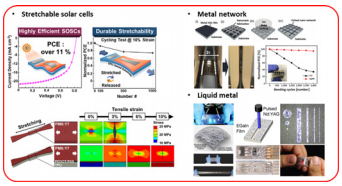
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 4 PhD Students: 10 Master's Student: 8

■ **Research Areas**

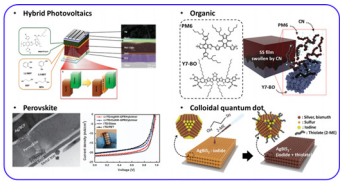
1. Stretchable optoelectronic devices

For realizing wearable devices, outstanding performance in stretchable optoelectronic devices is required. We investigate novel stretchable and transparent electrodes including silver nanonetwork, InGa-based liquid metal and hybrid electrodes. Furthermore, we perform the structural engineering for efficient stretchable optoelectronic devices.



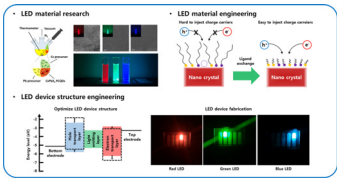
2. Highly efficient emerging optoelectronic devices

Although emerging optoelectronic materials including organic molecules, quantum dots and perovskite are beneficial to optoelectronic devices including solar cell, LED and photodetector, more efforts are required for commercialization. We study structural engineering for achieving high performance of the emerging optoelectronics devices.



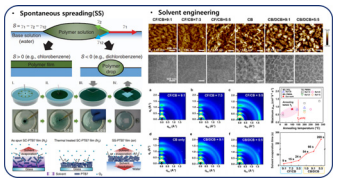
3. Next-generation light-emitting diodes and displays

Electronic devices are essential equipment for people today and provide a lot of useful information for their lives. An efficient way to convey tons of information from electronic devices is through displays. Therefore, for a clearer and more efficient display, advanced light-emitting diodes are needed. In our group, we research on synthesis and modification of materials, and optimization of device structures for advanced next-generation LEDs.



4. Novel device fabrication techniques

We develop novel thin film device fabrication techniques such as spontaneous spreading (SS), water floating, and solvent engineering. These methodologies open up new routes to new types of devices and scientific origins for efficient device performance.



■ **Recommended courses & Career after graduation**

Recommended courses : Introduction to Physical Electronics (EE211), Introduction to Organic Electronics (EE568), Solid State Physics (EE661), Advanced Electromagnetic Theory I (PH507)

Career after graduation : Professors, postdoctoral researcher, researchers of national research labs, company (SAMSUNG, LG electronics)

■ **Introduction to other activities besides research**

Exercise activity : Football, Basketball, Badmintonm, Weight training

Group teamwork : Team meating (once every two weeks), dining together (more than twice a year)

■ **Introduction to the Lab.**

Advanced devices for energy conversion (ADEC) lab has been studying on the emerging optoelectronic devices since 2010. We will support your researches whatever your interests are and help you to set up an experimental environments. Also, we are happy to discuss research issues and other problems. If possible, we can create synergistic effect on our results as we collaborate together.

■ **Recent research achievements ('21~'23)**

[1] S. Han et al., "Stretchable Electrodes Based on Over-Layered Liquid Metal Networks," Advanced Materials. 35, 2210112, (2023)

Journal articles (Total: 21) : 2021(6), 2022(6), 2023(10)

⟨Professor June-Koo Rhee's Lab.⟩

Quantum Information and Communications Lab

KAIST IT Research Center of Quantum Computing for AI

■ Contact information

Professor	Email: EE building E3-2 3208	Tel: 042-350-7416
LAb.	Email: EE building E3-2 3217	Tel: 042-350-7516
Website	http://quic.kaist.ac.kr	

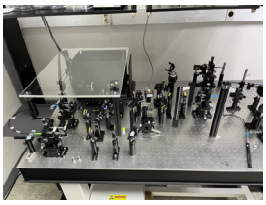
■ Current state of the Lab. (in 2023 Fall Semester)

Research professor: 1 Post-doctoral: 1 PhD Students: 3 Master's Student: 3

Team leader: Dong-Ha Kim (010-4443-8755)

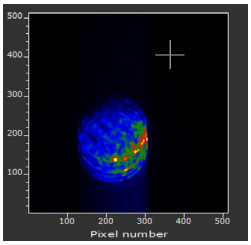
■ Research Areas

√ Satellite based Quantum Key Distribution (SQKD)



Since the successful demonstration of a satellite-based quantum key distribution (QKD) system by a research team from the University of Science and Technology of China (USTC) in 2017, the world has been fervently engaged in a competition to secure future technologies. South Korea is also actively conducting research related to this field, and we are conducting research specifically on entangled photon pair (EPP) sources, which is one of the essential technologies for achieving this project. In this research, we utilize optical experimental setups to observe and confirm phenomena that demonstrate quantum properties.

√ Quantum Ghost Imaging



The imaging technique allows the reconstruction of an image without directly detecting the photons that interact with the object. Despite a single photon from the signal not hitting the detector, the object can be obtained by utilizing the correlation between the detected signal and idler as the unique properties of the entanglement and non-locality of quantum mechanics.

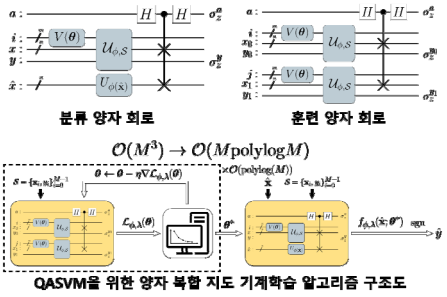
Advantages:

1. Low light sensitivity
2. Have better noise reduction compared to classical imaging techniques *under specific conditions.*

Main focus:

1. Develop the entangled photon pair.
2. Measure the correlation between entangled photons.
3. Increase the speed of object detection while maintaining SNR.

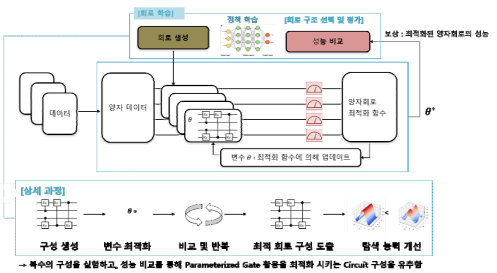
√ Quantum Approximate Support Vector Machine



A kernel-based quantum classifier is the most practical and influential quantum machine learning technique for the hyper-linear classification of complex data. Variational Quantum Approximate Support Vector Machine (VQASVM) algorithm demonstrates empirical sub-quadratic run-time complexity with quantum operations feasible even in NISQ computers.

We experimented our algorithm with toy example dataset on cloud-based NISQ machines as a proof of concept. We also numerically investigated its performance on the standard Iris flower and MNIST datasets to confirm the practicality and scalability.

√ Ansatz Structure Search via Reinforcement Learning



Parameterized Quantum Circuit is quantum circuit which parameter can be optimized by Goal of Loss. Ansatz structure of quantum circuit is important task for many algorithms such as Variational Quantum Algorithm, Variational Quantum Eigensolver, cause result of algorithms changes via structure of ansatz. In this work, we used Reinforcement Learning to search optimal ansatz structure with various goals.

■ Recommended courses

Recommended courses are linear algebra, probability theory, quantum mechanics, information theory.

■ Career after graduation

Graduates have emancipated for various careers such as professors (Coventry U UK, IFSTTAR France), and researchers at major companies (Samsung, LIG Nex1, KT, ETRI, NSR).

<Professor Hyunjoo. J. Lee's Lab.>

Brain/Bio Medical Microsystems Lab

■ **Contact information**

Professor : hyunjoo.lee@kaist.ac.kr TEL : 7436

Lab. : Electronics Building (E3-2) TEL : 7536

Website : https://bmm.kaist.ac.kr

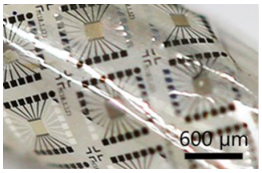
■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 13 Master's Student: 5

■ **Research Areas**

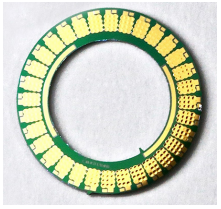
Our lab aims to develop novel systems for biomedical applications such as early detection of disease, therapeutics, and investigation of underlying mechanism of brain diseases. In specific, we focus on 1) developing Neural interface 2) developing Capacitive micromachined ultrasound transducer (CMUTs) for ultrasound neuromodulation, and 3) brain stimulation for neural circuits

Neural Interface



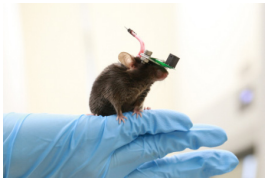
In order to provide chronic applications that offer long-term stability and precise measurements, flexible materials, such as those based on various polymers, are increasingly being integrated into the fabrication of microtechnologies. Multi-electrode arrays, also known as microelectrode arrays (MEAs), are one such field where flexible substrates are becoming critical components.

Ultrasound Neuromodulation



Capacitive micromachined ultrasound transducers (CMUTs) utilize traditional silicon-based microfabrication technologies to achieve highly configurable designs in a miniaturized package compatible with integrated circuits. A thin silicon membrane acts as the diaphragm for each micro-cell and a AC/DC voltage is applied across the vacuum cavity to deliver ultrasound pulses. Compared to conventional ultrasound transducers, CMUTs present numerous advantages such as easy fabrication of large arrays, large bandwidth, high sensitivity, and integration with various circuitry. In addition, CMUT arrays with various geometries and dimensions have been widely applied for biomedical ultrasound applications

Brain stimulation for neural circuits



We are exploring low intensity focused ultrasound as a new stimulation modality for treatment of brain/neurological diseases. A method currently used to treat degenerative brain diseases such as Parkinson's disease is to directly apply electrical, chemical, or light to the brain. Among them, ultrasound stimulation offers competitive advantages such as non-invasiveness, higher spatial resolution, and larger penetration depth. We are developing miniaturized flexible ultrasound transducers for small animal experiments as well as for clinical applications.

■ **Recommended courses & Career after graduation**

Recommended courses include fabrication, nano/bio electronics, and MEMS. Careers in semiconductor and medical industries as well as academia are possible.

■ **Introduction to other activities besides research**

Spring walk, Strawberry party, National teacher's day, Graduation party, and other many extra activities to accommodate friendship.

■ **Introduction to the Lab.**

Due to the interdisciplinary research field, our lab consists of a diverse group of students from different backgrounds such as electrical engineering, materials science, and chemistry.

■ **Recent research achievements ('21~'23)**

1. S. Kim†, Y. Jo†, G. H. Im, C. Lee, C. Oh, G. K, S.-G. Kim*, and H. J. Lee* (2023). Miniaturized MR-Compatible Ultrasound System for Real-Time Monitoring of Acoustic Effects in Mice using High-Resolution MRI. NeuroImage, 276.
2. Y. Kim†, E. Jang†, Y. Lee, C. Oh, K. Kim, G. Kook, M. K. Kim, M.-O. Lee, and H. J. Lee* (2023). Miniature Transparent Dopamine Sensor based on Nanosphere Lithography. Advanced Materials Technologies, 2300006.
3. G. Kook, Y. Jo, C. Oh, X. Liang, J. Kim, S.-M. Lee, S. Kim, J.-W. Choi, and H. J. Lee* (2023). Multifocal Skull-Compensated Transcranial Focused Ultrasound System for Neuromodulation Applications based on Acoustic Holography. Microsystems & Nanoengineering, 9 (45).
4. H. Chae, Y. Park, Y. Jo, Y. Jeon, H. J. Lee, S. Yoo, and K. C. Choi* (2023). Blue Transparent OLEDs with High Stability and Transmittance for Modulating Sleep Disorders. Advanced Materials Interfaces, 2202443.
5. Y. Jo, S-M. Lee, T. Jung, G. Park, C. Lee, G.H. Im, S. Lee, J.S. Park, C. Oh, G. K, H. Kim, S. Kim, B.C. Lee, G.S.B. Suh, S-G. Kim, J. Kim*, H.J. Lee* (2022). General-Purpose Ultrasound Neuromodulation System for Chronic, Closed-loop Preclinical Studies in Freely Behaving Rodents. Advanced Science, 9 (34).
6. M. K. Kim†, J. C. Leong†, Y. Jo†, G. Kook, and H. J. Lee* (2022). Multimodal Neural Probes with Small Form Factor based on Dual-Side Fabrication. Advanced Materials Technologies, 8 (2), 2200692.

<Prof. Dong Eui Chang 's Lab>

KAIST EE
Ctrl Lab
Control Laboratory

■ Contact information

Professor	Email: dechang@kaist.ac.kr	Tel: 042-350-7440
Lab.	Room: 1110, N24	Tel: 042-350-7540
Website	https://control.kaist.ac.kr	

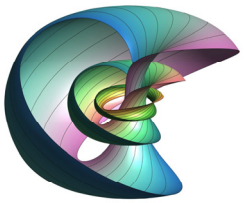
■ Current state of the Lab. (in 2023 Fall Semester)

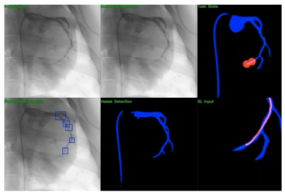
Postdoctoral Fellows : 1 PhD Students: 10 Master's Student: 7

■ Research Areas

■ Control theory and its application with AI

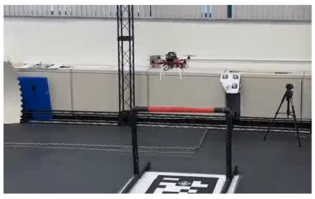
- We develop novel control theories for efficient and robust control and implement them on real systems.
- We develop automatic control algorithms that combine image processing AI and reinforcement learning.
- We develop numerical integration algorithms to faithfully preserve the values of conserved quantities such as energy during numerical integration.

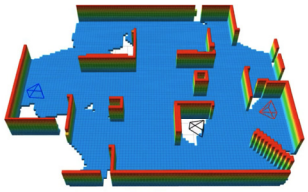

Drone control using S^1 fiber bundle


Automatic guidewire control using reinforcement learning

■ Autonomous flight drone

- We take a new approach to autonomous flight by applying control theory, deep learning and reinforcement learning.
- We combine AI-based perception and motion planning using reinforcement learning to accomplish missions.
- We implement developed control algorithm on real drone.

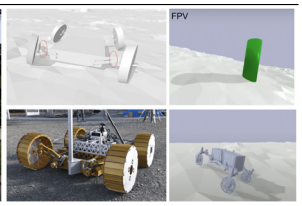

Autonomous flight drone for perching


Reinforcement learning-based swarm drone exploration

■ Robotics with AI

- We develop artificial intelligence technologies for various robotics fields.
- We develop a simulator for reinforcement learning as well as reinforcement learning algorithms for robust control.


Autonomous driving using imitation learning



Lunar rovor simulator for reinforcement learning

■ Recommended courses & Career after graduation

Research on control and robotics requires a strong background in mathematics, physics and computer science as well as electrical engineering. Recommended undergraduate courses are analysis, linear algebra, differential equations, optimization, signals and systems, feedback control, visions, and deep learning.

- Graduates can work in academia, national labs or companies.

■ Introduction to other activities besides research

There are no other activities done laboratory-wide other than research.

■ Introduction to the Lab.

Prof. Chang is an expert in control, and robotics. He takes students from various fields including electrical engineering, mechanical engineering, aerospace engineering, brain science, computer science, and mathematics, thus creating a synergistic and multi-disciplinary research environment in the laboratory. Prospective students are not expected to have been exposed to all these areas. Only industriousness is required of them.

■ Recent research achievements (2021-2023)

[1] A new bundle picture for the drone, IEEE TAC, 2023.

[2] Unscented Kalman filter with stable embedding for simple, accurate, and computationally efficient state estimation of systems on manifolds in Euclidean space, International Journal of Robust and Nonlinear Control, 2023.

[3] Feedback gradient descent: efficient and stable optimization with orthogonality for DNNs, AAAI, 2022.

[4] Model-free unsupervised anomaly detection of a general robotic system using a stacked LSTM and its application to a fixed-wing unmanned aerial vehicle, IROS, 2022

[5] Sim-to-Real transfer of image-based autonomous guidewire navigation trained by deep deterministic policy gradient with behavior cloning for fast learning, IROS, 2022

[6] Globally exponentially convergent observer for the rigid body system on SE(3), CDC, 2022

[7] Robust navigation for racing drones based on imitation learning and modularization, ICRA, 2021.

[8] Transversely stable extended Kalman filters for systems on manifolds in Euclidean spaces, Journal of Dynamic Systems, Measurement, and Control, 2021.

[9] Globally exponentially convergent continuous observers for velocity bias and state for invariant kinematic systems on matrix Lie groups, IEEE TAC, 2021.

<Prof. Min Seok Jang's Lab>

JLAB NANO OPTICS

■ **Contacts**

PI : E3-2 #2221 TEL : 042-350-7439

Lab : E3-2 #2222, #2232 TEL : 042-350-7539

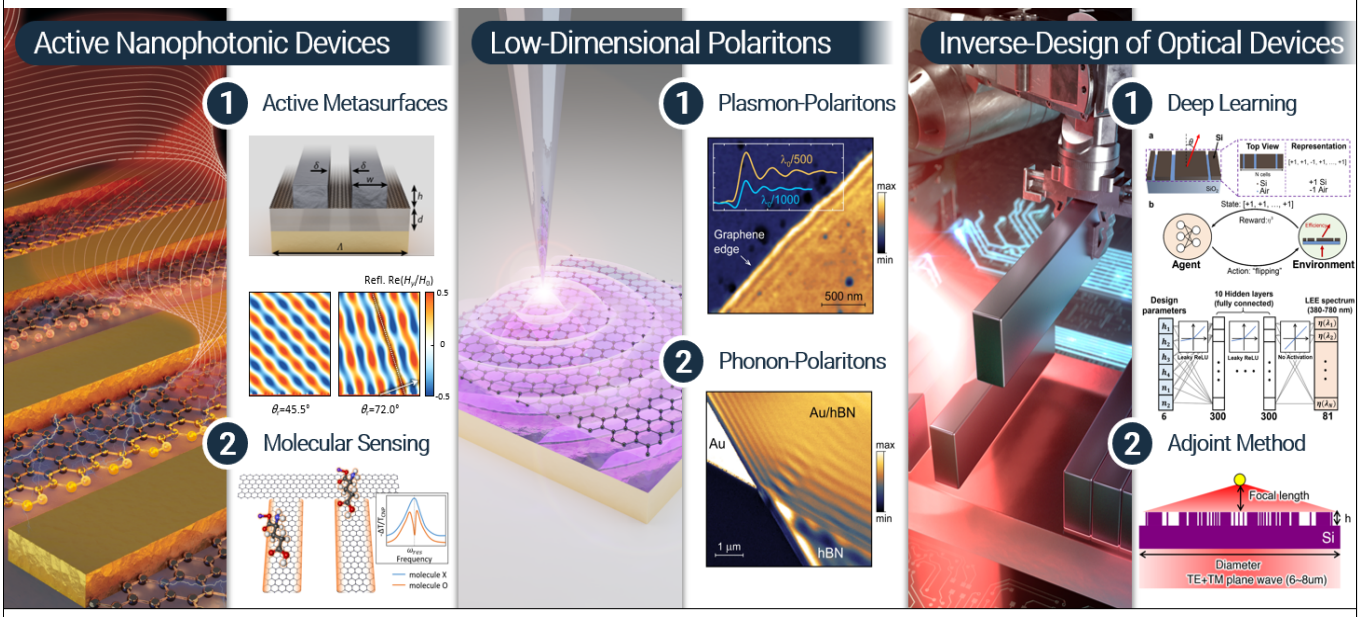
Homepage : janglab.org

Email : jang.minseok@kaist.ac.kr

■ **Current member status (2023 Fall): 1 research professor, 1 post-doc, 10 PhD students, 3 MS students, 5 undergrads**

■ **Research Areas**

We understand the properties of light in ultra-small, subwavelength scales and develop technologies in the field of imaging, sensing, information processing, displays, and quantum computing



■ **Recommended courses and Potential career paths**

Theoretical research: To analyze and design photonic device functionalities, courses such as 'Electromagnetics' 'Quantum mechanics', and 'Fundamentals of photonics' are recommended.

Experimental research: The following courses 'Introductions to physical electronics', 'Semiconductor devices', 'Semiconductor IC technology', etc. are recommended to prepare oneself for fabrication of photonic devices.

There's a lot of demand for nanophotonics in both academia and industry, and diverse career paths are possible, whether it be researching in academia or working on display technologies at an industry.

■ **About our lab and prospective team members**

We are currently accepting undergrads who want a research experience in a lab. What we offer:

(1) Research along the **interface between science and engineering**: Understand the fundamentals behind physical phenomena, and apply it for engineering purposes.

(2) You can choose between theory/simulations or experiment, or both, depending on your aptitude or preferences.

(3) Collaboration with other labs abroad.

Our lab prides in our friendly and horizontal lab culture and student-driven researches. We respect every student's own times and schedules, and provide an academic environment to study and research in at one's own needs.

*** About the PI**: I myself was a KAIST undergraduate, class of 2006, who took classes in the same rooms of KAIST and did internships and undergrad research programs, developing my skills as a researcher. Also, having very recently graduated from graduate school, I understand very well the difficulties and problems graduate students go through. I take as a top priority to lead a lab that's the most beneficial for our members, and will try my hardest in **helping students find the research topics of their interest** and **creating a non-authoritative lab atmosphere blooming with fruitful discussions**.

■ **Publications**

[1] "Near-field probing of image phonon-polaritons in hexagonal boron nitride on gold crystals", Science Advances (2022).

[2] "Full 2π tunable phase modulation using avoided crossing of resonances", Nature Communications (2022).

[3] "Real-space imaging of acoustic plasmons in large-area graphene grown by chemical vapor deposition", Nature Communications (2021).

[4] "Complete complex amplitude modulation with electronically tunable graphene plasmonic metamolecules," ACS Nano (2020). **[Front Cover]**

[5] "Self-stabilizing laser sails based on optical metasurfaces," ACS Photonics (2019).

⟨Professor Sanghun Jeon's Lab.⟩

ANTONIS Lab
Advanced Nano Technology based Opto, electronics & Integrated System Lab.

■ Contact information

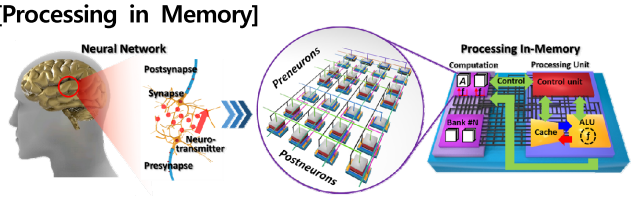
Professor	Email: jeonsh@kaist.ac.kr	Tel: 042-350-7544
Lab.	Email: mutual_lee@kaist.ac.kr	Tel: 010-3566-2497
Website	https://antonis.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

PhD Students: 9 Master's Student: 11

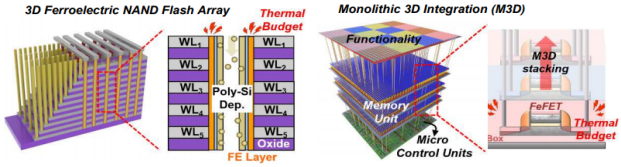
■ Research Areas

[Processing in Memory]



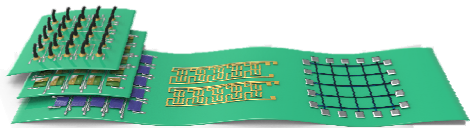
Processing in memory is a next-generation computing architecture beyond the conventional von Neumann computing architecture, and FeFET has been widely studied as a promising computational memory device based on their fast operation speed, high reliability and C-MOS compatibility. Antonis lab is actively conducting various research to develop an optimal FeFET for performing multiply and accumulation (MAC) operations, which is the most primary calculations in machine learning. In detail, we are introducing key approaches covering material and device architecture to overcome current technological issues. Moreover, using various computing logic, we are demonstrating the FeFET-PIM array with a high energy efficiency, which is evaluated by the system-level simulation.

[Nano-electronic Device]



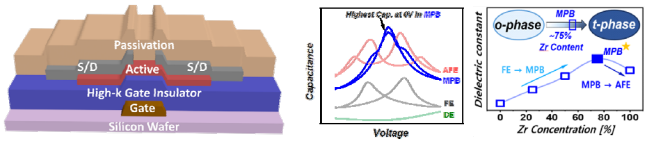
Recently, in the semiconductor industry, device structures that enable vertical stacking of transistor layers are considered as promising solution of device scaling-down limitations. In particular, 3D NAND Flash memory is the most representative memory application, as of now, aiming for 1000 layers of stacking. As the vertical dimension of the NAND flash is increaseing, the following increased burden on circuit design and channel resistance become the major hurdle. Antonis LAB is actively conducting various researches using the ferroelectric material replacing the conventional charge trap layer, or combining the existing charge trapping mechanism with the ferroelectric switching for next generation high-performance 3D NAND flash memory application.

[Bio-inspired E-skin for artificial nerve system with M3D]



We are currently working on a ferroelectric Hf-Zr-O (HZO) based artificial nerve system. Ferroelectric is well-known material with an interesting behavior that can retain its electrical dipole characteristics even after removing the external field. Also, all ferroelectric material has pyroelectric and piezoelectric properties that respond to heat and pressure respectively. In comparison with lead-zirconium-titanium-oxide (PZT) which is widely used conventional ferroelectric material, HZO has no lead component and was able to use at nm scale. We hope that the approaches in our laboratory can be widely adopted in various industrial fields such as electronic skin for humanoid robots, health-care monitoring systems, and advanced prosthetic devices.

[High-k gate insulator for oxide TFT for display]



In recent years, high-performance TFT for high speed operation has been required to realize large-area, and high-resolution displays. In this regard, high-k gate insulator with relatively high thickness (~100 nm) is required for display backplane. But there are some bottleneck for realized formation of thick, high-k dielectrics with ALD process, which is long time process, and limitation of dielectric constants below ε_r~35. Therefore, a new approach is required for the formation of thick, high-k dielectrics. In our lab, we are conducting research on improving leakage current and on current (I_{ON}) by using HfO2-based ferroelectric as the gate insulator of oxide TFTs. In addition, research on integrateing FeTFT devices is being conducted with various TFT characteristics measurements.

■ Recommended courses & Career after graduation

◇ Recommended courses : Introduction to Physical Electronics,Semiconductor Devices, Semiconductor IC Technology
◇ Career : Semiconductor Industries and Institutes (Samsung, SK hynix, Qualcomm, NVIDIA, ETRI, etc.)

■ Introduction to other activities besides research

◇ Great Work Place (GWP) event : Wine seminar, LAB field trips
◇ Regular group meal
◇ Coffee time with LAB members
◇ Cultural activities : Bowling, laser tag, book club

■ Introduction to the Lab.

Our lab focuses on the research and development of functional oxide electronics ranging from materials, process and devices for nano-electronics, intelligent semiconductor, IOT sensor and display applications. Our research in materials science aspect is mainly focused on ferroelectrics and oxide semiconductor. Based on this, we are currently developing various semiconductor devices such as DRAM, NAND Flash and X-point memory. Also with this, we are also exploring futuristic semiconductor device including processing-in-memory, logic-in-memory and neuromorphic device to turn them into reality.

■ Recent research achievements (2022-2023)

[1] Kim, Giuk, et al. "Design Guidelines of Thermally Stable Hafnia Ferroelectrics for the Fabrication of 3D Memory Devices." IEDM, 2022.

[2] Hwang, Junghyeon, et al. "Ultra-high Tunneling Electroresistance Ratio & Endurance in Oxide Semiconductor-Hafnia Self-rectifying Ferroelectric Tunnel Junction." VLSI, 2023.

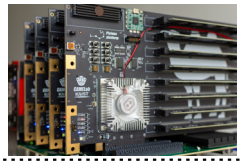
<Professor Myoungsoo Jung's Lab.>

Computer Architecture and Memory Systems Laboratory

Contact information		
Professor	Email: m.jung@kaist.ac.kr	Tel: 042-350-7455
Lab.	Email: kukdh1@kaist.ac.kr	Tel: 042-350-7555
Website	http://camelab.org	

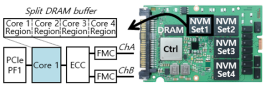
Research Areas

CXL Hardware and Software co-solution



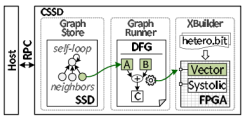
- Opening a new direction for memory disaggregation
- Ensuring direct accessible and high-performance capabilities

Kernel & Storage Architecture



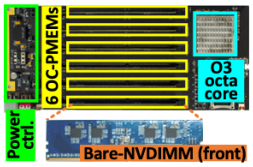
- High performance SSD architectures and firmware design
- In-memory processing and In-storage processing

Machine Learning with Storage/SCM



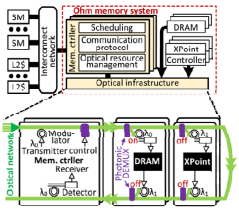
- Exploring ML algorithms to make system-related decisions
- Implementing hardware acceleration architectures using ML within Memory and storage

Next Gen. Non-Volatile Memory (NVM)



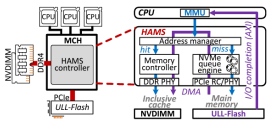
- Overcoming challenges of emerging NVMs such as RRAM and PRAM
- Architecting new platforms with byte-addressable NVMs

Heterogeneous Computing



- Researching energy-efficient heterogeneous computing with diverse devices
- Remove data movement by aggressively integrating memory with hardware accelerator

New Memory Computing



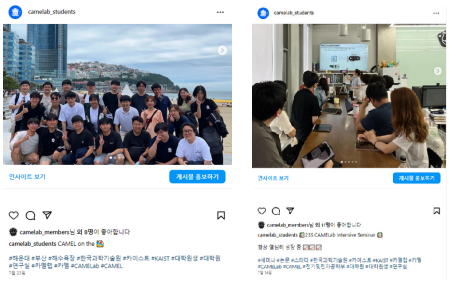
- New memory device design and implementation (e.g. Z-NAND, PRAM)
- Exploring a new territory to integrate new memory into domain specific accelerator

Recommended courses & Career after graduation

We recommend taking courses related to **operating systems (OS)**, **system programming**, **computer architecture, machine learning and field programmable gate array (FPGA)**. It would be better to have experiences with simulators or benchmark tools. Though all those courses and experiences listed above aren't mandatory. About career, based on your will, Dr. Jung will support everything for you to get publications and to become a leading researcher at from industry to faculty jobs.

Introduction to other activities besides research

We regard horizontal and active communications as important. So, we often have mealtimes and talking time together. Now, we are moving forward together encouraging each other. In addition, we sometimes visit abroad to attend top-tier academic conferences. If you're interested, check out our lab's instagram. :-) @camelab_members



Instagram

Introduction to the Lab.

Professor Jung has advised his students at UT Dallas, Yonsei Univ. and now KAIST under support and collaborations with U.S. government organizations, industries (Intel, Western Digital, Sandisk, Samsung, SK Hynix, Memray) and institutions (UIUC, Georgia tech). Our lab have published many papers to top-tier conferences and gotten attention in many presses. We continue to target top-tier conference publications in a perfect environment for research.

homepage

Recent research achievements (2012 - 2023)

- 42 publications in top-tier conferences. (Total 125 publications including major conferences and SCI journals.)
- Our system research is **ranked first** in Korea, according to the metrics-based system, CSRankings.
- 15 international articles, 102 domestic articles including **Korea major presses** and **Naver news headline**.
- 37 international and domestic patents.

<Professor Wanyeong Jung's Lab.>

Smart Energy-Efficient Design Laboratory

■ Contact information

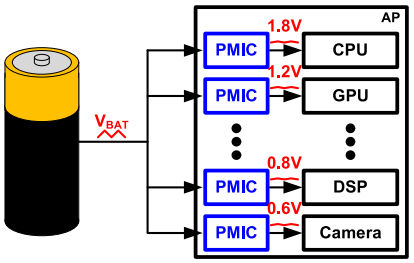
Professor : wanyeong@kaist.ac.kr TEL : 042-350-7459
Lab. : seed@kaist.ac.kr TEL : 042-350-7559
Website : https://seed.kaist.ac.kr

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 10 Master's Student: 10 Undergraduate Student: 4

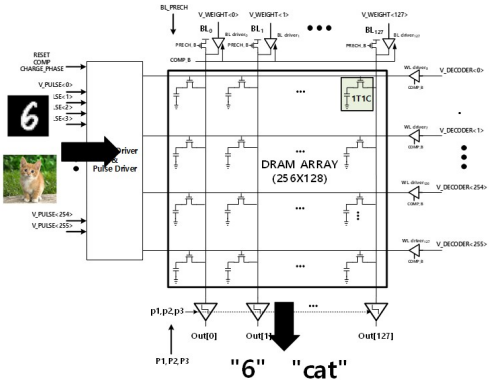
■ Research Areas

▶ Autonomous Power Management for Self-Powered Devices



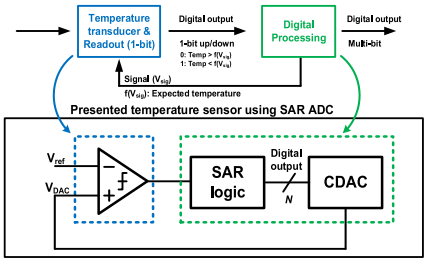
Improving efficiency in energy harvesting and power management is essential to extend overall system operating time. The group has developed efficient switched-capacitor (SC) DC-DC converters for energy harvesting and power management. The group is also exploring inductive/hybrid DC-DC converters, multi-phase/multi-output converters, linear regulators, and their applications including fine-grained DVFS and design co-optimization with load circuits.

▶ Machine Learning on Edge Devices



Machine learning allows us to make a unified data processing accelerator that can be widely used in many applications and devices regardless of data type and purpose. The needs for machine learning are growing fast in many types of mobile devices and systems, but it is difficult to find an architecture with high efficiency and flexibility. The PI has developed a general inference accelerator for various types of CNN networks, and the group is now extending the research area to digital building blocks, computer architecture, near/in-memory computing with analog computation, and algorithm. The group is also trying to apply machine learning to circuit design process itself, to automate some time-consuming design steps.

▶ Energy-Efficient Sensors in Advanced Technologies



Sensor interfaces are difficult to scale down because of noise, process variations, and the reduction of output swing and intrinsic gain in advanced processes. The PI applied principles for digital circuits to analog designs so that they fully benefit from process scaling and are easily combined with other digital-oriented techniques. While trying to extend the application of this new approach among others, the group has developed many analog circuits including ADCs and sensor inferfaces, aiming for simpler and more robust design with efficiency.

■ Recommended courses & Career after graduation

Courses for analog and digital integrated circuits are strongly recommended. Basic English and programming skills are necessary. The career after graduation includes academia or industries related to circuit design.

■ Introduction to other activities besides research

The lab holds group dinners and annual workshop. The lab supports attendance at top international conferences in the field of integrated circuits such as ISSCC and VLSI-C, and other student-driven events and activities.

■ Introduction to the Lab.

The lab was established in August 2019. The lab is looking for graduate students and undergraduate students who are interested in IoT/low-power circuits and systems. The lab has friendly atmosphere and various research field, and try to research more creatively.

■ Recent research achievements ('21~'23)

[1] "A 74.0 dB-SNDR 175.4 dB-FoM Pipelined-SAR ADC Using a Cyclically Charged Floating Inverter Amplifier," *IEEE A-SSCC,* 2023
[2] "ConverGenT: Automated Topology Generation and Analysis of Hybrid DC-DC Converters," *IEEE TPEL*, June 2023
[3] "A Wide Range, Energy-Efficient Temperature Sensor Based on Direct Temperature–Voltage Comparison," *IEEE SSC-L*, April 2023

<Professor Jae-Woong Jeong's Lab.>

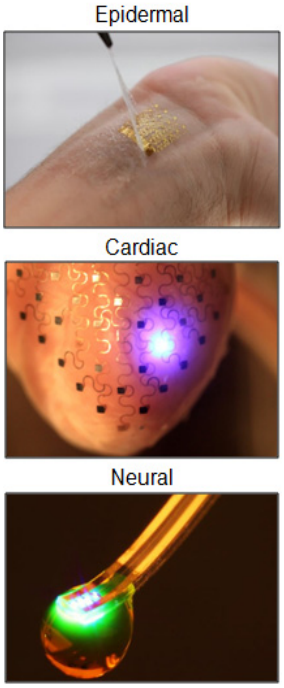
Bio-Integrated Electronics and Systems Laboratory

■ **Contact information**
Professor : Nanofab center (E19), Room 516
Lab. : Nanofab center (E19), Room 522
Website : http://jeongresearch.org

■ **Current state of the Lab. (in 2023 Fall Semester)**
Postdoctoral Fellows : 0 PhD Students: 8 Master's Student: 7

■ **Research Areas**

Our mission is to invent the future generation "soft" bioelectronics and biomedical systems for advancing healthcare and biomedical research. Research areas in our group include design and fabrication of flexible/stretchable electronics, photonic microsystems, and microfluidic devices for various applications such as health/wellness monitoring, disease diagnosis and therapy, human-machine interfaces, and neuroscience.



"Wearable" Skin-like Electronics

Conventional biomedical devices mounted on our body are rigid, bulky, and its mechanical properties do not match with the property of the human tissue. Based on flexible/stretchable electronics technologies, our group develops soft, flexible, and stretchable devices with diagnostic and therapeutic capabilities, which can be conformally wrapped on curvilinear-shaped skin. We are broadly interested in stretchy bio-integrated electronics that integrate multiple modalities (e.g. electronics, photonics, and microfluidics)

"Implantable" Soft Electronics

Implantable devices have been drawing significant attentions in biomedical research for continuous monitoring of force, pressure, temperature, and electrophysiological signals inside living subjects. Implantable electronic systems must be small in size, compatible with biological tissue, and sturdy enough to withstand the physical forces within the body. Our research focus is to develop soft, stretchable sensors and actuators that enable high spatiotemporal resolution recording and control; and that conform to the micro-geometry of 3-D tissue without creating damaging local stresses. Our particular interests are in implantable cardiac devices and wireless multifunctional neural probes for the brain.

■ **Recommended courses & Career after graduation**

Recommended courses: MEMS, micro/nanofabrication, circuit design, embedded systems, etc.

Potential career path:

Industry: Electronics, Semiconductor, Medical, etc.

Academia: Univ. Professors, Researchers at National Labs

■ **Introduction to other activities besides research**

We hold annual group party and workshop. In addition, we attend various international conferences including Transducers, MEMS, EMBC, MRS, BMES, etc.

■ **Introduction to the Lab.**

Our group works on multidisciplinary research, crossing the areas of EE, ME, BME, materials, and physics. We are actively collaborating with Washington Univ. School of Medicine, Georgia Tech, Yonsei University Medical School, etc.

■ **Recent research achievements ('21~'23)**

- ***Nature Communications, Advanced Materials*** (2021). ***Nature Biomedical Engineering, Nature Communications, Advanced Materials*** (2022). ***Nature Protocols, Nature Communications, Science Advances*** (2023).

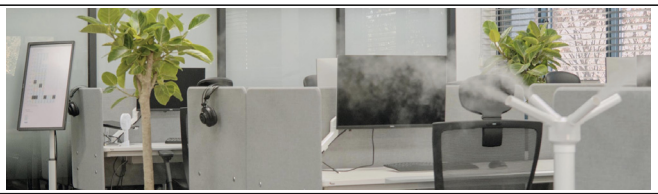
[1] "Soft subdermal implant capable of wireless battery charging and programmable controls for applications in optogenetics." ***Nat Commun*** 12, 535 (2021).

[2] "Scalable and modular wireless-network infrastructure for large-scale behavioural neuroscience." ***Nat. Biomed. Eng*** 6, 771–786 (2022).

[3] "Rapid meniscus-guided printing of stable semi-solid-state liquid metal microgranular-particle for soft electronics" ***Nat Commun*** 13, 2643 (2022).

[4] "Customizable, wireless and implantable neural probe design and fabrication via 3D printing" ***Nat Protoc*** 12, 219-237 (2023).

<Professor Joon Son Chung's Lab.>



■ Contact information

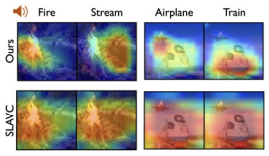
Professor : Joon Son Chung TEL : 042-350-2114
Lab. : Multimodal AI Lab (N24 #3102)
Website : https://mmai.io

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 2 PhD Students: 5 + 5 (integrated) Master's Student: 10

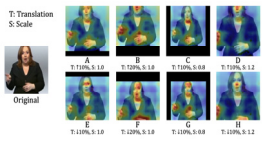
■ Research Areas

- **Sound Source Localization**



As humans have intuitive understanding of the direction of sound when perceiving visual scene. By focusing on cross-modal alignment of visual and auditory information and leveraging learning-based approach, we achieve high localization performance.

- **Sign Language and Gesture Recognition**

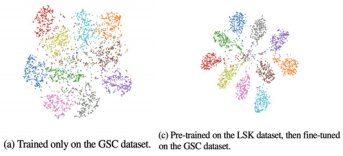


Sign language includes complex features to sufficiently understand the meaning. Therefore, we attempt to extract multiple features without the need for additional annotations. Our self-sufficient learning framework and thereby achieves the state-of-the-art performance.

- **Talking Face Generation**

Generating a talking face video plays a crucial role in human-computer interactions and can be applied to diverse fields. We construct a method that generates a natural-looking talking faces with fully controllable facial attributes and accurate lip synchronization

- **Keyword Spotting**


(a) Trained only on the GSC dataset.
(c) Pre-trained on the LSK dataset, then fine-tuned on the GSC dataset.

We explore a task of discovering keywords spoken by humans. By leveraging user-defined keyword spotting and metric learning, we produce the state-of-the-art performance in the domain. We also propose a novel dataset corresponding to the task.

■ Recommended courses & Career after graduation

Recommended Courses

- Signals and Systems (EE202)
- Programming Structure for Electrical Engineering (EE209)
- Digital Signal Processing (EE432)
- Special Topics in Electronic Engineering: Deep Learning for Computer Vision (EE488)

■ Introduction to other activities besides research

Our Lab highly encourages social events including strawberry party, internal workshops, and sports. All lab members including foreign students and interns are open to active participation.

■ Introduction to the Lab.

Mutimodal AI (MMAI) Lab develops numerous ideas based on multi-modal data. With the help of Artificial Intelligence, we aim to solve various tasks by fundamental understanding of multi-modality, an extension of single modal approach such as vision only, and audio only. We focus on augmenting the performance of existing tasks by the multi-modal approach and exploring more in-depth researches based upon the combination of various information. Any motivated students in machine learning, visual, and auditory information are welcomed.

■ Recent research achievements ('22~'23)

1 paper at ACM International Conference on Multimedia 2023 (ACM MM)
1 paper at International Conference on Computer Vision 2023 (ICCV)
2 papers at Interspeech 2023
4 papers at International Conference on Acoustics, Speech, and Signal Processing 2023 (ICASSP)
1 paper at British Machine Vision Conference 2022 (BMVC)

<Professor Hye Won Chung's Lab>

Inference and Information for Data Science (IIDS) Lab.	■ **Contact information** Professor : ITC Building (N1) 206 TEL : 042-350-7441 Lab. : ITC Building (N1) 213 TEL : 042-350-7541 Website : http://iids.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

PhD Students: 7 Master's Student: 3

■ **Research areas: Algorithms and theory for data science / Efficient deep learning and trustworthy AI.**

The goal of our research group is to provide a theoretical and algorithmic framework for data science and machine learning that can lead to efficient strategies for assessing, gathering, extracting, and exploiting information. In the era of big data, we want to fully utilize the large volumes and richness of data sets to efficiently infer the real-world phenomena behind the data. Information-theoretic concepts and tools are useful in data science, especially to establish fundamental limits and to explore trade-offs in extracting information from data sets. To deal with new challenges originated from practical concerns related AI systems, we also develop algorithms for data-efficient deep learning, and robust/trustworthy ML/AI systems.

Raw Data Useful Information

■ **Recent research topics:**

- **Data-efficient deep learning:** for many tasks, deep learning heavily relies on large datasets. However, storing and utilizing such large datasets for training deep neural networks require high storage and computational costs. Our goal is to solve this challenge by finding techniques to select the most informative subset of the dataset or to acquire a summary of the dataset that can approximate the training with the entire datasets in a cost-efficient manner.
- **Robust and trustworthy machine learning:** we work on developing reliable machine learning methods to address practical issues in deploying deep learning systems such as timely-decision making, out-of-distribution detection or test-time adaptation.
- **Algorithms and theory for data science:** we have worked on developing strategies to efficiently collect data from human annotators using crowdsourcing platforms and to extract useful information from high-dimensional data such as random graphs or matrices. We develop new algorithms and theoretically analyze these algorithms to provide not only efficient ways of processing data but to provide theoretical guarantees of the algorithms.

■ **Recommended courses & career after graduation**

Recommended courses are probability, information theory, and machine learning. Mathematical background (in probability, statistics, or analysis) and/or programming skills would be helpful to start research in our lab. Data science and machine learning are rapidly emerging areas with many possible career opportunities both in industry and academia.

■ **Introduction to other activities besides research**

Students who would join our group can freely suggest ideas on group activities they would like to have. Prof. Hye Won Chung is willing to provide great support for students in our group and she tries to be available for students in meeting and discussing ideas.

■ **Introduction to the Lab.**

We are welcoming new students who are passionate in exploring interesting ideas in data science and machine learning. We encourage open discussions and collaborations in defining research problems and developing ideas.

■ **Recent research achievements (Year 2023)**

[1] A Generalized Worker-Task Specialization Model for Crowdsourcing: Optimal Limits and Algorithm, IEEE Trans. on Info. Theory 2023.
[2] Test-Time Adaptation via Self-Training with Nearest Neighbor Information, ICLR 2023.
[3] Data Valuation without Training of a Model, ICLR 2023.
[4] Recovering Top-Two Answers and Confusion Probability in Multi-Choice Crowdsourcing, ICML 2023.
[5] Efficient Algorithms for Exact Graph Matching on Correlated Stochastic Block Models with Constant Correlation, ICML 2023.

<Professor Minkyu Je's Lab.>

IMPACT Lab
Integrated Microsystems Powered with Advanced Circuit Technology

■ **Contact information**

Professor : mkje@kaist.ac.kr TEL : 7437

Lab. : ygc980215@kaist.ac.kr TEL : 7637

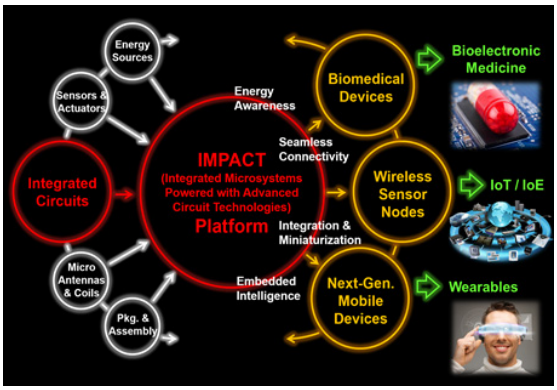
Website : impact.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 26 Master's Student: 12

■ **Research Areas**

The core technology of the research is analog, mixed-signal, and RF integrated circuit design techniques, especially focusing on intelligent sensor interface circuits and ultra low power wireless communication circuits.



▷ **Intelligent sensor interface**

The sensor interface circuit that works with the sensor is an essential component to acquire the information of the real physical world. It has to provide sufficient performance while consuming low power. In particular, we aim to develop an intelligent interface circuit that can compensate the deficiencies of the sensor and extract meaningful information even under imperfect conditions.

▷ **Ultra-low-power wireless communication**

Particularly, we are interested in the technology that realizes the short distance communication in the vicinity of the human body with high energy efficiency as well as the various circuit techniques for duty-cycling the wireless communication circuits which consume the most power in the wireless sensor microsystems as much as possible.

▷ **Microsystem convergence for emerging applications**

Based on this low-power integrated circuit technology, the extremely small and intelligent systems can be integrated for various applications expected to play an important role in the future. Especially, the miniaturized medical device that can be implanted inside a human body for therapeutics, brain research, and neuromodulation is the main application area. We are also interested in wearable devices which are expected to be the next generation mobile devices, and ultra low power wireless sensor nodes which are key to the implementation of the internet of things.

■ **Recommended courses & Career after graduation**

Courses on circuit and system design as well as wireless communication are recommended, which include circuit theory, electronic circuits, analog electronic circuits, digital electronic circuits, digital systems, digital signal processing, communication engineering, and radio engineering. After graduation, your career can be furthered at a variety of domestic and foreign companies, research institutes, or universities related to integrated circuit and microsystem design as well as research and development in the application areas of IoT, wearables, and medical devices.

■ **Introduction to other activities besides research**

The IMPACT lab. is fairly new in that we started in 2016 at KAIST. Therefore, the members can make an important contribution in forming the culture of the laboratory. The best possible support will be provided to create an environment in which the members can engage in research with pleasant passion, voluntary commitment, and open exchange, based on strong mutual trust. A variety of non-research activities are also being created in line with this.

■ **Introduction to the Lab.**

We are not just targeting to develop new circuit design techniques, but to create substantial achievement that can greatly affect our future lives, by working together with experts from diverse fields including sensor, energy, communication, packaging, as well as medical devices and IT applications through an international collaborative research network.

■ **Recent research achievements (2022-2023)**

[1] "A Process-Scalable Ultra-Low-Voltage Sleep Timer With a Time-Domain Amplifier and a Switch-Less Resistance Multiplier," IEEE Journal of Solid-State Circuits (JSSC), 2023.

[2] "A 2.5mW 12MHz-BW 69dB SNDR Passive Bandpass Delta-Sigma ADC with Highpass Noise-Shaping SAR Quantizers," IEEE Symposium on VLSI Circuits (SOVC), 2023.

[3] "A 187dB FoMS 46fJ/Conv. 2nd-order Highpass Delta-Sigma Capacitance-to Digital Converter," IEEE Symposium on VLSI Circuits (SOVC), 2023.

[4] "A High-Efficiency Single-Mode Dual-Path Buck-Boost Converter With Reduced Inductor Current," IEEE Journal of Solid-State Circuits (JSSC), 2023.

[5] "A 600mV$_{PP}$-Input-Range 94.5dB-SNDR NS-SAR-Nested DSM with 4th-Order Truncation-Error Shaping and Input-Impedance Boosting for Biosignal Acquisition," IEEE Symposium on VLSI Circuits (SOVC), 2022.

<Professor Byung Jin Cho's Lab.>

NAND
Nanoelectronic And Neuromorphic Device Lab

■ **Contact information**

Professor : Cho, Byung Jin TEL : 042-350-3485

Lab. : pyk0808@kaist.ac.kr TEL : 042-350-5485

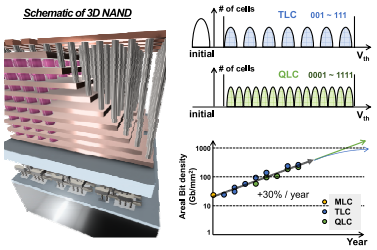
Website : https://nand.kaist.ac.kr/

■ **Current state of the Lab. (in 2023 Fall Semester)**

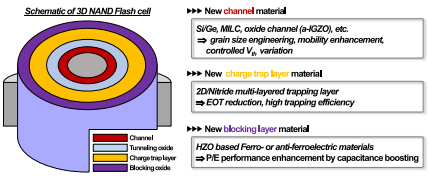
Postdoctoral Fellows : 0 PhD Students: 6 Master's Student: 9

■ **Research Areas**

3D NAND Flash

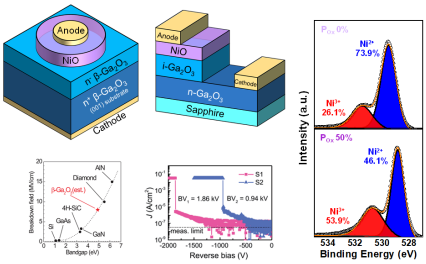


The rapid evolution of high-tech industry, including artificial intelligence, big data, autonomous driving, and cloud computing, is anticipated to drive a consistent demand for memory semiconductors, especially for **3D NAND technology**.



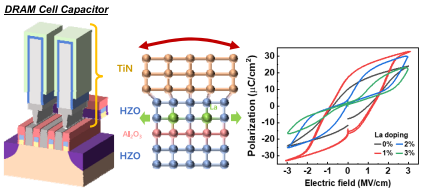
To maintain a leading position in the ever-competitive arena of 3D NAND technology, our laboratory actively has been researching for the next-generation **charge trap flash (CTF) technology**. This research area includes high-mobility channel materials, low-k interlayer dielectric (ILD), novel charge trap layer (CTL), new blocking layer and innovative cell structure.

Oxide semiconductor based device (Thyristor, Photodetectors)

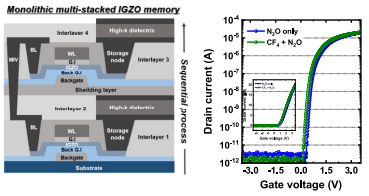


As Si-based devices has been facing various limitations, oxide semiconductors which can change the game of the semiconductor industry are emerging. Nickel oxide and Gallium oxide, which are type of oxide semiconductors featuring wide bandgap (WBG) characteristics, are getting attention as advanced channel materials for power devices, specifically **thyristor,** due to their capability of withstanding ultra-high voltage/current. In addition, oxide semiconductors can be used as optical devices (**photodetectors**) for detecting UV light with excellent photo-responsivity. Our laboratory are actively working on fabricating and developing power devices (thyristors) and photodetectors based on NiO, Ga_2O_3.

DRAM



Performance improvement of **DRAM cell capacitor** with conventional materials has reached its limit and people are seeking for new materials with high-k value and better leakage characteristic. Our research group is studying various methods to achieve the better performances utilizing ALD-$Hf_xZr_{1-x}O_2$ dielectrics for superior DRAM cell capacitor.



At the same time, to lead the low-power and high density 3D DRAM, we are researching the possibility of **Monolithic multi stacked 3D DRAM** with oxide semiconductor (e.g. IGZO) for the new channel material.

■ **Recommended courses & Career after graduation**

Our lab strongly recommends freshmen to take following courses: [EE211] Introduction to Physical Electronics, [EE362] Semiconductor Devices, [EE463] Semiconductor IC Technology, and so on. After graduation, graduates start their careers in domestic or foreign semiconductor companies (Samsung Electronics, SK Hynix, Lam Research, etc), research institutes, universities, and so on.

■ **Introduction to other activities besides research**

As COVID-19 calms down, outdoor sports (soccer and basketball) are held once a week to improve physical strength. Also, we are harmonizing the lab by holding a regular activities (spring picnic or winter MT) every year.

■ **Introduction to the Lab.**

Our lab has world-class experience and various know-hows on traditional memory devices **(NAND and DRAM)** and advanced semiconductor devices **(Monolithic 3D and Oxide semiconductor based devices)**. Currently we are running 8 main projects funded by Samsung, SK hynix, and government agencies. Our research group published **293 journals** and presented in **354 conferences**. Professor thoroughly guides our research with his deep understanding on CMOS technology. Our lab has open and friendly atmosphere that students make interactive discussion about their research.

■ **Recent research achievements ('21~'23)**

Major International Conference (one IEDM 2021, one VLSI 2023)

24 SCI papers, 16 conference presentations, 12 patents

<Professor SeongHwan Cho's Lab.>

Cho's Circuits and Systems Laboratory (CCSLAB)

■ **Contact information**

Professor : chosta@kaist.ac.kr TEL : 042-350-3480

Lab. : Nano-Fab Center 304 TEL : 042-879-9926

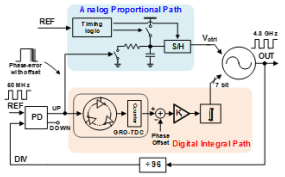
Website : https://ccs.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 11 Master's Student: 4

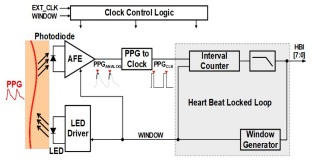
■ **Research Areas**

▷ High Speed Analog Circuits



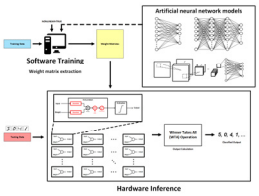
The high speed analog circuits studied in our laboratory include clock generation, memory interface, and wireline transceiver. Representively, PLL is an essential analog and mixed-mode circuit which synthesizes system clock to the desired frequency for communication system. Recently, we are focusing on V-band(40-75GHz) and W-band(75-110GHz) PLLs for RADAR applications.

▷ PVT-invariant Sensors



High performance PVT-invariant sensors are one of our current research interests. In most applications, PVT variation degrades the performance of sensors. To relieve the trade-off between calibration cost and performance, we are currently focusing on developing related techniques for biomedical, environmental and automotive sensors

▷ Machine Learning Processors



Machine learning based on neural network has garnered great interest over the past decade as it has the potential to revolutionize various technologies for commercial and industrial use. In particular, we are interested to implement machine learning processor in analog circuit domain which is effective to achieve low-power and high-speed operation than digital domain.

■ **Recommended courses & Career after graduation**

Students are encouraged to take Circuit Theory, Electronic Circuits, Communication System, Introduction to Physical Electronics and Digital Signal Processing. Alumni are working with international major companies and research institutes such as DGIST, ETH Zurich, KAIST (Faculty), NVidia, Qualcomm, Broadcom, A*STAR, Samsung Electronics, Fairchild, MIT, Stanford, Univ. of Michigan, U. C. San Diego, MIT Sloan (MBA), and T. U. Delft.

■ **Introduction to other activities besides research**

We take annual/seasonal events such as strawberry party (spring season), ski camp and workshop to foster friendship. Also, members can have flexible vacation plan during the year to refresh and reinforce their motivation. We offer various opportunities to participate in international conferences.

■ **Introduction to the Lab.**

Our group explores emerging technologies for high-performance communication and interference-tolerant sensors. Research focus is on the design of analog integrated circuits with multiple layers of system abstraction in mind, from algorithms and system architectures to circuit techniques and devices. Our main research area is wireline data interface, CMOS sensors, phase-locked loops (PLL), and low power circuit for machine learning. Recently we are also looking into power management circuit as well as reference generator.

■ **Recent research achievements ('21~'23)**

[1] J.-O. Seo, M. Seok, S.H. Cho, "ARCHON: A 332.7TOPS/W 5b Variation-Tolerant Analog CNN Processor Featuring Analog Neuronal Computation Unit and Analog Memory" IEEE International Solid-State Circuits Conference (ISSCC), 2022.

[2] Y. Jung, S. Lee, H. Kim, S.H. Cho, "A Supply-Noise-Induced Jitter-Cancelling Clock Distribution Network for LPDDR5 Mobile DRAM featuring a 2nd-order Adaptive Filter" IEEE International Solid-State Circuits Conference (ISSCC), 2022.

[3] N. Koo, H. Kim, and S.H. Cho. "A 43.3uW Biopotential Amplifier With Tolerance to Common-Mode Interference of 18Vpp and T-CMRR of 105 dB in 180-nm CMOS." IEEE Journal of Solid-State Circuits, 2022.

[4] S. Park, J-H. Seol, L. Xu, S.H. Cho, D. Sylvester, and D. Blaauw, "A 43 nW, 32 kHz, A 43 nW, 32 kHz, ±4.2 ppm Piecewise Linear Temperature-Compensated Crystal Oscillator With ΔΣ-Modulated Load Capacitance", IEEE J. Solid-State Circuits, vol. 57, no. 4, 2022.

⟨Professor Kyung Cheol Choi⟩

Advanced Display and Nano Convergence Laboratory

■ Contact information

Professor	Email: kyungcc@kaist.ac.k	Tel: 042-350-3482
Lab.	Device Innovation Facility (E3-3)	Tel: 042-350-5482
Website	http://adnc.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 2 PhD Students: 13 Master's Student: 7

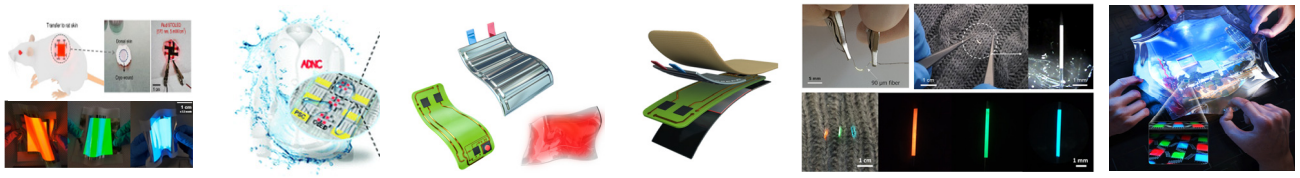
■ Research Areas

▶ **Transparent and Flexible display –** Fundamental researches on encapsulation, electrodes, and out-coupling enhancement methods applicable to transparent and flexible OLED displays.

▶ **Wearable and Stretchable display –** Various researches on display devices fabricated on textiles, such as fabric and fiber, used for truly wearable (wearing) and stretchable OLEDs are going on in the ADNC lab. Wearing textile displays are clothing-like wearable devices that can be used for fashion displays, IoT devices, and photo-therapeutic patches. Stretchable displays are beyond the curved and foldable displays and a strong candidate for future displays.

▶ **Bio and Medical applications (Photo-therapeutic by using display devices) -** Research on photo-therapeutic and cell & animal experiments (in-vitro & in-vivo) by using display devices used for medical tools, health-care is going on

▶ **Nanotechnology and nano-covergence –** New innovative technologies such as active metaphotonic color-imaging devices, oxide TFTs are also going on in ADNC Lab.



■ Recommended courses & Career after graduation

The lecture titled 'Display engineering' is recommended. A total of 54 people (as Ph.D. 35, M.S. 19) graduated from ADNC Lab. are working in university, corporations, and national institutes as professors and research engineers.

■ Introduction to other activities besides research

ADNC lab emphasizes team-work through various sports activities such as footsal, basketball, hiking and etc.

■ Introduction to the Lab.

The ADNC lab conducts research on future technology of display devices. Until now, we have published 204 SCI papers, delivered 236 presentations in conferences, and filed 119 patents. ADNC lab had led the Center for Advanced Flexible Display Convergence (CAFDC), an 'Advanced Research Center Program' of the National Research Foundation of Korea (NRF) from 2007 to 2016. Since 2017, Our lab has been in charge of the important part in "Attachable Photo Therapeutics Center for e-Healthcare", a new Engineering Research Center (ERC) of NRF, which is funded until 2024. Professor Kyung Cheol Choi has been in charge of the LG Display-KAIST cooperation center from 2010 until now, and our laboratory hence has many opportunities for industry-academia cooperation with LG Display. From previous research on the world's most efficient PDP to current research on textile-based washable optoelectronic modules, we have reported numerous excellent results and have attracted attention from worldwide industries and various media. Students interested in future technologies should take note of our lab.

■ Recent research achievements (2021-2023)

21 SCI papers, 32 presentations in conference, 24 patents applied for or registered.

[Representative Journal papers]

- **[Front Cover]** Highly Air-stable, Flexible, and Water-resistive 2D Titanium Carbide MXene-based RGB Organic Light Emitting Diode Displays for Transparent Free-form Electronics (ACS nano IF: 18.027, 2023)
- **[Frontispiece]** Wearable Photomedicine for Neonatal Jaundice Treatment using Blue Organic Light-Emitting Diodes (OLEDs): Toward Textile-based Wearable Phototherapeutics (*Advanced Science* IF: 17.52, 2022)
- **[Inside Front Cover]** High-Performance and Reliable White Organic Light-Emitting Fibers for Truly Wearable Textile Displays (*Advanced Science* IF: 17.52, 2022)
- **[Front Cover]** Bright-Multicolor, Highly Efficient, and Addressable Phosphorescent Organic Light-Emitting Fibers: Toward W□earable Textile Information Displays, (*Advanced Functional Materials* IF: 19.98, 2021)

⟨Professor Sung-Yool Choi's Lab.⟩

QMDL
QUANTUM MATERIALS & DEVICES LAB

■ Contact information

Professor : KI Building (E4) C413
Lab. : School of Electrical Engineering (E3-2) 5232
KI Building (E4) C418

Professor	**Email:** sungyool.choi@kaist.ac.kr	**Tel:** 042-350-7427
Lab.	**Email:** mingu5067@kaist.ac.kr	**Tel:** 042-350-7627
Website	qmdl.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Research Professor: 1 Postdoctoral Fellows : 0 PhD Students: 7 Master's Student: 12

■ Research Areas

▸ Synthesis of 2D Material and Process Development

- Our lab possesses various skills for the synthesis of metallic graphene, semiconducting TMDs (transition metal dichalcogenides) such as MoS_2, and insulating hexagonal boron nitride
- Besides conventional CVD processes, novel synthetic approaches such as MOCVD (metal organic chemical vapor deposition), and ALD (atomic layer deposition) have been studied to overcome the existing process limitations.
- Development of novel 2D material process techniques such as doping, defect healing and transfer
- Additionally, various materials synthesis and engineering methods using IPL (intense pulsed light) are being developed.

▸ 2D Materials Applications

- Research on applications based on materials growth, processes, and device fabrications of 2D materials
- Graphene based electrodes for transparent electrodes and doping techniques for luminance efficiency improvement using atomically thin and high electron mobility of graphene
- Utilization of 2D semiconducting materials for TFT array channels in backplane for displays
- Development of low-power integrated circuits based on 2D materials
- Optical devices using various bandgap 2D materials for sensor applications

▸ Neuromorphic and Memristor Devices

- Study of novel memristor devices for memory and logic applications
- Research on next generation computing enabling in-memory-computing
- Development of memristor-based synaptic devices for neuromorphic computing
- Materials and structural engineering to improve the performance of memristors as artificial synapses
- With various memristors, device-to-system simulation performed for artificial neural network

■ Recommended courses & Career after graduation

We encourage you to take following courses.

- Introduction to Physical Electronics (EE211)
- Semiconductor Devices (EE362)
- Semiconductor IC Technology (EE463)

QMDL alumni are studying abroad, working for a research institute or semiconductor companies such as Samsung Electronics and SK Hynix.

■ Introduction of other activities besides research

We take a coffee break after lunch in a daily routine, and play team sports such as futsal and basketball once in a week. Also, once a semester, we invited alumni to introduce their research and conduct workshops. Besides, a lot of chances are provided to attend domestic and international conferences. As annual events, we have a strawberry party in April and year-end party in December.

■ Introduction of the Lab.

Quantum Materials and Devices Lab (QMDL) is focusing on the molecular-scale materials and devices for the next-generation IT-ET-BT convergence technology, spanning the electronics and photonics applications. Our vision of research is "**creative researches to change the world**". All research members can choose creative research topics based on the above-mentioned topics considering students' opinions. Freedom of time management is guaranteed for self-regulating and creative researches. Especially, **QMDL is mainly supervising GRC (Graphene/2D Materials Research Center), CAMD^3 (Center for Advanced Materials Discovery towards 3D Display), and KAIST-Hansol Center for Advanced Materials and Devices.** Individual member can have opportunities to perform in-depth study by cooperating with other members to achieve outstanding performance.

KAIST GRC 그래핀/2D소재 연구센터
GRC (Since 2012)

KAIST CAMD^3 디스플레이 미래소재 연구센터
CAMD^3 (Since 2016)

KAIST-Hansol Center (Since 2022)

■ Recent research achievements ('20~'23)

2D Material Synthesis & Process Development

1. Adv. Mater. Interfaces. 10, 2300135 (2023)
2. ACS Appl. Nano. Mater. 6, 8981 (2023)
3. ACS Appl. Mater. Interfaces. 14, 43907 (2022)
4. Chem 8, 1014 (2022) [Front Cover]
5. ACS Appl. Mater. Interfaces 13, 50497 (2021)
6. Adv. Mater. 1907166 (2020)
7. Adv. Sci. 7, 1903318 (2020) [Inside Back Cover]

Electronic & Optoelectronic Devices based on 2D Materials

1. Small. Online Published (2023)
2. ACS Photonics. Online Published (2023)
3. ACS Nano. 17, 9262 (2023)
4. Adv. Electron. Mater. 8, 2101325 (2022)
5. Adv. Mater. Technol. 2100494 (2021)
6. Adv. Mater. Interfaces. 8, 2100599 (2021)
7. Nano Res. 14, 1305 (2021)
8. Adv. Mat. 32, 1907166 (2020)

Neuromorphic and Memristor Devices

1. Small. 19, 2300223 (2023)
2. Mater. Horiz. 10, 2035-2046 (2023)
3. Adv. Mat. 35, 2300023 (2023) [Inside Front Cover]
4. Adv. Intell. Syst. 4, 2200177 (2022)
5. Adv. Intell. Syst. 4, 2200018 (2022) [Front Cover]
6. Sci. Adv. 7(32), eabg8836 (2021)
7. Nanoscale 12, 14301 (2020) [Inside Front Cover]

<Professor Shinhyun Choi's Lab.>

ENTIS (Emerging Nano Technology and Integrated Systems) Lab.

ENTIS

■ Contact information

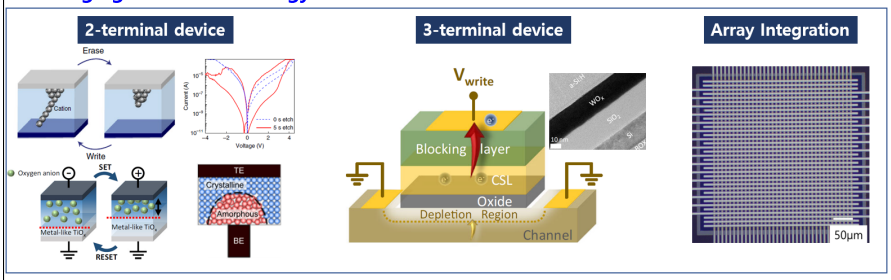
Professor : shinhyun@kaist.ac.kr TEL : +82-42-350-7450
Lab. : E3-2 Room 5235 TEL : +82-42-350-7650
Website : www.shinhyunlab.kaist.ac.kr

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 7 Master's Student: 8

■ Research Areas

<Emerging Nano Technology Device>

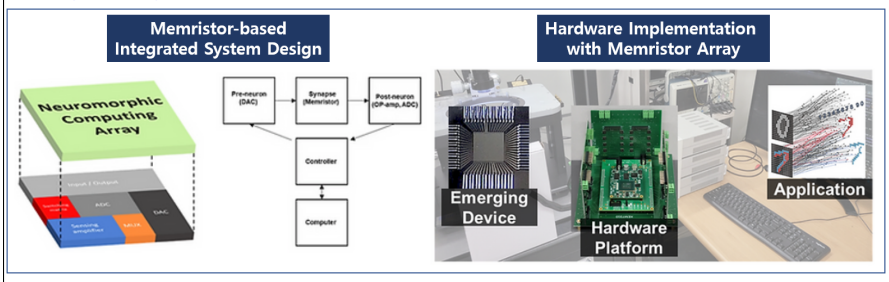


Research team designs, fabricates and evaluates emerging nanoelectronic devices such as

1) 2-terminal devices (RRAM, PCRAM, etc)
2) 3-terminal field-effect transistor (FET)
3) Array Integration of emerging device.

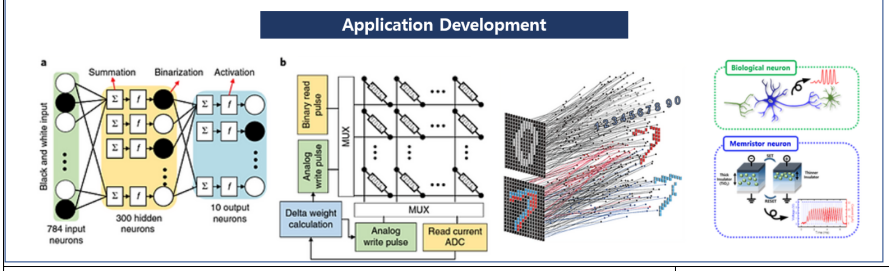
Our devices have garnered attention as possible candidates for various applications, such as neuromorphic computing, new memory technologies and logic devices.

<Integrated Systems Development>



By utilizing emerging device-based computing systems, **our team is working on demonstration of fully integrated systems from artificial neurons to artificial synapses.** Furthermore, we are also working on emerging device-based hardware such as digital/analog peripheral circuits controllers and software development for AI.

<Application Development>



Our team is focusing on **how to accurately implement AI inference and learning with low energy consumption using emerging devices.** Another focus of our team is how to use applications that can be efficient by utilizing our devices about images, sequence data, security, medical diagnosis and etc.

■ Recommended courses & Career after graduation

Major pre-requisites are Semiconductor device physics, Fabrication, and Neural networks. Other students majoring CS and circuit are also welcome. The students can become key members of academia and industry globally.

■ Introduction to other activities besides research

The lab holds annual group parties and joint-workshops for perspective collaboration. We also attend international conferences including MRS, IEDM, Memrisys etc. We also plan to have regular outdoor activities, such as soccer, basketball, hiking and so on (not mandatory).

■ Introduction to the Lab.

The group works on multi-disciplinary research areas including material sciences, device physics, circuits and neural network algorithms. Therefore, our group is able to give students a chance to participate in various fields besides device area. We will have lots of collaboration from Universities and Industries.

■ Recent research achievements ('21~'23)

S. Seo*, B. Kim*, D. Kim*, S. Park*, T. R. Kim, J. Park, H. Jeong, S. Park, T. Park, H. Shin, M. Kim, Y. Choi, and S. Choi, The gate injection-based field-effect synapse transistor with linear conductance update for online training, ***Nature Communications***, 13, 6431 (2022)
S. Park*, H. Jeong*, J. Park*, J. Bae, and S. Choi, Experimental demonstration of highly reliable dynamic memristor for artificial neuron and neuromorphic computing, ***Nature Communications,*** 13, 2888 (2022).
S. Choi*, S. Park*, S. Seo, and S. Choi, Reliable multilevel memristive neuromorphic devices based on amorphous matrix via quasi-1D filament confinement and buffer layer, ***Science Advances***, 8, 3 (2022)
J. Park, Y. Lee, H. Jeong, and S. Choi, Neural Network Physically Unclonable Function: A Trainable Physically Unclonable Function System with Unassailability against Deep Learning Attacks Using Memristor Array, ***Advanced Intelligent Systems,*** 3 (11) , 210011 (2021)

〈Professor Yang-Kyu Choi 〉

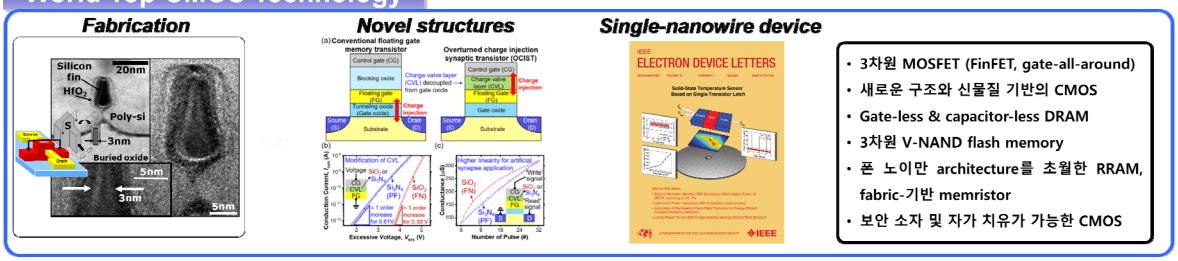
Nano-Oriented Bio-Electronics Lab

■ **Contact information**

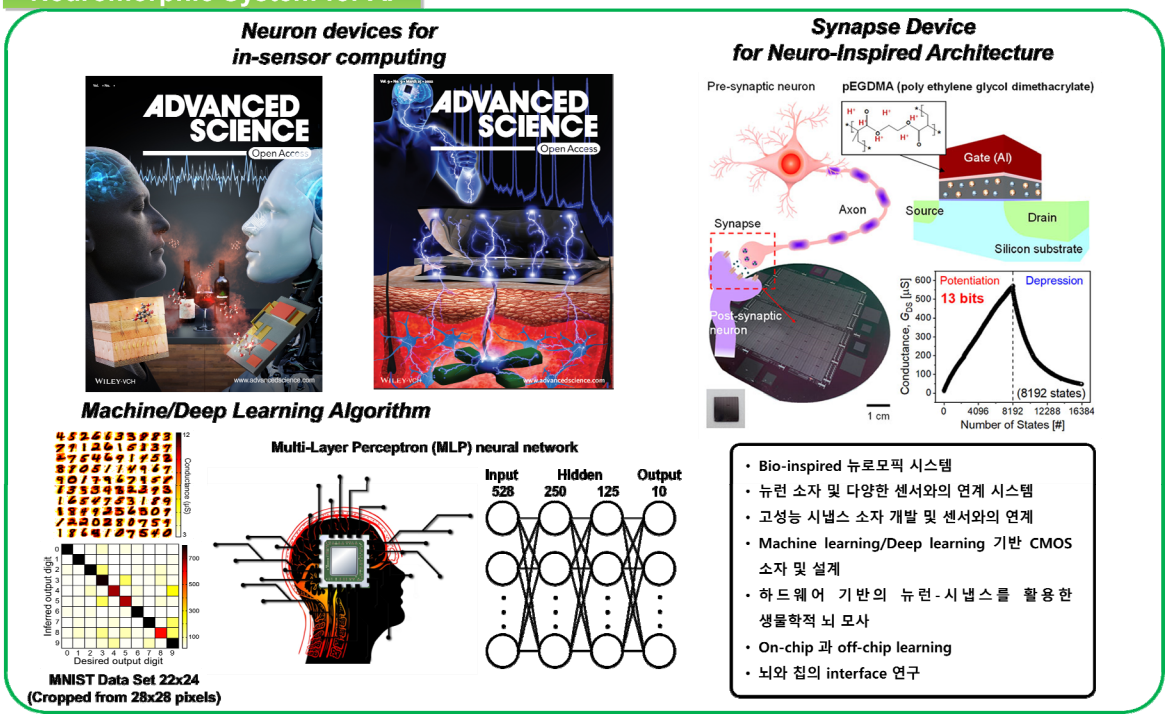
Professor	**Email: yangkyu@kaist.ac.kr**	**Tel: 042-350-3477**
Lab.	**Email: xodidth@kaist.ac.kr**	**Tel: 042-350-5477**
Website	**https://sites.google.com/view/nobelab/home**	

■ **Current state of the Lab. (in 2023 Fall Semester)** - PhD Students: 9 Master's Student: 9

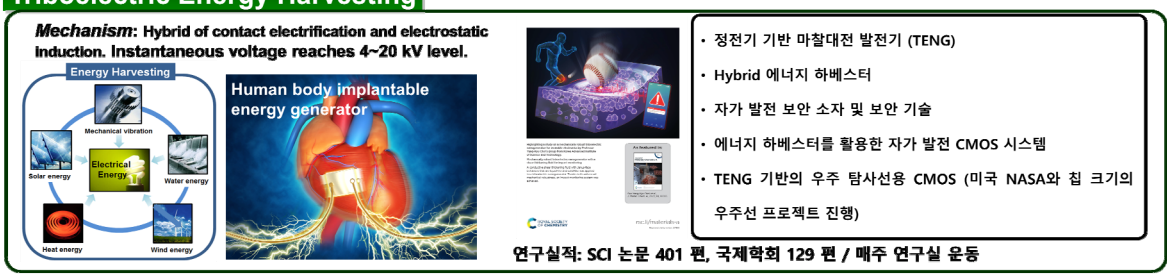
World Top CMOS Technology



Neuromorphic System for AI



Triboelectric Energy Harvesting



■ **Recommended courses & Career after graduation**

NASA (3), SK Hynix (14), Samsung electronics (29), Professor (11), KIST (1), Intel (2), ETC.

■ **Introduction to the Lab.** Our laboratory have friendly atmosphere with high-quality research facilities and know-hows. Students have various research field, and we try to think more creatively with deep, enthusiastic discussions.

■ **Recent research achievements (2021-2023)**

Four cover images, 60 SCI papers including high-impact journals (Science advances, etc.)

Our research were frequently highlighted in YTN Science, KBS, Etc.

<Professor Jung-Woo Choi's Lab.>

Smart Sound Systems Lab

■ **Contact information**

Professor : jwoo@kaist.ac.kr TEL : 042-350-7435
Lab.: N24 LG Innovation Hall 2103 TEL : 042-350-7535
Website : https://sound.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 0 PhD Students: 6 Master's Student: 3

■ **Research Areas**

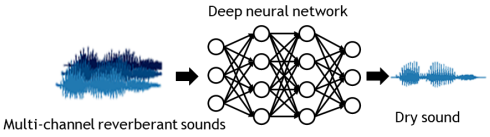
Smart Sound System Laboratory pursues **better understanding** and **rendering of spatial audio** through **AI-based technologies** and **audio signal processing**. We study audio signal processing, AI-based audio scene analysis, diagnosis, and audio generation models to realize truly immersive audio experience. Our research topics cover Metaverse Audio (virtual reality, augmented reality, extended reality audio), and Auditory Information Analysis such as Speech Enhancement and Separation, Direction-of-Arrival estimation, Room Impulse Response estimation, Room Geometry Inference. Sound-based Anomaly Detection and Fault Diagnosis is another major research topic in our Lab.

[Highlights]
- SOTA in DNN-based Multichannel Speech Enhancement [DeFTAN-II]
- 7th place, in 2023 DCASE Sound Event Detection & Localization
- Inventor of Personal Audio Technology for Automotive Vehicles

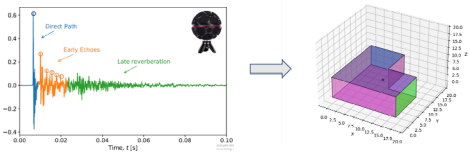
[Theories]
- Audio signal processing, Multichannel signal processing
- Sound propagation, Spatial perception of sound
- Anomaly detection, out-of-distribution detection

[Applications]
- Audio Metaverse, Audio AR/VR/XR
- Speech Enhancement and Separation, DoA Estimation using DNN
- Sound-based Environmental Parameter Generation and Estimation
- Beamforming, Sound Source Localization
- Intelligent Audio System with Environmental Awareness
- Machine Anomaly Detection and Fault Diagnosis with AI

<Metaverse Audio Recording>



<Audio & Speech Signal Processing using AI>



<Room shape inference from sound>

■ **Recommended courses & Career after graduation**

We recommend signal processing based courses (Signals and systems / DSP), Deep learning-related courses. After graduation, you can further develop your career in IT companies & research centers, as well as sound & vibration control industries (such as Samsung Research, ETRI, Naver, Gaudio). You can also work in a wide range of fields, including Electric / Defense science, etc.

■ **Introduction to other activities besides research**

Lab members frequently engage in yoga, ping-pong matches, and learning musical instruments. Through the organization of yearly membership training workshops and field trips, we actively facilitate the cultivation of camaraderie among members. Our laboratory fosters a regulation-free environment, striving to empower our members' creativity and self-motivation.

■ **Introduction to the Lab.**

The field of intelligent audio signal processing is a multidisciplinary field that enables the blending of signal processing technologies with machine-learning approaches, sound propagation theories, and insights into human sound perception. The driving force of the lab is the spirit of embracing challenges to explore new ideas guided by a profound intuition for signal processing. Collaborative research on top-notch immersive audio technology is underway, with the support of consistent funding, in partnership with KISTI, ETRI, and Samsung Electronics.

■ **Recent research achievements ('21~'23) (visit sound.kaist.ac.kr for full list of publications)**

- J-W. Choi, and F. Zotter, "Six degrees-of-freedom room impulse response dataset measured over a dense loudspeaker grid (6DRIR-DL)," AES International Conference on Spatial and Immersive Audio, Huddersfield, Aug. 2023.
- D. Lee, and J-W. Choi, "DeFT-AN: Dense Frequency-Time Attentive Network for Multichannel Speech Enhancement," IEEE Signal Processing Letters, vol.30, pp.155 - 159, Feb. 2023.
- Y. Shul, W. Yi, J. Choi, D-S. Kang, and J-W. Choi, "Noise-based self-supervised anomaly detection in washing machines using a deep neural network with operational information," Mechanical Systems and Signal Processing, vol.189, Apr. 2023.

<Professor Junil Choi's Lab.>

Prof. Junil Choi **Intelligent Communication Systems Lab.**	■ **Contact information** Professor : junil@kaist.ac.kr TEL : Lab. : TEL : 350-7560 Website : icl.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

Postdoctoral Fellows : 1 PhD Students: 15 Master's Student: 5

■ **Research Areas**

[MmWave Massive MIMO] Millimeter-wave (mmWave) massive multiple-input multiple-output (MIMO) refers to wireless communication systems that exploit carrier frequencies around 30~300 GHz spectra with a large number of antennas at transceivers. The widespread use of millimeter wave (mmWave) communications makes it possible to deploy a large number of antennas in a small form factor, which has popularized the use of massive MIMO in 5G and future wireless communications.

[Distributed Reception] In the IoT environment, devices could be used as distributed transmit and/or receive entities allowing massive distributed multiple-input multiple-output (MIMO) systems to be implemented. Potentially, a large number of built-in sensors in a home, used to monitor the environment or actuate devices such as bulbs or locks, could be exploited as transmit/receive entities to support data transmission by smartphones or laptops. By employing low-cost and low-power-consumption but a massive amount of distributed sensors, distributed reception enables reliable data communications as centralized systems do.

[Vehicular Communication] As driving becomes more automated, vehicles are being equipped with more sensors generating even higher data rates. Radars (RAdio Detection and Ranging) are used for object detection, visual cameras as virtual mirrors, and LIDARs (LIght Detection and Ranging) for generating high resolution depth associated range maps, all to enhance the safety and efficiency of driving. Connected vehicles can use wireless communication to exchange sensor data, allowing them to enlarge their sensing range and improve automated driving functions.

[Intelligent Reflecting Surface] Intelligent reflecting surface (IRS) is a large 2D surface of metamaterial, which is composed of passive scattering elements. Each element can be controlled to change the electromagnetic properties such as phase shift of the reflection of incident signals to make better communication channels. As millimeter wave (mmWave) communication systems are becoming the standard in 5G and future wireless communications, the role of IRS is expected to grow even more as mmWave communications suffers from high propagation path loss and blockage.

[ML-based Communication] Machine learning (ML)-based communication systems are a promising technology for 5G and beyond wireless communication systems. As the structure of wireless communication systems is becoming more complex, designing optimal channel estimators and symbol detectors is extremely challenging,. Surprisingly, it has been shown that a deep neural network (DNN), e.g., deep convolutional neural network (CNN) or multi-layer perceptron (MLP), can achieve nearly optimal channel estimation and symbol detection performance. Also, wireless communications-based ML framework introduces various interesting systems that differ from the conventional systems, such as over-the-air federated learning systems. To make ML-based communication systems practical, however, the large training overhead and overfitting must be resolved, which require extensive research efforts.

■ **Recommended courses & Career after graduation**

-[MAS] Introduction to Algebra, [EE210] Probability Introductory Random Process, [EE202] Signal and System, [EE321] Communication Engineering

- Qualcomm, Samsung, ETRI, etc.

■ **Introduction to other activities besides research**

Please visit our website(icl.kaist.ac.kr), where our various activities including are posted.

■ **Introduction to the Lab.**

Our laboratory aims to design state-of-art communication techniques related to 5G/6G communication systems. Specifically, our research interest is in the physical layer design, which needs mathematical analysis and simulation experiments. Including the research areas written above, our current interest expands to the satellite communications and THz communications. Our professor Junil Choi is always willing to support the student's research, and our members are happy to involve with other studies in the Lab. If you have any interest with our Lab., please contact us.

■ **Recent research achievements ('21~'23)**

26 journal papers and 12 conference papers are accepted or published.

Professor Junil Choi received two IEEE journal paper awards. (IEEE VTS, 2021/2022)

Students received multiple awards in various societies.

<Professor Jinseok Choi's Lab.>

SIC-X LAB.
Signal, Information, and Communications for everything

Signal, Information, and Communications for everything Lab.

■ Contact information

Professor : N1-615 TEL : 042-350-7473
Lab. : N1-618 TEL :
Website : https://sic-x.kaist.ac.kr/

■ Current state of the Lab. (in 2023 Fall Semester): PhD Students: 2 Master's Student: 3 Interns: 2

PROFESSOR

Prof. Jinseok Choi

Office : KAIST Bldg. N1, Rm. 615
Email : jinseok@kaist.ac.kr
Website : https://sic-x.kaist.ac.kr/professor
Education :
Ph.D., The University of Texas at Austin, Austin, TX, USA in 2019
M.S., The University of Texas at Austin, Austin, TX, USA in 2016
B.S., Yonsei University, Seoul, Korea in 2014
Experience :
Korea Advanced Institute of Science and Technology (KAIST), Feb. 2023 – present
– Assistant Professor, Electrical and Computer Engineering, KAIST, Daejeon, Republic of Korea
Ulsan National Institute of Science and Technology (UNIST), Oct. 2020 – Feb. 2023
– Assistant Professor, Electrical and Computer Engineering, UNIST, Ulsan, Republic of Korea
Qualcomm Technologies Inc., Nov. 2019 – Sep. 2020
– Senior System Engineer, Qualcomm Wireless R&D, San Diego, CA, USA

MEMBERS


Mintaek Oh


Eunsung Choi


Seokjun Park


Seunghyeong Yoo

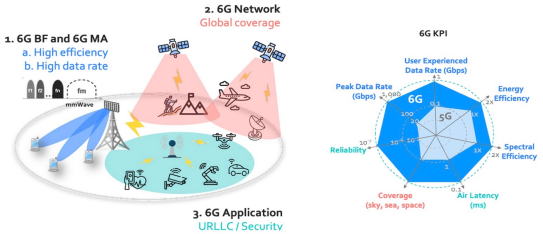

Sangmin Lee


Sungyu Kim

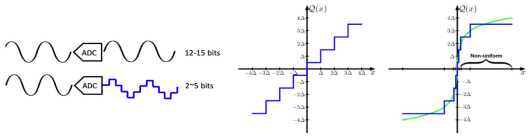

Jiwon Sung

■ Research Areas

BEYOND 5G & 6G COMMUNICATIONS

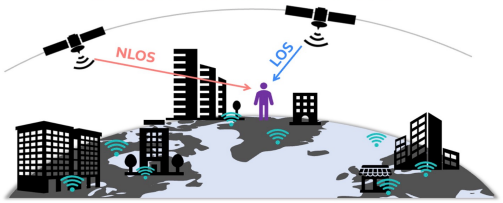


ENERGY EFFICIENT COMMUNICATIONS



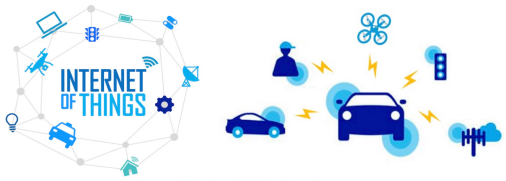
- Low-resolution ADC/DAC Communications
- Energy Efficient Beamforming Technique

SATELLITE COMMUNICATIONS



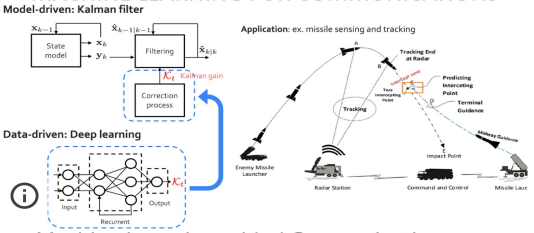
- Low-Earth Orbit Satellite Communication Analysis
- Satellite Physical Layer Security

IoT COMMUNICATIONS



- New Multiple Access
- Ultra low-latency Communication
- Secure Transmission

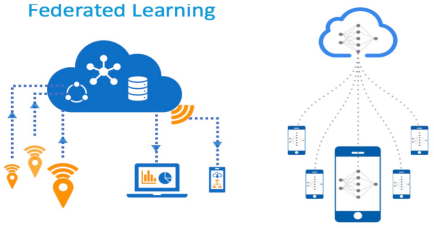
MACHINE LEARNING FOR COMMUNICATIONS



- Machine Learning-aided Communications
- Model-driven Machine Learning

COMMUNICATION FOR MACHINE LEARNING

Federated Learning



- Communications for Federated Learning

■ Recommended courses & Career after graduation

- Linear algebra, Probability, Information theory, Communications, Optimization, Machine learning
- Academia (faculty), Qualcomm, ETRI, ADD, KRIT, Samsung Research, SK, KT, etc.

■ Introduction to other activities besides research

- International and domestic conference participation
- Regular dining out
- Athletic Competition (Planned)

■ Introduction to the Lab.

Our lab is **Signal, Information, and Communications Lab.** Our primary research interest is to develop and analyze future wireless systems (beyond 5G and 6G) with information/communication theory, signal processing, and machine learning. Our current research directions include, but not limited to :
energy efficient MIMO system design, information security, IoT, next generation multiple access, and machine learning for wireless communications.

■ Recent research achievements ('21~'23)

14 Top Journal Papers and **11 Flagship Conference Papers**

<Professor Jeongseok Ha's Lab.>

CoCoA

Coding and Communications Lab

■ **Contact information**
Professor : **Email** jsha@kaist.edu **TEL** 042-350-7424
Lab : **Email** welcome2cocoa@kaist.ac.kr
Tel 042-350-7524
Website : http://cocoa.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**
Postdoctoral Fellows : 2 PhD Students: 10 Master's Student: 4

■ **Research Areas**

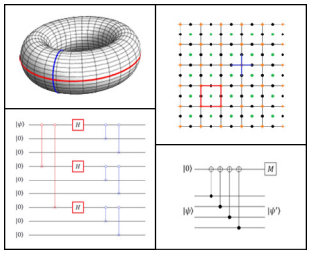
- **Error-Correction-Codes with Machine Learning for 6G Communication Systems and Data Storage**

Error-correction codes (ECCs) protect information from noisy environments. ECCs are an essential part of digital communications and are used in countless real-world applications. CoCoA Lab studies theoretical aspects of advanced ECCs like low-density-parity-check and polar codes. Recently, we are developing smart ECC solutions for data-centric computing devices and 6G wireless, optical, and space communication systems under the support of LG electronics, Electronics and Telecommunications Research Institute (ETRI), Institute of Information & communications Technology Planning & evaluation (IITP), and the National Research Foundation (NRF) of Korea.

- **Wireless Communications with Machine Learning for 6G Communication Systems**

CoCoA Lab is studying innovative machine-learning-based solutions for the 6th generation of wireless systems. In particular, we have been investigating wireless communication for 6G communication systems, including Low Earth Orbit (LEO) satellite communication systems, covert communication systems, Non-orthogonal multiple access (NOMA), and cell-free massive Multiple-input and multiple-output (MIMO) systems. Additionally, we have conducted research in the field of secure communication, with a particular emphasis on physical layer security: a promising secure communication scheme that doesn't rely on encryption. Our research is supported by the Korea Research Institute for defense Technology planning and advancement (KRIT) and the NRF.

- **Quantum Computing for Artificial Intelligence**



Artificial Intelligence (AI) is advancing rapidly, but it is expected to encounter limitations due to the slow growth of computing power. To solve this problem, quantum computers have been extensively studied. CoCoA Lab conducts research on quantum communication, information theory, as well as quantum-error-correction codes that are essential techniques for realizing quantum computers. We are currently working with Quantum Computing for AI Center supported by the Information Technology Research Center (ITRC), and NRF.

■ **Recommended courses & Career after graduation**
Recommended courses include introduction to information theory and coding, communication engineering, and basic probabilities. Graduates of CoCoA Lab have excelled in schools and leading information technology companies such as Samsung Electronics, LG CTO, SK-Hynix, etc.

■ **Introduction to other activities besides research**
CoCoA Lab regularly conducts social activities in addition to research activities. Strawberry festivals, sports, and various other activities are organized to unite members of CoCoA Lab.

■ **Introduction to the Lab.**
CoCoA Lab, led by Prof. Jeongseok Ha, seeks to develop theories and applications of state-of-the-art error-correcting codes and wireless communications. Our research interests include machine learning-based smart error-correcting codes, wireless communication systems, and quantum communication. Research is supported by various institutes and companies such as LG Electronics, ETRI, NRF, ITRC, IITP, and KRIT. CoCoA has a very friendly lab atmosphere and we welcome everyone interested in our research topics.

■ **Recent research achievements ('21~'23)**
International Journals: 9, International Conferences: 4, International Patents: 2, Domestic Patents: 7

[1] J. Park, H. Yeom, S. Yun and J. Ha, "Downlink Cell-Free Massive MIMO With Pilot Contamination," IEEE Transactions on Vehicular Technology, accepted, 2023
[2] S. Han, J. Oh, K. Oh and J. Ha, "Deep-Learning for Breaking the Trapping Sets in Low-Density Parity-Check Codes," IEEE Transactions on Communications, vol. 70, no. 5, pp. 2909-2923, May 2022.
[3] S. Jeong, H. Jung and J. Ha, "Rate-Compatible MET-LDPC Code Ensembles for CV-QKD Systems," npj Quantum Information 8, 6 (2022)

⟨Professor Dongsu Han⟩

Intelligent Network Architecture and Distributed Systems Lab.	■ Contact information		
	Professor	Email: dhan.ee@kaist.ac.kr	Tel: 7431
	Lab.	Email: inalab@kaist.ac.kr	Tel: 7631
	Website	https://ina.kaist.ac.kr	

■ Current state of the Lab. (in 2023 Fall Semester)

Postdoctoral Fellows : 0 PhD Students: 6 Master's Student: 4

■ Research Areas

With more diverse applications and its requirements, we design/implement (1) the distributed system where such applications can be operated efficiently, and (2) the new possibility created with more interconnected computers.

Cloud infrastructure: Currently, many applications and its infrastructure become more complex with advanced features. This trends will continue as technology advances. Accordingly, we are making network/cloud infrastructure more intelligent.

Why cloud and distributed systems?: Cloud and distributed system is the key to realize computer's infinite possibility. You can reflect your vision into the software technology. New systems create new worlds and the new worlds require new systems. For example, big-data processing system becomes the infrastructure extracting "knowledge" from the raw data such as Google Search. Moreover, you can make current systems more efficient. For example, if mobile OS like Android can predict network performance in real time to show the YouTube video, it can reduce the delay to play the video, which create additional market value.

■ Recent research topics

- **Systems for AI:** Optimizing the use of GPU resources and network bandwidth in hyper-scale training environment
- **AI for Systems:** Microservice auto-scaling study, Accelerate DNA sequencing using the learned index
- **AI + Video:** How will Deep Learning Change Internet Video Delivery? Adaptive streaming + neural super-resolution
- **Cloud computing and Big data processing:** Resource allocation for cloud infrastructure, optimization with Big Data.
- **Internet-scale content distribution:** Software-defined content distribution, QoE inferencing and optimization, diagnosis.
- **Future Internet architecture:** Evolvable congestion control, evolvable service model, incremental deployment over IP.

■ Recommended courses & Career after graduation

We offer comfortable and active environment where you can discuss freely with other people including professor. We strongly recommend and support collaboration with other laboratories and intern experience from the industry. We are trying to establish the environment where each individual's advantage can make grater synergy. We support student's self-improvement, sports activities, extracurricular activities to provide best research environment to the students.

We recommend you to take Computer Networks, Network Programming, System Programming, Operating System, Data Structure, and Discrete Structure courses. You will have ability to design, implement, and manage the new systems required in the future. You will experience a new world with new software systems and introduce them to the public. You will be a great software architect required by many industries and laboratories predicting and leading the new technology trend.

■ Introduction to other activities besides research

We offer comfortable and active environment where you can discuss freely with other people including professor. We strongly recommend and support collaboration with other laboratories and intern experience from the industry. We are trying to establish the environment where each individual's advantage can make grater synergy. We support student's self-improvement, sports activities, extracurricular activities to provide best research environment to the students.

■ Introduction to the Lab.

INA research group pursues innovative ideas in/for Internet services and applications, cloud infrastructure, and systems that support artificial intelligence. We identify and anticipate new problems that arise from the evolution of Internet-/Cloud-based services and the development of new hardware, provide novel solutions for challenging problems in the real-world, design and implement the solutions in a way that reaches out for real-world impact.

■ Recent research achievements (2022-2023)

Top research group at ACM SIGCOMM and USENIX NSDI in Korea (published 13 papers in the past 10 years)

- Co-optimizing for Flow Completion Time in Radio Access Network [CoNEXT 2022]
- NeuroScaler: Neural Video Enhancement at Scale [SIGCOMM 2022]
- TSPipe: Learn from Teacher Faster with Pipelines [ICML 2022]
- BWA-MEME: BWA-MEM emulated with a machine learning approach [BioInformatics 2022]
- AccelIR: Task-aware Image Compression for Accelerating Neural Restoration [CVPR 2023]

<Professor SooJean Han's Lab.>

Autonomous Control of Stochastic Systems (ACSS)

■ **Contact information**

Professor : SooJean Han TEL : 042-350-7474

Lab. : ACSS Mobile : 010-4868-7883

Website : acss.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

*New faculty member as of August 2023.

■ **Research Areas**

control systems, stochastic processes, machine learning

■ **Recommended courses & Career after graduation**

*coding background: Python, MATLAB.

*course background: calculus, ODEs, linear algebra, introductory machine learning, basic probability.

*[Bonus] coding background: C++, ROS, working on GPUs.

*[Bonus] course background: any control theory / control engineering course.

*[Bonus] hardware background: robots/drones, motion capture system.

Bonus backgrounds are not strictly required. Self-motivation and a determination to learn new skills is more important.

■ **Introduction to other activities besides research**

My biggest motivation for being an engineer comes from movies! When I was a kid, I was inspired by the robots in Wall-E, especially EVE.

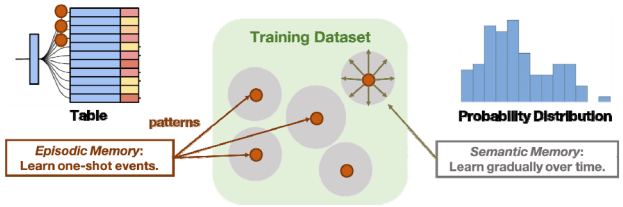
If you want to help me build real-life autonomous systems like EVE, consider joining my lab :)

■ **Introduction to the Lab.**

We develop intelligent and efficient methods for control, estimation, and decision-making of stochastic systems. Our main applications include networked systems: traffic management of unmanned (aerial) vehicles, multi-agent robotics, and distributed sensor networks.

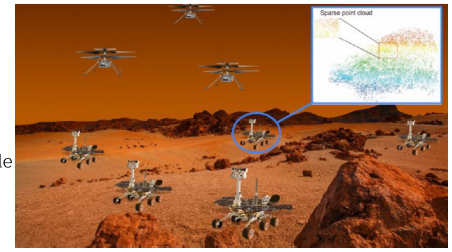
Heterogeneous Memory for Decision-Making.

We study the patterns of a system and design rules to determine what to store in memory and how to store them. By taking inspiration from the human brain, heterogeneous memory structures encode information in a diversity of ways (e.g., semantic versus episodic memory). Applications include autonomous robotic systems, reinforcement learning.



Topology of Multi-Agent Systems.

We design ways to abstract the topology of a complex real-world network into spatial patterns (e.g., tessellations) to achieve faster communication and more optimal resource allocation. Applications include large-scale flow networks: vehicle congestion control, air traffic management and UAV formation-flight.



Distributed Data-Gathering with Feedback.

We take inspiration from the human nervous system to improve distributed data-gathering algorithms: feedback channels are established from the processor to the individual sensors, enabling prediction and redundancy-reduction. Applications include problems where large-scale wireless communication is important: collaborative mapping of an unknown environment, multiagent target-tracking, distributed sensing and decision-making.

■ **Recent research achievements ('21~'23)**

*Han, Chung, Doyle, "Predictive Control of Linear Discrete-Time Markovian Jump Systems by Learning Recurrent Patterns." Automatica, May 2023.

*Han, Chung, Gustafson, "Congestion Control of Vehicle Traffic Networks by Learning Structural and Temporal Patterns." Learning for Dynamics and Control Conference (L4DC), Jun 2023.

*Han, "Optimizing Accuracy and Efficiency in Distributed Data Gathering Architectures with Feedback." Sep 2022.

*Han, Chung, "Incremental Nonlinear Stability Analysis for Stochastic Systems Perturbed by Lévy Noise." International Journal of Robust and Nonlinear Control (IJRNC), Aug 2022.

<For more, please visit personal homepage at soojean.github.io>.

<Professor Hamza Kurt's Lab.>

Metaphotonics Research Laboratory

■ **Contact information**

Professor : hamzakurt@kaist.ac.kr TEL : 010-8465-5506

Lab. : ymyyjh@kaist.ac.kr (윤진형) TEL : 010-2013-9369

Website : https://kurtresearch.com, https://mpl.kaist.ac.kr

■ **Current state of the Lab. (in 2023 Fall Semester)**

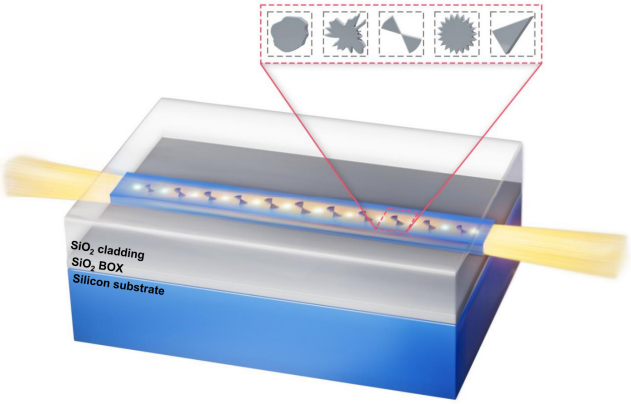
Postdoctoral Fellows : 0 PhD Students: 8 Master's Student: 0 Undergraduate Student: 3

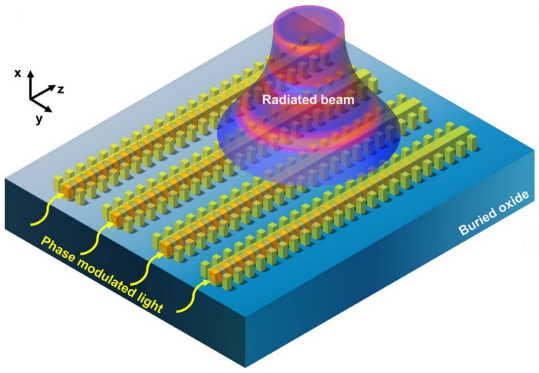
■ **Research Areas**

1. Optical Neural Networks: An optical neural network (ONN) is a physical realization of an artificial neural network with conventional (and usually discrete) optical components. We are interested in implementation of ONN with integrated photonic elements designed by utilizing advanced optimization methods. Processing data all optically in analog domain holds huge potential to alleviate the full potential of machine learning with photonics.

2. Integrated Photonics, Silicon Photonics: Inverse and AI assisted designs and fabrication of nano-photonics and silicon photonic devices. The interaction of light with nanostructures that have variations in the refractive index on the order wavelength or sub-wavelength generates so many rich physical concepts that cannot be easily observed in conventional medium. At this stage, it becomes very crucial to have powerful numerical techniques assisted with AI tools to explore the tremendous novelties of meta-photonics domain for LiDAR and optical computing and programmable photonics applications.

3. Flat optics and meta-surfaces in imaging and display (AR and VR): Recently, meta-surfaces have been identified as promising optical elements in the modulation of the phase, amplitude and polarization of light within a subwavelength thickness. Compared to the bulky, conventional optical elements that use phase accumulation to manipulate light along curved optical paths, two-dimensional meta-surfaces composed of engineerednanostructured antennas arrays allow the realization of the manipulation of light on a flat surface.





■ **Recommended courses & Career after graduation**

Basic level background in "Electromagnetics, Fundamentals of Photonics, and Optics". The academic career is one option. The candidate can also work as a researcher in the R&D departments of private sectors such as Intel, Samsung, Apple, IBM, and Google. There are many examples of such career paths. Interested candidates may contact to the PI and lab representative

■ **Introduction to other activities besides research**

Participation in the international conferences (CLEO, SPIE, IEEE Photonics), being part of the professional societies and their activities (OSA, IEEE), holding social events (hiking, group dining, sport activities), short term scientific visits to our collaborators in different countries (such as US, Spain, Australia).

■ **Introduction to the Lab.**

We conduct fundamental as well as applied research with an interdisciplinary nature covering Engineering and Science. We have published 140 papers in highly prestigious journals. The number of conference proceedings and papers is more than 150.

■ **Recent research achievements ('21~'23) The scientific outcome between 2018-2023 is the publication of total 54 journal articles. Selected articles are given below:**

1. Inverse design of Si-based high-performance vertical emitting metagrating coupler on 220 nm silicon-on-insulator platform," Photonics Research 11 (6), 897-905 (2023).
2. "Experimental demonstration of inverse-designed silicon integrated photonic power splitters," Nanophotonics 11 (20), 4581-4590 (2022).
3. "Curved beam generation and its experimental realization by rectangular prism with asymmetric polynomial back surface," Physica Scripta 98 (1), 015026 (2022).

<Professor Steven Euijong Whang's Lab>

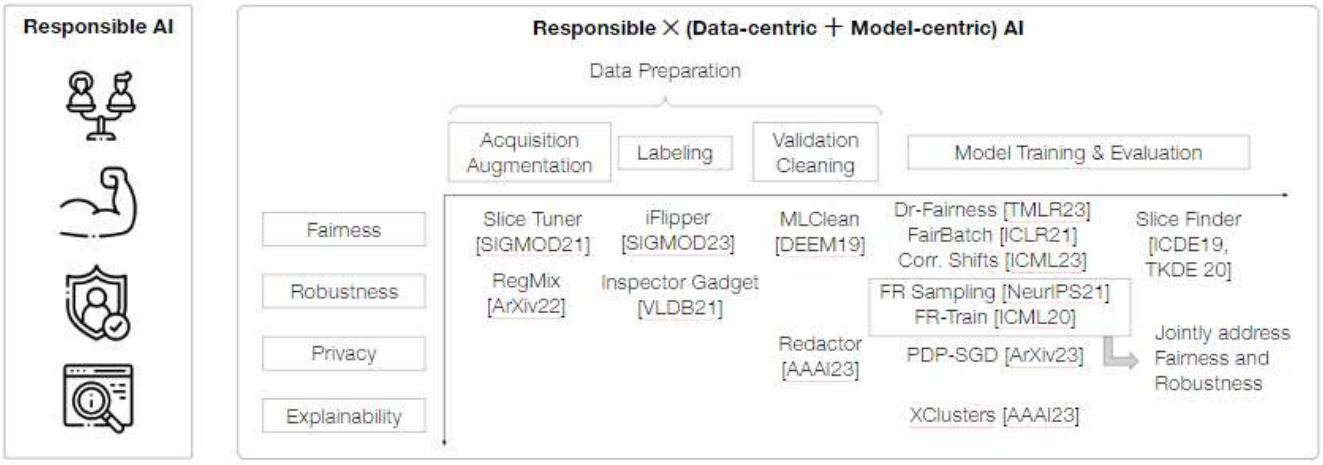
Data Intelligence Lab	■ Contact information	
	Professor	Email: swhang@kaist.ac.kr Tel: 042-350-7443
	Website	https://stevenwhang.com

■ **Current state of the Lab (in 2023 Fall Semester)**

Postdoctoral Fellows: 0 PhD Students: 8 Master's Students: 4

■ **Research Areas**

Software 2.0 is a fundamental shift in software engineering where machine learning is prevalent and data becomes a first-class citizen, on par with code. The goal of the Data Intelligence Lab is to pioneer the inevitable trend of Responsible/Trustworthy AI, Data-centric AI, and Big Data – AI Integration. We are especially interested in solving fairness, robustness, privacy, and explainability challenges in machine learning from the data.



■ **Recommended courses & Career after graduation**

Recommended courses: Discrete mathematics, data structures, algorithms, databases, data mining, probability theory, linear algebra, convex optimization, and machine learning. **Career after graduation:** Students will be trained to be world-class researchers and have career opportunities both in industry and academia.

■ **Introduction to other activities besides research**

Students are encouraged to participate in extracurricular activities. For example, the professor likes swimming and is an alum of the KAIST swimming team KAORI. Our lab will also have regular social events.

■ **Introduction to the Lab**

The Data Intelligence Lab solves important problems in Data-centric AI and Responsible AI. We are funded by Google Research, Microsoft Research, Samsung Electronics, SK Hynix, the National Research Foundation of Korea (AI ERC), and the Institute of Information & communications Technology Planning & Evaluation (IITP) among others. Our lab has 8 PhD and 4 Masters students with internship experiences at Google DeepMind & Youtube and NVIDIA Research.

Steven Euijong Whang is an associate professor at KAIST EE and AI. Previously he was a Research Scientist at Google Research and co-developed the data infrastructure of the TensorFlow Extended (TFX) machine learning platform. Steven received his Ph.D. in computer science in 2012 from Stanford University. He received a Google AI Focused Research Award (2018, the first in Asia) and was a Kwon Oh-Hyun Endowed Chair Professor (2020-2023).

■ **Recent research achievements ('21~'23)**

[1] Y. Roh, K. Lee, S. E. Whang, and C. Suh, "Improving Fair Training under Correlation Shifts", ICML 2023.

[2] H. Zhang, K. Tae, J. Park, X. Chu, and S. E. Whang, "iFlipper: Label Flipping for Individual Fairness", ACM SIGMOD 2023.

[3] G. Heo and S. E. Whang, "Redactor: A Data-centric and Individualized Defense Against Inference Attacks", AAAI 2023.

[4] H. Hwang and S. E. Whang, "XClusters: Explainability-first Clustering", AAAI 2023.

[5] S. E. Whang, Y. Roh, H. Song, and J. Lee, "Data Collection and Quality Challenges in Deep Learning: A Data-Centric AI Perspective", VLDB Journal, 2023.

교과목 이수요건

KAIST

별첨 1 학사과정용 이수요건 양식 (2015학년도이전용)

전기및전자공학부 전공과목 이수요건
(2015학년도 이전 입학생 학사과정용)

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점: 총 130학점 이상 이수**

▣ **(특이사항) 학과 지정 전공·연구 외 이수요건**

❍ 기초선택: 9학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 2과목 이상 이수

※ 복수전공을 선택한 학생은 3학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 1과목 이상 이수

▣ **전공: 53 학점 이상 이수**

◯ 전공필수: 18 학점
- EE305 전자설계및실험, EE405 전자디자인랩, EE201 회로이론, EE202 신호및시스템, EE204 전기자기학, EE209 전자공학을 위한 프로그래밍 구조

◯ 전공선택: 35 학점
- 개별연구는 4학점까지 전공선택으로 인정
- 본과 소속 학생 중 타학과 복수전공/부전공 이수자는 29학점 이수

▣ **부전공: 총 21 학점 이상 이수**

◯ EE201 회로이론, EE202 신호및시스템, EE204 전기자기학, EE303 디지털시스템, EE304 전자회로, EE305 전자설계및실험을 포함하여 전공과목 21학점 이상 이수

※타 학사조직 전공과목과의 9학점까지 중복인정 가능

▣ **복수전공: 총 40 학점 이상 이수**

◯ 전공필수 18 학점을 포함하여 전공과목 40 학점 이상 이수

※타 학사조직 전공과목 최대 9 학점까지 중복인정 가능

▣ **연구: 총 3 학점 이상 이수**

◯ 졸업연구 3학점을 포함하여 이수

◯ 복수전공 이수자는 연구과목 이수를 면제함.

◎ 24주 인턴십 프로그램 <EE Co-op 1> 이수학점중 최대 9학점에 한해 전자디자인랩(3), 졸업연구(3)로 대체 인정 가능하며, 나머지 3학점은 자유선택으로 인정 가능함.
다만, 24주 인턴십 프로그램 <EE Co-op 1> 참여 이전에 전자디자인랩(3), 졸업연구(3) 교과목을 기이수한 경우, 해당 학점을 자유선택 학점으로 인정함.
추가로 <EE Co-op 2>를 이수한 경우, 이수학점중 최대 3학점만 졸업 이수학점으로 인정함.

□ 경과조치

- 2015학년도 이전 입학생은 본인이 희망하는 경우, 2016학년도 이후 입학생 이수요건을 적용받을 수 있다.
- 본 이수요건중 24주 인턴십 프로그램 <EE Co-op 1,2> 학점인정은 모든 재학생에게 적용함.
- 본 이수요건은 2014학년도 입학생부터 적용함. 단, 2013학년도 이전 입학생은 입학년도 이수요건을 따름.
- 2008학년도 이전 입학생은 입학년도 학사요람 전공과목 이수요건을 따름. 단, 아래와 같이 예외조치 사항을 두되, 전공과목 이수학점이 총 47학점 이상 되도록 전공과목을 이수하여야 함.
  - ○ 폐강 조치된 'EE306 디지털 전자설계 및 실험' 과목은 전공필수 이수요건에 제외
  - ○ 폐강 전 'EE306 디지털 전자설계 및 실험' 교과목을 이수한 경우 대체과목인 'EE305 전자설계 및 실험' 과목을 이수한 것으로 인정

- 학번별 전공필수 및 전공선택 이수요건

구분	'2004~2008학년도 입학생	'2009~2013학년도 입학생	'2014~2015학년도 입학생
전공필수	6 EE305 전자공학실험Ⅰ EE405 전자 디자인 랩	18 EE201 회로이론 EE202 신호및시스템 EE204 전기자기학 EE209 전자공학을 위한 프로그래밍 구조 EE305 전자설계및실험 EE405 전자디자인 랩	18 EE201 회로이론 EE202 신호및시스템 EE204 전기자기학 EE209 전자공학을 위한 프로그래밍 구조 EE305 전자설계및실험 EE405 전자디자인 랩
전공선택	41 EE201 회로이론 EE202 신호및시스템 EE203 디지털시스템 EE204 전기자기학Ⅰ EE206 전자회로Ⅰ EE209 전기공학을 위한 프로그래밍 EE301 전자회로Ⅱ EE302 물리전자개론 중 4과목 이상 포함	29	35
연구	EE490 졸업연구	EE490 졸업연구	EE490 졸업연구

※'04학년도 ~ '08학년도 입학생은 전공선택의 밑줄 친 8과목 중 반드시 4과목 이상 수강.

- 위의 경과조치의 적용이 곤란한 경우는 본 학부의 교과위원회의 심의를 거쳐 학부장이 정함.

별첨 2 학사과정용 이수요건 양식 (2016학년도이후용)

전기및전자공학부 전공과목 이수요건
(2016학년도 이후 입학생 학사과정용)

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점: 총 136학점 이상 이수**

※ 전공 이외에 심화전공, 부전공, 복수전공 및 자유융합전공 중에서 반드시 한 가지 이상 선택하여 이수

▣ **(특이사항) 학과 지정 전공·연구 외 이수요건**

❍ 기초선택: 9학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 2과목 이상 이수

※ 복수전공을 선택한 학생은 3학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 1과목 이상 이수

▣ **전공: 총 50 학점 이상 이수**

◯ 전공필수: 18 학점
- EE305 전자설계 및 실험(3), EE405 전자디자인 랩(3), EE201 회로이론(3), EE202 신호 및 시스템(3), EE204 전기자기학(3), EE209 전자공학을 위한 프로그래밍구조(3)

◯ 전공선택: 32 학점
- 개별연구는 4학점까지 전공선택으로 인정

▣ **심화전공: 총 12 학점 이상 이수**

▣ **자유융합전공: 총 12 학점 이상 이수**

◯ 소속학과를 제외하고 2개 이상 학사조직의 전공교과목 중 12학점 이상 이수

▣ **부전공: 총 21 학점 이상 이수**

◯ EE305 전자설계 및 실험을 포함하여 전공필수 12학점 이상 반드시 이수

※타 학사조직 전공과목과의 중복 인정 불가

▣ **복수전공: 총 40 학점 이상 이수**

◯ 전공필수 18 학점을 포함하여 전공과목 40 학점 이상 이수

▣ **연구: 총 3 학점 이상 이수**

◯ 졸업연구 3학점을 포함하여 이수

◯ 복수전공 이수자는 연구과목 이수를 면제함

◎ 24주 인턴십 프로그램 <EE Co-op 1> 이수학점중 최대 9학점에 한해 전자디자인랩(3), 졸업연구(3)로 대체 인정 가능하며, 나머지 3학점은 자유선택으로 인정 가능함.
다만, 24주 인턴십 프로그램 <EE Co-op 1> 참여 이전에 전자디자인랩(3), 졸업연구(3) 교과목을 기이수한 경우, 해당 학점을 자유선택 학점으로 인정함.
추가로 <EE Co-op 2>를 이수한 경우, 이수학점중 최대 3학점만 졸업 이수학점으로 인정함.

□ **경과조치**

-2015학년도 이전 입학생은 본인이 희망하는 경우, 위 이수요건을 적용받을 수 있다.
-본 이수요건중 24주 인턴십 프로그램 <EE Co-op 1,2> 학점인정은 모든 재학생에게 적용함.

별첨 3 학사과정용 이수요건 양식 (2018학년도이후용)

전기및전자공학부 전공과목 이수요건
(2018학년도 이후 입학생 학사과정용)

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ 졸업이수학점: 총 136학점 이상 이수
※ 전공 이외에 심화전공, 부전공, 복수전공 및 자유융합전공 중에서 반드시 한 가지 이상 선택하여 이수

▣ (특이사항) 학과 지정 전공·연구 외 이수요건
❍ 기초선택: 9학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 2과목 이상 이수

※ 복수전공을 선택한 학생은 3학점 이상 이수
- MAS109 선형대수학개론, MAS201 응용미분방정식, MAS202 응용해석학 중 1과목 이상 이수

▣ 전공: 총 50 학점 이상 이수
◯ 전공필수: 15 학점
- EE305 전자설계 및 실험(3), EE405 전자디자인 랩(3) 필수 이수
- EE201 회로이론(3), EE202 신호 및 시스템(3), EE204 전기자기학(3), EE209 전자공학을 위한 프로그래밍구조(3), EE210 확률과 기초확률과정(3), EE211 물리전자개론(3) 중 3과목 선택하여 이수

(전공필수 과목 15학점 초과 이수 시, 초과된 학점은 전공선택 학점으로 인정할 수 있음)

◯ 전공선택: 35 학점
- 개별연구는 4학점까지 전공선택으로 인정

▣ 심화전공: 총 12 학점 이상 이수

▣ 자유융합전공: 총 12 학점 이상 이수
◯ 소속학과를 제외하고 2개 이상 학사조직의 전공교과목 중 12학점 이상 이수

▣ 부전공: 총 21 학점 이상 이수
◯ EE305 전자설계 및 실험을 포함하여 전공필수 12학점 이상 반드시 이수
※타 학사조직 전공과목과의 중복 인정 불가

▣ 복수전공: 총 40 학점 이상 이수
◯ 전공필수 15 학점을 포함하여 전공과목 40 학점 이상 이수

▣ 연구: 총 3 학점 이상 이수
◯ 졸업연구 3학점을 포함하여 이수
◯ 복수전공 이수자는 연구과목 이수를 면제함

◎ 24주 인턴십 프로그램 <EE Co-op 1> 이수학점중 최대 9학점에 한해 전자디자인랩(3), 졸업연구(3)로 대체 인정 가능하며, 나머지 3학점은 자유선택으로 인정 가능함.
다만, 24주 인턴십 프로그램 <EE Co-op 1> 참여 이전에 전자디자인랩(3), 졸업연구(3) 교과목을 기이수한 경우, 해당 학점을 자유선택 학점으로 인정함.
추가로 <EE Co-op 2>를 이수한 경우, 이수학점중 최대 3학점만 졸업 이수학점으로 인정함.

□ 경과조치

- 위 이수요건은 2018학년도 이후 입학생부터 적용한다.
- 2015학년도 이전 입학생은 본인이 희망하는 경우, 위 이수요건을 적용받을 수 있다.
- 본 이수요건중 24주 인턴십 프로그램 <EE Co-op 1,2>학점인정은 모든 재학생에게 적용함.

-학번별 전공과목 이수요건

구분	'2016~2017학년도 입학생	2018학년도 이후 입학생
전공필수	18학점	15학점
	EE201 회로이론 EE202 신호및시스템 EE204 전기자기학 EE209 전자공학을 위한 프로그래밍 구조 EE305 전자설계및실험 EE405 전자디자인 랩	EE305 전자설계및실험 EE405 전자디자인 랩 6학점 필수 이수
		EE201 회로이론 EE202 신호및시스템 EE204 전기자기학 EE209 전자공학을 위한 프로그래밍 구조 EE210 확률과 기초확률 과정 EE211 물리전자개론 중 3과목 선택하여 이수
전공선택	32	35
연구	EE490 졸업연구	EE490 졸업연구

별첨 4 석사과정용 이수요건 양식

전기및전자공학부 전공과목 이수요건
(석사과정용)

논문석사

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점: 총 33 학점 이상 이수**

▣ **공통필수: 3학점 이상 이수**
- ○ 학과 지정 과목: CC500 Scientific Writing, CC510 전산응용개론, CC511 확률 및 통계학, CC512 신소재과학개론, CC513 공업경제 및 원가분석학, CC530 기업가 정신과 경영전략, CC531 특허분석과 발명출원, CC532 협력시스템 설계, CC533 창업가의 리더십 중 택1

▣ **전공필수:** 없음

▣ **선택: 총 21 학점 이상 이수**
- ○ EE509 연구논문작성법 1학점 반드시 이수(외국인 학생인 경우는 선택과목임)
- ○ 본 학과 EE500단위 이상의 교과목 9학점 이상 반드시 이수
- ○ 본 학과 EE400단위 이상 교과목, 타 학과 500단위 이상
  (단, EE400단위 교과목은 반드시 학사·대학원 상호인정 교과목이어야 함)
- ○ 단, 복수학위 학생이 타 대학원에서 취득한 학점을 타학과 500단위 이상으로 인정할 수 있음.

▣ **연구:** 총 6 학점 이상 이수
- ○ 논문연구 4학점 이상, 세미나(석사)는 2학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정

교과석사

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점:** 총 33학점 이상 이수

▣ **공통필수:** 3학점 이상 이수 (논문석사와 동일)

▣ **전공필수:** 없음

▣ **선택:** 27학점 이상 이수
- ○ EE509 연구논문작성법 1학점 반드시 이수 (외국인 학생인 경우는 선택과목임)
- ○ 본 학과 EE500단위 이상의 교과목 9학점 이상 반드시 이수

○ 본 학과 EE400단위 이상 교과목, 타 학과 500단위 이상
(단, EE400단위 교과목은 반드시 학사·대학원 상호인정 교과목이어야 함)
○ 단, 복수학위 학생이 타 대학원에서 취득한 학점을 타학과 500단위 이상으로 인정할 수 있음.

▣ 연구

○ 세미나(석사)는 2학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정, 개별연구는 1학점까지 인정

◎ 교과석사 제도는 Dual Degree Program 에만 적용

□ 경과조치

- 본 이수요건은 2018학년도 입학생부터 적용. 단, 2017학년도 이전 입학생들은 입학년도 이수요건 및 2009년 2월 시행된 교과학점 축소 규정을 따른다.
- 단, 연구과목 이수요건은 별도로 명시된 이수요건 적용 학번에 따라 달리 적용할 수 있으며, 복수학위 학생의 타 대학 기이수학점 인정 관련 조항과, 공통필수 이수요건은 전체 재학생에게 적용한다
- 학번별 연구과목 이수요건

구분	2015~2017	2018~
연구과목 이수요건	▣ **연구:** 총 5학점 이상 이수 - EE960 논문연구(석사) 4학점을 포함하여 연구학점 5학점 이상 이수	▣ **연구:** 총 6학점 이상 이수 -EE960 논문연구(석사) 4학점 -EE966세미나(석사)<콜로키움> 2학점 (부제가 콜로키움일 경우에만 인정)

별첨 5 박사과정용 이수요건 양식

전기및전자공학부 전공과목 이수요건 (박사과정용)

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점: 총 60 학점 이상 이수**

▣ **공통필수: 3학점 이상 이수 (석사과정과 동일)**

▣

▣ **전공필수:** 없음

▣ **선택: 총 27 학점 이상 이수**

○ 본 학과 EE600단위 이상의 교과목 6학점 이상 반드시 이수
○ 나머지 과목은 모든 학과 500단위 이상의 교과목 중에서 선택
○ 석사과정 취득학점을 누적 인정함. (석사과정에서 취득한 본 학과 EE400단위 학사·대학원 상호인정 교과목도 인정함)
○ 단, 복수학위 학생이 타 대학원에서 취득한 학점을 타학과 500단위 이상으로 인정할 수 있음.

▣ **연구: 총 30 학점 (이상) 이수**

○ 세미나(박사) 4학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정

□ **경과조치**

- 본 이수요건은 2018학년도 입학생부터 적용. 단, 2017학년도 이전 입학생들은 입학년도 이수요건 및 2009년 2월 시행된 교과학점 축소 규정을 따른다.
- 단, 연구과목 이수요건은 별도로 명시된 이수요건 적용 학번에 따라 달리 적용할 수 있으며, 복수학위 학생의 타 대학 기이수학점 인정 관련 조항과, 공통필수 이수요건은 전체 재학생에게 적용한다
- 논문세미나(박사) 이수요건은 2014~2017학년도 입학생까지 적용한다.
- 학번별 연구과목 이수요건

구분	~2013	2014~2017	2018~
연구과목 이수요건	▣ 연구: 총 30학점 이상 이수	▣ 연구: 30학점 이상 이수 -논문세미나(박사) 1학점 반드시 이수 ※ 논문세미나(박사)는 세미나(박사)<콜로키움>으로 대체할 수 있음. (논문세미나(박사) 1학점/ 세미나(박사)<콜로키움)> 2학점/ 논문세미나(박사) 0.5학점+세미나(박사)<콜로키움>1학점 중택 1하여 이수 가능)	▣ 연구: 30학점 이상 이수 -세미나(박사) 4학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정

별첨 6 석박통합과정용 이수요건 양식

전기및전자공학부 전공과목 이수요건 (석박통합과정용)

공통 이수요건은 반드시 따로 확인하시기 바랍니다.

▣ **졸업이수학점: 총 60 학점 이상 이수**

▣ **공통필수: 3학점 이상 이수** ***(석사과정과 동일)***

▣ **전공필수: 없음**

▣ **선택: 총 27 학점 이상 이수**

○ EE509 연구논문작성법 1학점 반드시 이수 (외국인 학생인 경우는 선택 과목임)
○ 본 학과 EE600단위 이상의 교과목 6학점 이상 반드시 이수
○ 나머지 과목은 모든 학과 500단위 이상의 교과목 중에서 선택
○ 석사과정 취득학점을 누적 인정함. (석사과정에서 취득한 본 학과 EE400단위 학사·대학원 상호인정 교과목도 인정함)
○ 단, 복수학위 학생이 타 대학원에서 취득한 학점을 타학과 500단위 이상으로 인정할 수 있음.

▣ **연구: 총 30 학점 (이상) 이수**

○ 세미나(석사) 또는 세미나(박사)를 총 5학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정

□ **경과조치**

- 본 이수요건은 2018학년도 입학생부터 적용. 단, 2017학년도 이전 입학생들은 입학년도 이수요건 및 2009년 2월 시행된 교과학점 축소 규정을 따른다.
- 단, 연구과목 이수요건은 별도로 명시된 이수요건 적용 학번에 따라 달리 적용할 수 있으며, 복수학위 학생의 타 대학 기이수학점 인정 관련 조항과, 공통필수 이수요건은 전체 재학생에게 적용한다
- 논문세미나(박사) 이수요건은 2014~2017학년도 입학생까지 적용한다.
- 학번별 연구과목 이수요건

구분	~2013	2014~2017	2018~
연구과목 이수요건	▣ 연구: 총 30학점 이상 이수	▣ 연구: 30학점 이상 이수 -논문세미나(박사) 1학점 반드시 이수 ※ 논문세미나(박사)는 세미나(박사)<콜로키움>으로 대체할 수 있음. (논문세미나(박사) 1학점/ 세미나(박사)<콜로키움)> 2학점/ 논문세미나(박사) 0.5학점+세미나(박사)<콜로키움>1학점 중 택1하여 이수 가능)	▣ 연구: 30학점 이상 이수 -세미나(석사) *또는* 세미나(박사) 총 5학점을 반드시 이수하되 부제가 콜로키움인 경우에만 인정

교과목 개요

KAIST

교과목 개요

▣ 학사과정

EE105 세상을 바꾸는 전자공학 (Electrical Engineering: Changing the World) 3:0:3
본 과목은 전기및전자공학을 신입생에게 소개하고 전기및전자공학을 전공으로 선택하는데 도움이 되도록 설계되었다. 학생들의 궁금증을 자극하기 위해 전기및전자공학분야의 6개 주제, 컴퓨터, 통신, 소자, 반도체에 대한 흥미로운 질문들을 제시하였다. 이러한 질문들에 대한 해답은 강의와 단순한 프로젝트 활동들을 통해 제공되어 질 것 이다.

CoE202 인공지능 입문 <빅데이터 분석 및 기계학습> Fundamentals of Artificial Intelligence <Big data analysis and machine learning> 3:0:3
본 과정에서는 KAIST 1학년 학생들을 대상으로 기본적인 기계학습 기법들을 소개합니다. 구체적으로 선형 회귀, 최대 확률과 베이지안 기술, 로지스틱 회귀, SVM 및 심층 신경망 분야를 다룹니다. 본 과정은 KAIST 1학년 학생들이 별다른 선행 학습 없이 수강 할 수 있으며, 이론 강의와 노트북을 사용하는 흥미로운 프로젝트 활동으로 구성되어 있습니다.

EE201 회로이론 (Circuit Theory) 3:1:3
회로이론에서는 전기 및 전자회로, 반도체 Memory, 전력전자, 통신 및 제어 시스템, VLSI 회로설계 연구에 필수적인 저항, 축전기, 인덕터 등의 회로소자와 회로 해석기법, 천이상태 및 정상상태 해석, 다상회로, 주파수 응답, Laplace 변환기법을 학습하고 응용하여, 창의적인 회로설계를 할 수 있는 기초소양 및 역량을 키운다.

EE202 신호 및 시스템 (Signals and Systems) 3:1:3
시연속 그리고 이산 신호 및 시스템을 소개한다. 푸리에 급수, 푸리에 변환, 라플라스 변환, z 변환 및 그들의 응용에 대하여 알아보고 시불변 선형 시스템이 강조되면서 다양한 시스템에 대해서 알아본다.

EE204 전기자기학 Ⅰ (Electromagnetics Ⅰ) 3:0:3
본 과목에서는 전기자기장과 전자파의 기초를 강의한다. 구체적으로 벡터 및 벡터 미적분을 다루고, 정전계, 정자계를 강의한다. 이후에 시변 전기자기장을 다루고, 멕스웰 방정식을 소개한다. 마지막으로는 전자파 및 전송선의 기초개념을 강의한다.

EE205 전자공학을 위한 자료구조 및 알고리듬 (Data Structures and Algorithms for Electrical Engineering) 3:0:3
본 과목은 공학 응용을 위한 자료구조에 대한 학습을 한다. 본 과목에서는 실재적인 공학 응용 사례에서 자료 재표현, 자료 구조 및 알고리즘 분석을 주로 다룬다. 세부 주제로서 기본 자료 구조들, 배열, 연결 리스트, 스택, 큐, 트리, 서치 트리, 그래프, 정렬, 해싱을 살펴본다. 본 강의에서는 전자공학과 관련된 실질적인 응용의 예를 논의한다.

EE209 전자공학을 위한 프로그래밍 구조 (Programming Structure for Electrical Engineering) 3:0:3
본 과목에서는 전기 및 전자공학에 필요한 자료구조, 알고리즘, Web Programming, JAVA등을 학습한다. 또한 객체지향적 프로그래밍 기법을 학습하며 프로그래밍 언어로는 C, JAVA를 사용한다.

EE210 확률과 기초 확률과정 (Probability and Introductory Random Processes) 3:0:3
확률과 기초 확률과정을 다룬다. 확률 부분에서는 확률 공간, 확률을 얻는 방법, 여러 가지 확률분포를 살펴본다. 확률변수와 확률변수의 변환을 공부하고, 이를 다차원 확률변수로 - 곧, 확률벡터로 - 확장한다. 그 뒤, 확률과정의 기초적인 개념을 소개하고 몇 가지 기본적인 보기를 다룬다.

EE211 물리전자개론 (Introduction to Physical Electronics) 3:0:3
전자공학 이해 및 응용의 기본개념인 전자의 양자 물리적, 통계 물리적인 특성, 결정고체, 고체의 에너지 밴드이론, 반도체내에서의 전자와 정공의 움직임, pn 접합특성 및 이를 이용한 반도체 전자 소자와 관련된 물리현상을 다룬다.

EE212 전자 설계 실습 (Electronics Design and Practice) 1:6:3
전기및전자공학 분야와 관련된 디자인을 소개 하고 디자인 능력을 함양하기 위한 과목으로 2학년 1학기에 기초 전공과목을 수강한 학생들을 대상으로 다양한 주제로 실습이 진행된다.

EE213 전자공학을 위한 이산 방법론 (Discrete Methods for Electrical Engineering) 3:0:3
저학년과 비전공 학생들에게 적절한 AI 교육을 균형 잡힌 실습과정과 이론 강의를 통해 제공하고자 한다. 특별한 배경지식을 요구하지 않고 처음 입문하고자 하는 학생들이 쉽게 이해할 수 있도록 과목을 설계함으로, AI 교육 활성화 및 인재 양성에 도움을 줄 것으로 사료된다.

EE214 머신러닝기초와 실습 (Machine Learning Basics and Practices) 2:3:3
전기, 전자, 컴퓨터 공학에 필요한 이산 방법론적인 기초 방법론과 그 응용을 다룬다. 통신, 컴퓨터 구조, 네트워킹, 알고리즘, 암호론 등 다양한 분야에서 필요한 방법론들과 수학적인 증명 기법들을 소개한다.

EE303 디지털시스템 (Digital System Design) 3:1:3
본 교과목을 통하여 디지털 로직 회로의 기본적인 원리를 이해하며, 디지털 시스템의 근본적인 개념, 구성 요소와 동작을 이해한다.

EE304 전자회로 (Electronic Circuits) 3:1:3
먼저 다이오드, 트랜지스터의 물리적인 구조와 기본 동작 원리에 대하여 자세하게 설명하고, 이로부터 등가회로 모델이 구성되는 것을 이해시킨다, 그리고 이들 소자들을 이용한 기본적인 정류회로, 소신호 증폭기 회로, 차동 증폭기에 초점을 맞추어 강의한다. (선수과목 : EE201)

EE305 전자설계 및 실험 (Introduction to Electronics Design Lab.) 1:6:3
전자공학에 관한 필수적인 hands-on experience와 design 경험을 함양하기 위하여 실험을 수행한다.
(선수과목 : EE209)

EE309 전기공학을 위한 고급 프로그래밍 기술 (Advanced Programming Techniques for Electrical Engineering) 3:0:3
본 과목에서는 고급 시스템 프로그래밍 기술을 전반적으로 다룬다. 기본적으로 Linux/Unix 운영체제 기반의 시스템 구조와 시스템 프로그래밍을 위한 기본적인 지식을 다룬다. 파일 시스템의 기본 구조와 이를 시스템 관점에서 다루는 법을 배운 후, 메모리 관리에 대한 고급 방법들을 배울 수 있다. 또한, 프로세스와 쓰레드의 운영에 대한 고급 방법들을 배우고, 멀티 프로세스 멀티 쓰레드 환경을 구동하기 위한 시스템 프로그램 기술을 배울 것이다.

EE312 컴퓨터구조개론 (Introduction to Computer Architecture) 3:1:3
워크스테이션, PC 등 다양한 컴퓨터 시스템에 대하여 기본적인 하드웨어와 소프트웨어의 구조와 동작 원리를 이해하고 설계하는 방법을 배우는 것을 목적으로 한다. 데이터 표현 방법, 중앙처리장치(CPU)의 하드웨어 구조, 명령어의 형식과 종류, 어셈블러와 컴파일러의 처리 과정, Datapath와 Controller의 설계 방법, 성능 향상을 위한 파이프라인 기법, 메모리 계층구조와 캐쉬메모리, IO 주변장치의 동작 원리를 다루며, 고성능 컴퓨터에 대해서도 소개한다. (선수과목 : EE303)

EE321 통신공학 (Communication Engineering) 3:0:3
확률, 통계, 랜덤 프로세스에 관하여 간략히 배운 후, AM, FM, SSB, PLL, Mixer, ADC의 원리, 회로 및 통신회로의 잡음해석 방법을 공부한다. BPSK, FSK, QAM 등의 디지털 통신 방식에 관하여도 공부한다. 다중접속 시스템의 개요도 간략히 다룬다. (선수과목: EE202)

EE323 컴퓨터 네트워크 (Computer Network) 3:0:3
본 과목은 컴퓨터 네트워크의 프로토콜과 서비스, 어플리케이션들 속에 담긴 법칙과 실제적 예시를 통해 컴퓨터 네트워크가 어떻게 설계되고 구현되었는지를 공부한다. 그리고 이를 직접 체험해봄으로써 학생들의 이해를 보다 높이고자 한다. 가장 중요한 주제는 인터넷, 즉 인터넷의 동작 원리이다.

EE324 클라우드 컴퓨팅 개론 (Introduction to Cloud Computing) 3:1:3
네트워킹 분야 입문을 위한 기초로서 컴퓨터 네트워크의 설계, 구축, 유지에 필요한 실제적인 기술을 다룬다. Cisco의 네트워킹 아카데미 프로그램과 연계하여 산업현장에서 요구되는 컴퓨터 네트워킹의 실무지식 뿐만 아니라 고급 네트워킹 기술의 습득에 필요한 기초지식을 강의와 실습을 통하여 익힌다.

EE326 정보이론 및 부호화 개론 (Introduction to Information Theory and Coding) 3:0:3
본 과목은 통신 엔지니어를 위한 정보이론의 기초를 소개한다. 과목에서 다루게 될 주요한 주제들은 1) 정보 및 소스의 측도, 2) 데이터 압축, 3) 채널 용량 및 오류 정정 부호, 4) 전송율 왜곡 이론 등이다.

E331 기계학습개론 (Introdutcion to Machine Learning) 3:0:3

본 강의에서는 기계학습의 기본 원리와 응용분야를 모델링과 예측; 학습문제 그리고 신호를 요약한다는 관점에서 소개한다. 구체적으로 generalization, over-fitting, regularization, deep learning, regression, classification, clustering, recommendation problems, probabilistic modeling, reinforcement learning, 내용을 다룬다.

EE341 전기자기학 II (Electromagnetics II) 3:0:3

본 교과목에서는 시간에 따라 변화하는 전자기장과 맥스웰 방정식을 다룬다. 또한 매질에 따른 전자기파의 전파 특성, 트랜스미션 라인, 전자기파 도파로와 안테나의 원리를 이해한다.(선수과목: EE204)

EE342 무선공학 (Radio Engineering) 3:1:3
현대 무선 통신 시스템의 RF 전단부에서 사용하는 회로, 부품, 시스템의 설계 및 해석에 필요한 기본 이론을 습득하고 컴퓨터 시뮬레이션을 이용하여 실습한다. (선수과목 : EE204, EE304)

EE352 광공학 개론 (Fundamentals of Photonics) 3:0:3
본 과목에서는 광공학의 기초 및 기본 원리들에 대하여 강의한다. 여러 가지 광소자의 기본 동작 원리 및 이의 응용을 다루며, 광공학 기반 기술의 다양한 응용 가능성에 대하여 논의한다.

EE362 반도체소자 (Semiconductor Devices) 3:0:3
기본적인 반도체 소자의 동작 원리 및 특성을 이해한다. 기초적인 pn접합과 pn접합 다이오드, 금속-반도체 이종접합과 반도체 이종접합, Bipolar Transistor, MOSFET과 JFET의 동작 원리 및 특성에 대하여 폭넓게 다루고 실제 소자의 non-ideal 특성에 대해서도 공부한다.

EE372 디지털 전자회로 (Digital Electronic Circuits) 3:0:3
이 과목은 연산, 논리 및 기억 기능 블록을 위한 조합/순차 논리 회로에 기본적인 내용으로 하여 CMOS 집적회로의 제작, 동작과 설계 기술에 대한 기본적인 개념을 다룬다. 또한, 타이밍, 연결선 및 설계 방법론에 대하여도 배운다.

EE381 제어시스템공학 (Control System Engineering) 3:0:3
본 과목은 다이나믹 시스템의 분석과 디자인 방법을 다룬다. 주요 내용으로는 제어시스템의 서론, 시스템의 수학적 모델, 궤환제어시스템의 특성, 궤환제어시스템의 성능, 선형궤환시스템의 안정성, 근궤적 기법, 주파수 응답 기법, 주파수영역에서의 안정성, 제어시스템의 시간영역 해석, 궤환 제어시스템의 설계와 보상 등이다. (선수과목 : EE202)

EE391 전력전자제어 (Power Electronics Control) 3:0:3
자기회로 및 전력변환기기, 전기-기계적 에너지 변환 원리, 회전기기의 기본원리, solid-state 모터제어 및 과도 특성 동작 등을 배우고 전동기의 산업 응용에 따른 가동, 가속, 감속, 제동 등의 제특성에 대하여 취급한다. (선수과목 : EE202)

EE402 미래사회와 전자공학 (Future Society and Electrical Engineering) 2:0:2
전자공학의 여러 분야의 기술 동향과 미래 사회의 수요를 미리 살펴봄으로써 학생들이 주도적으로 진로를 기획하고 미래의 변화에 대비하도록 도와주는 것을 목적으로 한다.

EE403 아날로그 전자회로 (Analog Electronic Circuits) 3:0:3
이 과목에서는 BJT와 CMOS 아날로그 회로 설계 능력을 배양하는 것을 목표로 한다. BJT와 CMOS 증폭기 회로로부터 시작하여, 주파수 응답, 되먹임, 아날로그 집적회로, 파워 증폭기, Filter 설계 방법을 배우고, 데이터 변환기, Oscillator, 신호 발생기 등의 응용 회로에 대해서 다룬다. (선수과목 : EE201, EE304)

EE405 전자 디자인 랩 (Electronics Design Lab.) 1:6:3
이 실험은 학부에서 배운 지식을 총동원하여 analog 및 digital, hardware 및 software가 결합된, 주어진 과제에 대한 설계 과목이다. 예를 들어 AM radio를 analog 회로를 이용하여 구현하고, voice recorder를 Linux 기반의 embedded system을 이용하여 구현하여, 학부과목들의 종합응용을 통한 chipstone 설계과목의 역할을 담당한다. (선수과목 : EE305)

EE411 스위칭 및 오토마타이론 (Switching and Automata Theory) 3:0:3
본 과목은 이산수학에 기반 하여 조합논리 회로 및 순서논리 회로를 해석하고 설계하는 기법을 다룬다. 다룰 내용은 집합의 기초, 관계, Lattice, 스윗칭 Algebra, 스윗칭 함수 합성, Fault 검출, 오토마타로부터 회로 변환기법. 상태 및 시스템 Identification, 유한상태 기계의 특성, 역 유한기계, 이산 시스템 검증법 등 이다. (선수과목 : EE303)

E412 빅데이터 분석 개론 (Introduction to Big Data Analytics) 3:0:3
본 과목에서는 빅데이터 분석에 필요한 수학적 방법론과 프로그래밍 모델을 다룬다. 웹 검색, 스팸 필터, 크라우드 소싱, 추천 시스템, 비주얼라이제이션 등 다양한 어플리케이션에서 필요한 데이터 분석 방법론들을 소개한다. (선수과목: MAS212, EE209, EE210)

EE414 임베디드시스템 (Embedded Systems) 3:1:3
이 과목은 최근 전자 시스템의 중요한 구현기술의 하나인 embedded 시스템에 대하여, 그 구성요소인 hardware 및 software에 대하여 분석하고, 시스템 구현 기술을 습득한다. Embedded system에서 가장 널리 쓰이는 ARM processor를 기반으로 제작된 CPU board 및 입출력 board에 대하여 소개하고, open source의 가장 보편적인 Linux operating system에 대하여 설명하고, PC를 이용한 개발환경에서 어떻게 시스템을 구현하는가에 대하여 공부한다. 기본적인 interface들에 대한 device driver 실험을 병행하여 개념을 확실히 잡도록 한다. (선수과목 : EE303)

EE415 전자공학을 위한 운영체제 및 시스템 프로그래밍
(Operating Systems and System Programming for Electrical Engineering) 3:0:3
본 과목은 시스템 프로그래밍, 특별히 OS에 관련된 병렬성, 동기화, 프로세스, 메모리 관리, 입출력 디바이스, 파일 시스템에 관련한 기본적 지식 및 기술들을 다룬다. 또한 어셈블리와 컴파일러의 기본적인 원리를 공부한다.

EE421 통신시스템 (Communication Systems) 3:0:3
EE321 통신공학 개론에서 다루는 아날로그 통신 및 디지털 통신의 기본적인 내용을 좀 더 심화하고, EE321 통신공학 개론에서 다루기 어려운 현대 통신기술을 학부 수준에서 그 개념을 위주로 소개한다. (선수과목: EE321 또는 담당교수의 허락)

EE424 최적화 개론 (Introduction to Optimization Techniques) 3:0:3
이 과목에서는 회로설계, 통신, 신호처리 및 제어공학에 필수적인 최적화의 기초 개념 및 기법과 그 응용 분야를 다룬다. 선형 벡터공간, 선형 연산자, 선형 추정 및 필터링, 함수 해석학, 최적 제어, 선형 계획법, 비선형 계획법, 동적 계획법, 진화 연산, 신경 회로망 등을 다룬다. (선수과목: MAS212)

EE425 무선 통신망 (Wireless Network) 3:0:3
본 과목에서는 무선 네트워크 접속 기술과 시스템 어플리케이션의 법칙에 대한 내용을 공부한다. 주로 무선 접속 기술, 다중 접속 제어 및 스케쥴링, 시스템 캐패시티 최적화와 그 응용인 WiFi, WiMax, adhoc 센서 네트워크를 다룬다.

EE426 인공지능 반도체 시스템 (AI Silicon Systems) 3:1:3
본 과목에서는 무선 네트워크 접속 기술과 시스템 어플리케이션의 법칙에 대한 내용을 공부한다. 주로 무선 접속 기술, 다중 접속 제어 및 스케쥴링, 시스템 캐패시티 최적화와 그 응용인 WiFi, WiMax, adhoc 센서 네트워크를 다룬다. (선수과목 : EE303, EE312, EE321)

EE432 디지털신호처리 (Digital Signal Processing) 3:0:3
이 과목에서는많은 산업이 인공지능/머신러닝 기술을 채택하면서, 관련 워크로드를 빠르고 효율적으로 처리할 수 있는 하드웨어에 대한 수요가 높아지고 있다. 본 과목에서는 최신 인공지능/머신러닝 모델의 필요 연산에 대하여 간략히 배우고, 최신 산업계와 학계에서 출시된 인공지능을 위한 반도체 시스템과 그 설계에 대하여 깊이 배운다. (선수과목 : EE202)

EE441 광통신개론 (Introduction to Fiber Optic Communication Systems) 3:0:3
본 과목에서는 광통신의 기본 개념과 이에 사용되는 각종 광학, 전자, 통신 기술을 강의한다. 본 과목의 구체적인 내용은 광통신의 개요, 기본적 광학이론, 광섬유, 광수신기 설계 및 잡음 분석, 광통신 시스템디자인 등을 포함한다.

EE450 과학기술 기업가 정신 (Technology Entrepreneurship) 3:0:3
과학기술 기업가 정신은 이공계 학생들에게 기업가 정신을 기르고 IT 벤처 기업과 창업에 대한 중요성을 알려주는 역할을 수행한다. 본 수업에서는 이공학도들에게 벤처 기업의 기본 개념과 기업가 정신을 훈련시킨 뒤, 이를 바탕으로 사례를 통해 현실에서의 벤처 기업과 창업에 대한 이해를 촉진시킬 수 있다.

EE451 IT 벤쳐창업의 실제 (IT Venture Start-up) 3:0:3
본 강의는 IT 벤처기업을 설립하여 이를 성공적으로 성장, 발전시키기 위한 제반 요건을 다룬다. 창업아이디어 정립, 비즈니스모델, 사업계획, 성장전략, 투자유치, IPO전략 등 창업단계부터 기업상장에 이르기까지의 전 과정을 학생들이 연습해 보게 한다.

EE453 광전자소자의 이해 (Understanding of Optoelectronic Devices) 3:0:3
본 강의는 물리전자개론의 기본 개념을 토대로 현대 광전자공학에 사용되는 반도체 기반 발광 및 수광 광전자 소자의 기본 원리를 다룬다.

EE463 반도체 집적회로 기술 (Semiconductor IC Technology) 3:0:3
본 과목에서는 현재의 전자 시스템의 근간이 되는 실리콘 반도체 IC 칩에 적용되는 공정기술을 다룬다. 역사적 배경, 반도체 소자 구조, 제작 공정 등을 중심으로 강의가 진행될 것이며, 현재 및 미래의 반도체 IC 기술 동향에 대해서도 다룬다. (선수과목 : EE211, EE362)

EE464 그린에너지 전자공학 (Electrical Engineering for Green Energy) 3:0:3
본 교과는, 학부 4학년 수준에 맞추어, 전력 시스템의 기초 원리와 개념을 전반적으로 배우며, 특히 전자공학적 관점에서 중요한 신재생 에너지 기술들을 소개한다.

EE465 이종집적 반도체소자 (Heterogeneously Integrated Semiconductor Devices) 3:0:3
최근 반도체 업계에서 서로 다른 소재/소자의 집적을 필요로 하는 반도체 소자에 관해 소개하고 공부한다. 이종집적 및 3차원 집적의 필요성에 관해서 이해하고 해당 소자의 제작 방법 및 응용 어플리케이션 (CMOS, Si photonics, Image sensors, MicroLED display 등)에 대해서 살펴본다. 또한 각 파트 이해에 필요한 물리현상도 같이 소개한다. (선수과목 : EE211, EE362)

EE466 바이오 및 의용 전자공학 개론 (Introduction to Biomedical Electronics) 3:0:3
의료전자공학의 기본 개념을 소개하고, 의학과 생물학 문제를 해결하기 위한 전자공학 기술을 응용할 수 있도록 한다. 의료용 센서, 나노바이오 센서, 나노바이오 액츄에이터, 생체모방 의료기기, 비침습 유비쿼터스 생체 신호 측정과 의학적 응용 등을 다룬다.

EE467 센서전자공학 (Sensor Electronics) 3:0:3
수많은 종류의 센서들이 현대 공학 시스템에 사용되고 있고, 거의 모든 센서들은 전자 장치나 시스템에 직접 연결되어 있다. 본 과목에서는 측정 개론과 함께 다양한 센서들의 기본 원리와 그에 따른 전자 시스템과의 인터페이스에 대해 공부한다. (선수과목 : EE211)

EE468 박막 트랜지스터 (Thin Film Transistor) 3:0:3
이 강의에서는 3D 적층형 반도체 소자뿐만 아니라 평판 디스플레이 응용 제품에서 가장 중요한 장치인 박막 전자 소자용 박막 트랜지스터 (TFT)와 같은 핵심 요소를 다룹니다. 이 과정에서 우리는 기본과 간결한 역사적 관점으로 시작하겠습니다. 그런 다음 구조, 제조 및 트랜지스터 특성에 대해 배우게 됩니다. (선수과목 : EE211, EE362)

EE469 뇌, 기계, 사회 (Brains, Machines, and Societies) 3:0:3
이 강의에서는 최근 인공지능 기술의 발전은 "지능"의 본질에 대한 질문을 던진다. 본 수업에선 진화 과정을 통해 완성된 인간의 지능과 기계적 인공지능의 차이를 살펴보고, 동시에 인공지능 기술의 사회, 경제, 도덕적 문제들을 분석하고 논의한다.

EE474 멀티미디어개론 (Introduction to Multimedia) 3:0:3
본 코스는 학생들에게 텍스트, 그래픽, 소리, 비디오, 멀티미디어 하드웨어, 소프트웨어 요소 및 멀티미디어 상호 작용 요소를 소개한다. 관련된 기초 기술을 소개함으로 학생들이 멀티미디어기술을 이해하고 이를 이용한 상상력이 있고 창의적인 기술을 습득할 수 있도록 하고자 한다. (선수과목 : EE202)

EE476 시청각 인지 모델 (Audio-Visual Perception Model) 3:0:3
인간의 시각 및 청각계 정보처리 과정에 대한 인지과학적 계산모델 및 응용 예를 다룬다. 먼저 인간의 시각계와 청각계에서 일어나는 정보처리 메카니즘에 대한 인지과학적 지식을 설명하고, 단계적 특징추출, 두 귀와 두 눈을 이용한 공간지각, 선택적 주의집중, 시청각 융합 등 인공 시청각 시스템을 위한 계산모델을 다룬다.

EE481 지능시스템 (Intelligent Systems) 3:0:3
이 과목의 중요한 두개의 주제는 'Modern Control System'과 'Computational Intelligence'이다. 강의는 제어 이론에 대한 이론뿐만 아니라 실제적인 적용에 대한 것도 다룬다. 강의의 첫 번째 부분은 제어 시스템 설계를 위한 디지털 제어 이론에 대해 다룬다. 모르는 시스템에 대한 제어를 고려한 기본적인 시스템 검증 방법 또한 역시 다루게 될 것이다. 일단, modern control system에 대한 개념을 정립하고 난 후에, 현재의 지능 제어 시스템에 대한 최근의 추세를 알아볼 것이다. "fuzzy logic", "artificial neural network", 그리고 "evolutionary computation"을 이용한 "computational intelligence"에 대해서 다룰 것이다. 주어진 문제를 풀기위한 알고리즘을 검증하기 위한 과목 프로젝트가 주어질 것이다. (선수과목 : EE381)

EE485 전자공학특강Ⅰ (Special Topics in Electronic Engineering Ⅰ) 1:0:1

EE486 전자공학특강Ⅱ (Special Topics in Electronic Engineering Ⅱ) 2:0:2
전기전자공학 분야 중 기존 교과목 이외의 새로운 이론 및 응용분야 주제를 필요에 따라 다룬다.

EE488 전기 전자공학특강 (Special Topics in Electrical Engineering) 3:0:3
전기 및 전자공학분야에서 중요하거나, 현재의 흐름을 파악할 수 있는 주제, 새로운 개념, 새로운 분야 등을 다룬다.

EE490 졸업연구 (B.S. Thesis Research) 0:6:3
전기전자공학의 기본 원리를 이해하고 응용할 수 있는 분야를 선정하여 지도교수의 지도아래 졸업연구를 수행한다.

EE495 개별연구 (Individual Study) 0:6:1
학생의 관심 분야를 교수와 상의하여 연구주제로 선정하여 학생이 개별적인 연구를 담당교수의 지도아래 수행한다.

EE496 세미나 (Seminar) 1:0:1
전기전자공학 분야뿐만 아니라 타 분야의 연구 활동 및 방향에 대해 내외부의 전문가를 초청하여 강의를 듣는다.

▣ 석·박사과정

EE509 연구논문작성법 (Technical Writing) 1:0:1
이 과목에서는 전기및전자공학과에 맞는 좋은 연구논문을 작성하기 위해 알아야할 필수요소들을 가르친다. 그 요소들은 대학원 학위 과정에 대한 올바른 이해, 좋은 연구를 하는 법, 좋은 발표를 하는 법, 메모하는 법, 연구논문 작성법, 특허 작성법, 기술적인 글 쓰는 법, 논문 작성법, 사례조사 등을 포함한다.

EE511 전산기구조 (Computer Architecture) 3:0:3
컴퓨터 시스템의 구조와 동작원리 이해하고 첨단 프로세서에서 사용하는 성능 향상 방법과 정량적인 성능 분석 기법을 배우는 것을 목적으로 한다. 파이프라인, super-scalar, 비순차 연산방법 등 성능향상 기법과 메모리 계층 구

조, cache 구조, Virtual Memory, Interrupt 처리 방식을 배우고 정량적으로 해석하여 설계하는 방법을 배우게 된다. 또한 SIMD, Multi-threading 등 최근 중요 이슈를 소개하며, 가상적인 전산기에 대한 설계와 시뮬레이션을 통하여 종합적인 이해가 가능하도록 한다. (선수과목 : EE303, EE312)

EE513 네트워크 시스템 및 보안 (Networked Systems and Security) 3:0:3
본 과목에서는 네트워크 미들웨어에 대해서 공부한다. 네트워크 미들웨어는 네트워크 운영체제 위에서 그리고 어플리케이션 단 아래에서 동작하는 분산 소프트웨어 이고 주어진 환경의 다양성을 추상화하는 역할을 한다. 네트워크 시스템에서 미들웨어의 역할은 점차 중요해 질 것이며 특별히 유무선 네트워크 환경에서 서로 다른 응용프로그램 및 서비스를 통합하기 위한 모바일 컴퓨팅과 같은 신흥 분야에 필요할 것이다. 미들웨어는 소프트웨어를 구성하기 위한 유용한 요소를 제공해야 하기 때문에 본 과목에서는 분산 시스템 과 컴퓨팅 인프라 관련 분야에 관한 기초적인 원리, 아키텍쳐 및 인터렉션 방식 등에 대하여 소개한다. (선수과목 : EE312)

EE514 병렬컴퓨터구조 (Parallel Computer Architecture) 3:1:3
본 교과목은 대표적인 병렬 컴퓨터 구조인 멀티코어 CPU 와 GPU의 코어 구조, 코어들 간의 통신을 위한 인터커넥션 네트워크, 그리고 연산의 결과를 저장하는 메모리 및 스토리지 시스템의 하드웨어 구조에 대하여 배워본다. 이와 더불어, 해당 병렬 컴퓨터 구조의 소프트웨어 프로그래밍 시스템에 대한 이론과 실습 과정을 통해 병렬 컴퓨터 구조의 하드웨어/소프트웨어 시스템 간의 인터페이스에 대한 이해를 학습한다.

EE515 신기술의 보안 (Security of Emerging Systems) 3:0:3
다른 분야와 마찬가지로 보안 연구에서 가장 중요한 요소는 새로운 문제 즉 새로운 보안 공격을 발견하는 것이다. 보안 공격은 웹서버, DNS, 온라인 뱅킹, 전자 투표 시스템, 무선전화망, 소셜 네트워크, 무선 전화 시스템, 핵발전소등과 같이 수많은 시스템에 대한 공격을 포함하며, 인터페이스 설계, security by obscurity, 설치상의 실수, 물리적 접근등을 통한 시스템상의 다양한 약점에서 출발한다. 이 과목의 핵심 목표는 보안 공격을 감행하는 해커처럼 생각하는 법을 배우는 것이다. 다양한 공격 형태에 관해 공부하고, 왜 그리고 어떻게 그러한 공격이 가능한지에 대해 공부한다. 이를 통해 여러 공격에 대한 내성을 지니는 시스템을 설계하고 설치하는 방법을 습득한다.(선수과목 : EE323, EE415)

EE516 임베디드 소프트웨어 (Embedded Software) 3:0:3
Embedded computer(ARM CPU)에서 embedded system programming방법을 강의한다. 사용하는 embedded Linux를 사용하여 기본적인 Linux의 구조, 사용법, system call 구현 방법, process 관리방법, file system 구조 및 관리, Flash memory file system 구조 및 구현, Linux porting 방법, 새로운 device를 위한 driver 작성 방법, Bootloader 이해 및 사용 방법등 embedded programming을 위한 기본적인 원리를 강의하고 실험을 통하여 Embedded Software 능력을 배양한다. (선수과목 : EE209)

EE517 소프트웨어 해킹 이론과 실습 (Software Hacking Theory and Practice) 3:1:3
본 과목은 소프트웨어 보안 취약점과 이를 방어하기 위한 기술, 그리고 공격 코드를 작성하기 위한 다양한 기술들을 가르친다. 학생들은 사이버 보안의 역사 순서를 따라서 점점 더 고도화된 소프트웨어 해킹 기술들을 접하게 되며, Capture-The-Flag (CTF)라는 제한된 환경 내에서 실제로 다양한 취약점들을 실습해본다. (선수과목 : EE209)

EE520 정보통신 네트워크 (Telecommunication Networks) 3:0:3
이 과목에서는 각종 통신 프로토콜을 기반으로 하는 다양한 통신망의 원리를 이해하고 주요 통신망인 LAN/MAN, 패킷통신망, 인터넷, 전화망, ATM망, 광대역통신망 등 정보통신 네트워크 전반에 대해서 알아본다.

EE522 통신이론 (Communication Theory) 3:0:3
본 강의는 이동통신시스템 물리계층 관련한 다음의 주제를 포함한다. : (1) 이동통신 채널 모델, 채널 용량, (2) 다중 반송파 시스템, 확장대역 시스템, (3) 다중안테나 시스템, 시공간 부호. (선수과목 : EE421)

EE523 볼록 최적화 기법 (Convex Optimization Techniques) 3:0:3
이 과목의 목적은 전기 및 전자공학에 필수적인 볼록 최적화 기법의 기초 방법론과 실제적인 응용 기법을 다루는 데에 있다. 볼록 집합, 볼록 함수, 볼록 최적화, 쌍대성, 근사화 및 추정, 기하 계획법, 내부점 기법, 부경사 기법, 기타 고급 최적화 기법들과 응용 분야를 다룬다. (선수과목: MAS212, EE424)

EE527 데이터통신 (Data Communication) 3:0:3
데이터 통신에 대한 대학원 기초 과목임. 전반부에서는 데이터통신 개요, 전송, 데이터 통신망, 후반부에서는 인터넷 프로토콜, 서비스 및 무선 인터넷에 대하여 다룬다.

EE528 공학 확률과정 (Engineering Random Processes) 3:0:3
선수 과목 'EE210 확률과 기초 확률과정'에서 배운 기초적인 내용을 바탕으로, 확률과 확률과정을 좀더 높은 수준에서 다룬다. 다루는 주요 내용에는 집합의 대수, 극한 사건, 확률벡터, 수렴, 상관함수, 독립증분 과정, 복합과정이 들어있다. (선수과목: EE210 또는 담당교수의 허락)

EE529 무선통신 (Wireless Communications) 3:0:3
EE421 통신시스템의 내용을 대학원 수준으로 심화한 과목으로서, 현대 무선통신 기술 및 이론을 다루어 무선 통신

분야 연구를 위한 대학원 수준의 이론적 기초를 제공한다. (선수과목: EE421 또는 담당교수의 허락)

EE531 통계적 학습이론 (Statistical Learning Theory) 3:0:3
이 과목은 학생들에게 최근 머신 러닝 기술과 알고리즘들을 소개하고, 기초적인 개념과 직관력을 심어주는 것을 목적으로 한다. 강의에서 다룰 내용은 perceptron과 같은 고전적 개념에서부터 boosting, support vector machine, graphical model 등 최신 개념까지 포괄한다. 이 강의에서 소개될 대부분의 알고리즘은 통계적 추론을 기반으로 한다.

EE532 브레인 IT개론 (Introduction to Brain IT) 3:0:3
이 과목은 전통적인 정보처리시스템인 von Neumann 기계와 생물학적인 뇌 사이의 구조적 및 알고리즘적인 차이에 대하여 논의하고, 뇌를 모방한 정보처리 시스템의 기본 디자인을 구현해 보는데 그 목적이 있다. 이를 위하여, 신경세포 및 인공신경망 모델을 이용한 시스템 규모 모델링을 비롯하여, 병렬 프로그래밍, 기계학습, Bayesian 모델 등 neuromorphic 연구에 필요한 각종 배경지식을 공부할 예정이다.

EE533 디지털 음성처리 (Digital Speech Processing) 3:0:3
디지털 신호처리 기법들이 음성 통신에 어떻게 응용될 수 있는지 알아본다. 초반기에는 신호처리, 음성의 특성 그리고 생성 과정에 관한 기본적인 내용을 다루고, 후반기에 이를 바탕으로 음성 부호화, 음성인식, 음성 합성에 대하여 알아본다. 학생들은 여러 프로젝트를 수행함으로써 수업 시간에 배운 내용을 실제적으로 적용하는 기회도 갖게 될 것이다. (선수과목 : EE202)

EE534 패턴인식 (Pattern Recognition) 3:0:3
Bayes 결정이론, 모수형 확률 밀도 함수 추정, 비모수형 확률 밀도 함수 추정 및 인식 기법, 특징 변환 및 선정, 선형 판별 함수, Support Vector Machine, 다계층 신경회로망, 비관리형 학습법, Clustering 등 통계적 방법에 근거한 패턴 인식 기법들에 관하여 강의한다. (선수과목 : EE528)

EE535 영상처리 (Digital Image Processing) 3:0:3
여러 가지 영상신호 발생기기로부터 얻어지는 영상신호에 대한 기본적인 디지털 처리와 분석, 이해에 대해 배운다. 주제는 샘플링, 선형과 비선형 영상처리, 영상압축, 영상재구성, 영상분할 등으로 이루어져 있다.

EE538 신경회로망 (Neural Networks) 3:0:3
신경회로망의 이론과 응용에 대하여 강의한다. 특히 신경회로망의 구조와 기능 그리고 학습과 일반화에 대하여 설명하고 다양한 신경회로망 모델에 대하여 알아본다. 신경회로망의 여러 가지 응용을 설명한다.

EE539 비선형 통계학적 신호처리 (Nonlinear Statistical Signal Processing) 3:0:3
이 과목에서는 통신과 신호처리를 포함하는 전기전자공학의 여러 영역에서 자주 다루는 비선형 신호 처리와 그에 필요한 수리통계학과 확률론의 여러 개념, 기초와 고급이론, 여러 가지 방법론, 특히, 전기전자공학에서의 응용을 살펴본다. (선수과목 : EE528 권장)

EE541 전자장이론 (Electromagnetic Theory) 3:0:3
본 과목에서는 전자장 이론과 관련된 도파관 및 안테나 응용을 강의한다. 맥스웰 방정식의 기본 개념부터 시작하여, 여러 전자기 현상의 해석에 맥스웰 방정식이 어떻게 적용되는지를 강의한다.

EE542 마이크로파공학 (Microwave Engineering) 3:1:3
현대 무선 통신 시스템의 마이크로파 및 RF 회로, 부품, 시스템의 설계 및 해석에 필요한 고급 이론을 강의한다. 또한 설계 및 시뮬레이션 실습을 통하여 실제 응용 설계 경험을 제공한다. (선수과목 : EE204)

EE543 안테나 공학 (Antenna Engineering) 3:1:3(6)
이 과목에서는 안테나 및 안테나 시스템의 이론과 응용을 다룬다. 주요 토픽으로는 안테나 및 안테나 에레이의 분석 및 설계이며, 마이크로 스트립 안테나, 능동 안테나 어레이, 스마트 안테나이다.

EE546 장 및 파동론 (Fields and Waves) 3:0:3
도파로에서의 장과 전원, 결합모드 이론, 그리고 주기적인 구조와 비등방성 매질에서의 파동 현상에 대해 다룬다. 더불어 그린 함수들과 파동의 복사와 산란에의 그 응용에 대해 논한다.

EE547 양자정보처리개론 (Introduction to Quantum Information Processing 3:0:3
이 과목은 컴퓨터 네트워킹과 클라우드 컴퓨팅의 최신 연구 내용 및 동향을 다룰 예정이다. 이 주제와 관련된 컴퓨터 시스템, 네트워킹, 클라우드, 모바일 컴퓨팅의 다양한 세부 토픽인 WAN, 혼잡 제어, 데이터센터 네트워킹, 소프트웨어 기반 네트워킹, 네트워크 기능 가상화, 분산 시스템, 머신 러닝 시스템 및 데이터 인텐시브 컴퓨팅 등의 최신 이슈들에 대해 공부할 예정이다.

EE548 신호처리를 위한 행렬계산 (Matrix Computations for Signal Processing) 3:0:3
신호처리 분야에서 필요로 하는 행렬 계산 기법들을 다룬다. 선형 시스템 풀이 방법, 행렬의 norm, 실수 표현 방법, positive definite 행렬, Toeplitz 행렬, 행렬의 직교/대각화, 고유치 및 고유 벡터 계산, 특이값 분해 기법, 그리고 선형 시스템의 반복적인 풀이 방법들이다.

EE555 광전자공학 (Optical Electronics) 3:0:3
본 과목에서는 등방성/비등방성 매질에서의 빛의 진행과 가우시안 빔, 물질과 빛 사이의 상호작용, 레이저 원리, 빛의 변조와 스위칭, 그리고 비선형 광학 현상에 대해 다룬다.

EE561 집적회로소자 개론 (Introduction to VLSI Devices) 3:0:3
이 과목은 대학원생을 대상으로 집적회로소자에 대해 기초적인 지식을 확실하게 다질 수 있도록 강의한다. 양자 역학과 반도체 공정에 관한 기본적인 이론들을 간단하게 정리한 뒤에, PN 접합 다이오드, MOS 캐패시터, MOSFET, Bipolar 트랜지스터 등의 반도체 소자들에 대한 기본적인 동작 원리에 대해 깊이 있게 공부한다. 또한 트랜지스터의 크기가 micron 단위 이하가 되면서 나타나는 부차적인 현상 (Deep submicron secondary effect)들에 대하여 중점적으로 공부함으로써 반도체 소자에 대해 전반적인 이해를 하도록 한다. (선수과목 : EE362)

EE563 디스플레이공학 (Display Engineering) 3:0:3
본 강의에서는, 급변하는 전기전자공학 분야의 변화를 수용하기 위해, 최신의 기술인 차세대 정보 디스플레이 기술 동향을 소개하고, 기초 이론 및 응용에 대해 살펴본다. 차세대 정보 디스플레이인 LCD, PDP, OLED, FED 소자의 기본적 원리를 이해하고 그 응용에 대해 본 강좌에서 다룬다.

EE565 공학자를 위한 현대물리 (Modern Physics for Engineers) 3:0:3
공학자를 위하여 양자역학과 통계역학의 기본개념에 중점을 두어 강의한다. 양자 역학에서는 양자론의 기원, Schroedinger equation, wavepacket, 전자원자, 섭동론, WKB 방법, 자연 및 유도 방출, 다전자원자 등을 다루며, 통계역학에서는 통계역학의 필요성, Ensemble의 개념, Boltzmann 분포, Fermi-Dirac 분포, Bose-Einstein 분포, Non-Equillibrium Statistics등을 다룬다.

EE566 MEMS 전자공학 (MEMS in EE Perspective) 3:0:3
본 과목에서는 마이크로전기기계시스템(MEMS)에 대해 전자공학의 관점에서 설계, 제작, 응용에 이르는 전 과정을 탐구한다. MEMS 설계를 위해 다양한 동작 원리, 반도체 설계 툴을 포함한 MEMS용 CAD툴, 및 신호처리 회로들을 살펴보고, MEMS를 제작하는데 필요한 핵심 반도체 공정과 마이크로머시닝 기술들을 심도있게 공부한다. MEMS의 중요 응용사례들인 마이크로센서들, 무선·초고주파 MEMS, 광학 MEMS, 및 바이오·마이크로유체 MEMS 속에서 전자공학 측면에서의 중요한 사안들을 살펴본다.

EE567 태양광발전 (Photovoltaic Power Generation) 3:0:3
태양광발전소자, 즉 태양전지(단결정 실리콘, 다결정 실리콘, 비정질 실리콘, 화합물계, 박막계, 차세대 태양전지 등)와 태양광발전 시스템 전반에 걸친 내용을 소개하고 태양전지의 기초 이론, 다양한 태양전지 소자 구조 및 특성, 기술 개발의 최신 동향 등에 관해 다룬다. (선수과목 : EE211)

EE568 유기전자공학 (Introduction to Organic Electronics) 3:0:3
본 강의에서는 유기물질의 전기적/ 광학적 특성을 결정하는 기본 원리와 개념을 소개하고, 이것이 유기발광다이오드(OLED)나 유기태양전지, 유기트랜지스터 등에 활용될 수 있는지 알아본다. 강의는 물성과 소자 수준에서 근본 원리를 중심으로 하되, 관련분야의 실제 엔지니어링 상황에서 어떻게 이들을 활용하여 응용분야별 요건을 만족 수 있는지에 대해 예시를 통해 논의한다.

EE569 나노 바이오 전자공학 (Nanobioelectronics) 3:0:3
본 교과에서는, 반도체 기술과 바이오 기술을 접목한 하이브리드 시스템에서 발생하는 여러 현상들에 관하여 공부하며, 이를 통해 나노바이오 전자 소자를 개발하는데 있어 필요한 기본 원리와 기술에 대하여 배운다.

EE570 미래 반도체 회로기술 (Future Semiconductor Circuit Technology) 3:0:3
차세대 반도체 회로 기술, 시스템 기술, 응용 기술을 소개한다. 주차별로 각각 다른 주제에 담당 분야의 전문가 교수가 강의를 담당한다. 이를 통해 수강생들은 미래의 유망한 반도체 회로기술에 대해 학습하고, 미래의 회로 및 시스템 수요에 대응하게 한다.

EE571 전자회로특론 (Advanced Electronic Circuits) 3:0:3
본 강의는 능동소자 (BJT와 MOS 트랜지스터)를 이용해 구현된 아날로그 회로에 대한 분석방법을 소개한다. 아날로그 회로 설계가 근사화와 창의성이 필요하기 때문에 이 강의는 복잡한 아날로그 회로를 설계하고 근사화 하는 방법을 설명한다. (선수과목 : EE304, EE403)

EE573 VLSI 시스템 개론 (Introduction to VLSI Systems) 3:0:3
이 과목은 SoC(System-on-Chip)을 포함하여 VLSI 칩의 역할, 응용 및 설계와 검증에 관련된 여러 문제를 다룬다. 추가적인 내용은 HW/SW 동시설계 및 동시검증, 완전주문형 설계, 재구성가능 시스템, 저전력 시스템, 연결과 패키징 기술, 클록 분배, VDSM(Very Deep Submicron)문제 등이 있다. 학생들은 이 과목의 주제 범위 내에서 자신이 고른 주제에 대하여 포스터 발표와 구두 발표의 기회를 갖게 된다.

EE574 VLSI를 위한 CAD (Computer Aided Design of VLSI Circuits and Systems) 3:0:3
VLSI 회로와 시스템 설계를 위한 설계방법론 및 CAD의 기초 개념과 알고리즘을 다룬다. 주요 내용으로는 상위수준 합성과 로직 합성 등을 포함한 자동 합성, 정적 시간 분석, 테스팅 및 테스팅을 고려한 설계, 시스템 수준 설계 및 합성 등이다.

EE575 엔터테인먼트 프랫폼 (Entertainment Platform) 3:0:3
엔터테인먼트 프랫폼(EP)의 구조(H/W, S/W)에 대하여 강의한다. EP는 현대기술의 집합체로서 CPU, GPU, Entertainment engine, HCI, 네트워크, 2D-3D-4D Entertainment Systems, Graphics, Animation, VR, 감성공학, 스토리지, 서비스 등 다양한 이슈에 대하여 토의한다.

EE576 저잡음 전자회로 (Low Noise Electronic Circuits)) 3:0:3
본 과목에서는 전자공학의 기초가 되는 잡음(Noise)에 대하여 배운다. 특히 전자회로에서 나타나는 잡음의 근원과 이것이 미치는 영향, 그리고 이를 어떻게 극복하는지에 대해 다룬다. 잡음 해석을 위해 필요한 통계와 신호처리 기법을 배우고 아울러 잡음을 줄이기 위한 회로구조와 기술들을 배운다.

EE577 미래 반도체 소자기술 (Future Semiconductor Device Technology) 3:0:3
차세대 반도체 기술로서 공정기술, 소자기술, 응용기술을 소개한다. 주차별로 각각 다른 주제에 담당 분야의 전문가 교수가 강의를 담당한다. 이를 통해 수강생들은 미래의 유망한 반도체 기술에 대해 학습하고, 미래의 공정 및 소자 기술 수요에 대응하게 한다.

EE679 저잡음 저전력 아날로그 회로 (Low-noise Low-power Analog Circuits) 3:0:3
본 과목에서는 아날로그 회로와 전기시스템에 존재하는 잡음에 대한 이해를 하고 이를 집적회로에서 어떻게 극복하는지에 대하여 배운다. 실제 회로에서 생기는 여러 종류의 잡음에 대한 분석을 하고, 이를 극복하기 위한 저잡음, 저전력 회로 설계 기법을 다루고 뿐만 아니라 신호처리 기법, 시스템 구조에 대해서도 공부한다. (선수과목 : EE381, EE403)

EE581 선형시스템 (Linear Systems) 3:0:3
회로망, 공학시스템 또는 물리RP 등의 선형 모델에 대한 해석방법을 주로 다룬다. 상태변수 및 상태방정식, 선형 동적 방정식, 임펄스 응답 행렬, 가 제어성 및 가 관측성, state feedback 및 state estimator, 안정도, irreducible realization, canonical decomposition, matrix fraction 과 polynomial description, 다변수 시스템의 개요 등을 다룬다.

EE582 디지털 제어 (Digital Control) 3:1:3
컴퓨터를 이용한 디지털 제어기의 설계 및 시스템의 해석방법을 다룬다. Z변환 및 상태변수법에 의한 여러 가지 디지털 제어 시스템의 해석 및 설계 방법을 검토하고, 최적제어 및 적응제어 기법을 학습하며, quantization effect 및 sample rate selection을 고려한 마이크로콘트롤러를 이용한 제어 알고리즘의 설계문제를 과제 실험을 통하여 학습한다.

EE585 모바일 로봇공학 및 자율주행 (Mobile Robotics and Autonomous Navigation) 3:0:3
학생들이 자율주행 및 SLAM (동시적 위치인식 및 맵핑)을 포함한 최신의 모바일 로봇 공학 기술을 습득하도록 하며, 이를 토대로 시뮬레이션 툴인 Webots와 ROS (Robot Operating System) 환경에서 시뮬레이션을 수행한다.

EE591 전기자동차개론 (Introduction to Electric Vehicles)3:1:3
본 과목은 전기자동차를 소개하기 위해 크게 2개의 부주제로 구성되어있음 : 일반 자동차에 대한 기본 지식(차체, 구동계, 전기전자 장치)과 전기자동차의 전기전자 구조에 대한 설명(전기 모터, 드라이버, 배터리 및 관리장치). (선수과목 : EE414)

EE594 전력전자시스템 (Power Electronics Systems) 3:0:3
본 과목에서는 Harmonic Analysis를 시작으로 하여, 각종 Converter(Buck, Boost, Buck-Boost)의 동작과 Inverter의 Commutation(Voltage Source, Current Source) 및 Chopper의 동작원리와 운영에 관해서 취급한다. (선수과목 : EE391)

EE595 전기전자컴퓨터공학특강 (Special Topics in Electrical and Computer Engineering) 3:0:3
전기전자컴퓨터공학 분야의 최근 동향 및 연구 분야에 관한 내용을 다룬다.

EE612 이산사건 시스템 모델링 시뮬레이션 (Discrete Event System Modeling and Simulation) 3:0:3
본 과목은 통신네트웍, 생산시스템, 고수준 컴퓨터구조 등을 표현하는 이산사건 시스템의 모델링 및 시뮬레이션의 전 과정을 다룬다. 다루는 내용은 시스템 분류, 이산사건 시스템 모델링 방법론, 시뮬레이션 알고리즘, DEVS 형식론, Petri Nets, 통계적 모델 검증법, 시뮬레이션 출력 분석 등 이다.

EE613 분산 컴퓨팅 시스템 (Distributed Computing Systems) 3:0:3
분산 컴퓨팅 시스템은 급속히 퍼져왔다. 클러스터부터 인터넷상의 컴퓨터, 모바일 기기들까지 분산 시스템은 다양한 분야의 응용을 지원하기 위하여 존재 해왔다. 본 과목에서는 분산 컴퓨팅 시스템의 디자인 및 엔지니어링에 필요한 중요 개념 및 기술들에 대해서 소개한다. 본 과목의 목표는 다음과 같다 : 분산 컴퓨팅의 핵심 개념을 깊이 이해 - 프로젝트 수행을 통한 응용프로그램 제작 및 시스템 구성

EE614 서비스지향형 컴퓨팅시스템 (Service Oriented Computing Systems) 3:0:3
현재 서비스 및 서비스 기반 어플리케이션에 적용되기 위하여 많은 중요한 기술들이 데이터베이스, 분산 컴퓨팅, 다중 에이전트 시스템 분야에서 개발되었다. 이러한 기술들은 일반적으로 서비스 구성을 위하여 쉽게 적용할 수 있는 일들로 확립된다. 본 과목에서는 서비스 기반 컴퓨팅의 원리 및 실습에 대한 내용을 다루고 특별히 서비스를 도입하기 위하여 필요한 아키텍쳐, 이론, 기술, 표준, 인프라 등을 내용에 대해서 소개한다.

EE616 고급 빅데이터-인공지능 융합 (Advanced Big data – AI Integration) 3:0:3

본 과목에서는 빅데이터-인공지능 융합 최신 연구를 공부한다. 이 분야는 데이터 관리, 머신러닝, 시스템의 교차점에 있다. 학생들은 매주 정해진 토픽의 최신 논문을 세미나 형식으로 발표하거나 짧은 보고서를 제출한다. 또한 관심분야 최신 논문에 대한 서베이를 작성하고 그 기반으로 최신기법도 구현한다.

EE618 고급 컴퓨터 네트워크 및 클라우드 컴퓨팅 (Advanced Computer Networking and Cloud Computing 3:0:3
현재 서비스 및 서비스 기반 어플리케이션에 적용되기 위하여 많은 중요한 기술들이 데이터베이스, 분산 컴퓨팅, 다중 에이전트 시스템 분야에서 개발되었다. 이러한 기술들은 일반적으로 서비스 구성을 위하여 쉽게 적용할 수 있는 일들로 확립된다. 본 과목에서는 서비스 기반 컴퓨팅의 원리 및 실습에 대한 내용을 다루고 특별히 서비스를 도입하기 위하여 필요한 아키텍쳐, 이론, 기술, 표준, 인프라 등을 내용에 대해서 소개한다.

EE619 강화학습이론 (Mathematical Foundations of Reinforcement Learning) 3:0:3
불확실성을 가지는 대규모 동적시스템의 연속의사결정 이론과 이 문제의 복잡성과 불확실성을 극복하기 위한 학습이론을 다룬다. 이 문제는 전자공학 분야의 제어이론, 경제학/OR 분야의 의사결정이론, 통계학 분야의 학습이론의 융합문제로서 최근 AI 분야의 강화학습 문제로 발전해왔다. 본 강의는 강화학습 알고리즘의 실제 응용 보다는 그 수학적 근간, 알고리즘 수렴성 및 수렴속도, 최적성, 계산복잡도, 샘플효용성 등을 수학적인 툴을 가지고 엄밀히 탐구하며 다양한 강화학습 변종 알고리즘들이 지니는 수학적 특성 및 장단점을 분석한다.

EE621 부호이론 (Coding Theory) 3:0:3
이 과목은 오류를 정정 혹은 검출하는 방법을 다루는 고급과정이다. Finite Field Theory를 다루고 이 결과를 이용하여 cyclic code, BCH code, Reed-Solomon code를 다룬다. 그리고 convolutional code, trellis coded modulation을 다룬 뒤 최근에 개발된 turbo code, LDPC code, space-time code, adaptive coding을 다룬다. (선수과목 : EE522, EE528)

EE622 검출 및 추정 (Detection and Estimation) 3:0:3
이 과목은 대학원 학생을 대상으로 하며, 신호검파와 추정의 기본이론, 통계학적 원리와 응용을 다룬다. 주요 내용은 가설 검증, 정규과정과 그 성질, 여러 가지 검파와 추정 기준, 잡음과 신호, 복합가설 검증, 알려진 신호검파와 추정, 확률신호검파 및 추정이다. (선수과목 : EE528 권장)

EE623 정보이론 (Information Theory) 3:0:3
이 과목은 정보통신의 기본 과제인 정보전달과 정보저장에 존재하는 근본적인 한계를 공부한다. 정보량의 개념과 정의, 정보원의 손상 없이 짧게 표현할 수 있는 정보원 부호이론, 잡음이 존재하는 전송로에서 전송부호 신뢰성 한계, 손상과 표현부호 길이와의 관계를 다룬다. (선수과목 : CC511, EE528)

EE624 셀룰라망 시스템 및 프로토콜(Cellular Communication Systems and Protocols) 3:0:3
이 과목에서 다루는 주제들은 다양한 이동통신 시스템의 개요와 휴대전화 시스템의 구조, 접속 기술, 무선통신 전파, 페이딩, 안테나, 다이버시티, 링크 분석, CDMA 확산 스펙트럼 시스템, 물리 계층, 데이터 링크 계층, 네트워크 계층 프로토콜, 트래픽 제어, 이동통신 네트워크 구조와 3세대 이동통신 시스템에 관한 내용을 포함한다.

EE626 고급통신이론 (Advanced Communication Theory) 3:0:3
EE522 통신이론과 EE529 무선통신에 대한 심화 과목으로, 다중 사용자 통신과 앞으로의 발전에 중점을 두고 현대 고급 통신이론을 다룬다. (선수과목: EE522, EE529 또는 담당교수의 허락)

EE627 통신망 성능분석 (Performance Analysis of Communication Networks) 3:0:3
본 강좌에서는 고속 통신망의 설계 제어 모델링 및 성능 분석을 위한 최신 기법과 연구주제를 ATM과 IP 기술을 중심으로 다룬다. 또한 네트워크 트래픽, 네트워크 큐잉, 서비스 품질, 네트워크 알고리듬 및 프로토콜을 정량적으로 분석하고 이해한다.

EE628 영상 압축 및 응용 (Video Copmression and Applications) 3:0:3
비디오 압축은 TV/방송, 스마트폰, 디지털 캠코더/카메라 등의 분야에서 매우 중요하고 넓게 활용되고 있다. 영상통신시스템 교과목은 이미지/비디오 압축에 사용되는 기본 원리 및 알고리즘에 대해 포괄적인 개론을 학생들에게 제공한다. 특별히, 수업의 목적으로 프레임 기반 비디오 압축에 대한 깊은 이해와 더불어, 최신 비디오 압축 표준인 H.264/AVC 및 HEVC 표준 비디오 압축 부호화 기술의 원리에 대해 학습한다. (선수과목 : EE432)

EE631 고급디지털신호처리 (Advanced Digital Signal Processing) 3:0:3
디지털 신호의 모델링, 필터구현, 최적 디지털필터의 설계, 최적신호추정, 신호전력추정, 적응필터의 기본 알고리듬을 익히는데 목적이 있으며, 내용으로는 deterministic 신호와 확률신호의 모델링, FIR, IIR, Lattice 필터구현, 최소자승오차와 평균자승오차 기준적용, 파라미터 추정 알고리듬, Wiener, Kalman 필터 설계, 비모수 및 모수 전력추정, LMS및 RLS 적응 알고리듬이 포함된다. (선수과목 : EE432, EE528)

EE635 뇌기능영상 (Functional Brain Imaging) 3:0:3
이 과목은 뇌를 이해하는데 필요한 뇌기능영상법들의 배경이론, 실험디자인, 데이터습득, 결과분석, 및 논문작성에 관하여 전반적으로 다룸으로써, 학생들이 연구의 전 과정을 미리 실습해 볼 수 있도록 하는데 그 목적이 있다. MRI 및 fMRI 분석방법에 초점을 두고 있지만, 그 외 NIRS, 광유전학, PET, CT 등도 공부할 예정이다.

EE636 디지털 비디오 처리 (Digital Video Processing) 3:0:3
본 코스는 디지털 비디오 표현 및 처리에 대한 기본적인 이론 및 기술을 제공한다. 디지털 비디오 포맷, 비디오 시간-공간 샘플링, 2D/3D 움직임 추정, 움직임 분할, 디지털 비디오 필터링, 개선, 압축 및 비디오 시스템 등을 다룬다. 디지털 비디오 처리에 대한 이론 뿐 아니라, 학생들은 상기 토픽과 관련된 실습 등에도 참여한다.

EE637 음성 및 오디오 부호화 이론 (Speech & Audio Coding Theory) 3:0:3
이 교과목은 CELP와 같은 최근의 이동 단말용 음성 부호화 방법들, MP3 및 AAC 등과 같은 오디오 부호화 기술들의 수학적 기초 이론 및 구현 기술들에 대하여 살펴본다. 아울러 최근 그 주목받고 있는 음성 및 오디오 부호화 기술의 융합 추세에 대하여도 공부한다. (선수과목 : EE432)

EE639 신경로봇공학 (Neuro-Robotics) 3:0:3
이 과목은 뇌 기반의 학습, 감각운동 행동 (sensory-motor behavior) 생성 메커니즘을 이해하기 위한 합성 모델링 (synthetic modeling) 접근법을 탐구하는 것을 주된 목표로 한다. 이를 위해, 이 강의에서는 신경로봇에 관한 연구들 뿐만 아니라 감각 예측, 행동 생성에 연관된 신경과학 저서들을 살펴본다. 또한, 강의자의 연구실에서 신경 모델을 통해 학습을 할 수 있는 로봇을 이용하여 실험을 진행한다. 이 과목을 통해 생물학적 뇌와 인공 뇌가 인지 행위를 학습하고 생성하는 메커니즘에 대한 좋은 이해를 얻을 수 있을 것이다. 성적 평가는 강의 중 퀴즈, 텀 프로젝트 그리고 수업 참여도를 기반으로 이루어진다. (선수과목: EE581)

EE641 초고주파 집적회로 (Monolithic Microwave Integrated Circuits) 3:0:3
이동통신과 레이다를 포함한 wireless 시스템에 필요한 초고주파 집적회로의 공통되고 핵심된 사항을 다룬다. 저잡음증폭기, 혼합기, 발진기, 전력증폭기, 스위치, 위상변위기, 디지털 RF블럭 등의 단위회로설계방법, 각종모델 방법과 성능평가방법을 포함한다. (선수과목 : EE204, EE304)

EE643 밀리미터파 집적회로설계 (Millimeter-wave Integrated Circuit(mmWIC) Design) 3:0:3
10GHz 이상의 밀리미터파 및 테라헤르츠 영역에서 사용하는 IC설계 방법을 집중적으로 공부한다. 밀리미터파 설계에 필요한 능동소자와 수동소자의 등가회로, 능동 회로 및 안테나, 빔포밍 및 레이더 등 밀리미터파 특성의 이해에 필요한 주제를 학습하고, 고속 무선 통신 및 센서로의 응용을 공부한다.

EE645 무선 송수신기 시스템 (Wireless Transceiver Systems) 3:0:3
RFIC나 MMIC설계자를 위하여 구현에 초점을 맞추어 통신 시스템을 강의한다.

EE647 나노 포토닉스 (Nano-Photonics) 3:0:3
이 과목에서는 nanoscale 구조 및 소자의 광전자적인 특성을 강의한다. Near-field 광학, surface plasmonics, photonic crystal, silicon photonics 등의 원리와 응용을 다룬다.

EE650 통신망 최적화기법 (Optimization in Communication Network) 3:0:3
본 강좌에서는 최적화 문제를 풀기위한 병렬분산 알고리듬들을 분산 파워제어, 흐름제어, 라우팅과 같은 다양한 통신 네트워크 알고리듬에 응용하는 것에 초점을 맞추어 배운다. 특히, 비동기식 알고리듬 모델을 주로 다룬다.

EE652 광통신공학 (Fiber-Optic Communications) 3:0:3
본 과목은 광통신 기술의 기본원리를 이해하고, 이를 이용하여 광대역 통신망을 구축하는 방법을 강의하기 위한 것이다. 본 과목에서는 먼저 통신망의 개요를 설명하고, 광섬유의 구조, 광섬유에서 발생하는 신호의 왜곡, 광수신기 설계, 광섬유 링크 설계, WDM 시스템 등을 강의한다.

EE654 다중안테나 무선통신 (MIMO Wireless Communications) 3:0:3
본 과목은 다중안테나를 용량 및 링크 신뢰성 향상을 위해 효과적으로 사용하는 방법을 다룬다. 본 과목에서 다루는 주요 주제들은 무선통신의 기초, 다이버시티 이득, 전력 이득, 자유도 이득, 다중 안테나 다중화, 다중 안테나 채널의 용량, 기회적 통신, 다중 안테나 송수신기 구조, 다이버시티-다중화 거래, 보편적 시공간 부호, 다중 사용자 다중 안테나 통신 등이다.

EE655 통신망 경제 (Economics in Communication Network) 3:0:3
본 과목에서는 통신 네트워크에서의 다양한 기법들과 알고리즘, 프로토콜들을 이해하기 위한 경제학적 방법들을 공부한다. 주로 게임이론과 경매이론과 같은 방법들, 그리고 최근 논문들의 다양한 예제들을 소개하고 이에 대해 논의한다.

EE657 근거리통신망 (Local Area Network/Metropolitan Area Network (LAN/MAN)) 3:0:3
본강좌는 근거리통신망 메트로 통신망에 적용되는 네트워크 구조와 프로토콜에 대하여 강의를 한다. 특히, IEEE 802 시리즈 문서를 중심으로 LAN/MAN망의 설계 관점에서 강의를 한다. 이는 기존 이더넷 망, 무선 LAN, Wibro/WiMaX를 비롯하여, MIH 프로토콜, VPN, PON프로토콜도 포함한다.

EE658 큐잉이론 및 응용 (Queueing Theory with Applications) 3:0:3
본 강의에서는 먼저 Poisson process, renewal process, CTMC, DTMC, IBP, IPP, MMBP, MMPP 등 통신망 및 트래픽 모델링에 필수적인 확률 과정을 다루고, 이어 마르코비안 큐, M/G/1 priority, retrial, 및 vacation 큐 등 주요 큐잉이론 및 그 응용을 다룬다.

EE659 무선망 프로토콜 및 해석(Wireless Communication Protocols and Analysis) 3:0:3
이 과목은 무선망 접근 기술과 시스템 응용의 기본 원칙을 다룬다. 주요 내용으로는 미디엄 액세스 기술, 파워 관리, 핸드오프와 스케줄링 같은 무선 라디오 자원 관리를 포함하며 무선망의 처리용량과 효율성 관점에서의 최적화를 다루며, WiFi, WiMax, ad hoc/sensor/mesh 망에 대한 응용에 대해 공부한다.

EE661 고체물리 (Solid State Physics) 3:0:3
이 강의는 정보통신 소자에서 사용하는 도체, 반도체, 유전체, 열전체, 그리고 자성체 등의 고체물리를 기초적인 이론과 그 응용 가능성을 함께 강의한다. 양자우물, 양자선, 양자점과 같은 나노구조에서 발생하는 새로운 물리적, 전기적, 및 광학적 특성들을 강의하고 이를 이용한 소자들에 대해 다룬다.

EE663 고주파전자소자 (High Frequency Electronic Devices) 3:0:3
초고주파/초고속 집적회로 및 시스템에 사용되는 고주파 전자소자들의 물리적 특성과 구조, 소자 동작원리를 이해하고, 특성 모델링, 제작기법, 초고주파 아날로그/디지털 집적회로에의 응용 등에 대하여 공부한다.
(선수과목 : EE362)

EE664 디스플레이 응용 광기술 (Applied Optics for Display Devices) 3:0:3
본 교과목은 디스플레이 활용될 수 있는 응용 광기술의 기본 개념 및 실 활용사례를 가르치며, 이를 통해 디스플레이나 유관분야에서 소자의 광학적 설계 및 최적화에 활용할 수 있도록 한다.

EE665 CMOS 프론트-앤드 공정기술 (CMOS Front-end Process Technology) 3:0:3
집적회로 제조에 필수적인 미세패턴 형성, 실리콘 산화막의 성장, 불순물 확산, 이온 주입, 박막 형성, 상호연결, 패키징, 종합공정 및 새로 등장한 마이크로머시닝 기술 등 집적회로의 제조 공정을 다룬다.
(선수과목 : EE211, EE362, EE463)

EE666 반도체 광전자소자와 응용 (Optoelectronic Semiconductor Devices and Their Applications) 3:0:3
본 과목에서는 반도체 광전 소자의 기본 원리와 기술 개발 그리고 응용에 대하여 다룬다. 반도체 소재의 광학적 특성, 반도체 발광 소자의 작동 원리, 광 감지 소자, 이미지 센싱 소자 등에 대하여 강의하고, 나아가 초고속 광전 신호 처리, 수동/능동 광 이미지 센싱 등 최신 기술의 동향 및 응용에 대하여서도 폭 넓게 다룬다. (선수과목 : EE362)

EE667 다중 시점 기하학 (Multiple View Geometry) 3:0:3
삼차원 컴퓨터 비전 분야에서 필요로 하는 핵심적인 개념과 기법들을 다룬다. 주요 주제는 사영 기하, 좌표계 변환, 좌표 변환 행렬 추정, 카메라 모델, 카메라 행렬 추정, epipolar geometry, 바탕행렬, 바탕행렬 추정, 사영 복원, trifocal tensor, 3차원 구조 계산 등이다.

EE672 미래학과 공학기술: 미디어 기술과 비즈니스 전략 (Future and Technology: New Media technology and Business Strategies) 3:0:3
최근 우리나라가 탈추격(선도형) 기술혁신체제로 안착됨에 따라 미래학의 중요성과 더불어 미래산업 창출에 대한 지식수요가 부각되고 있음. 본 과목은 공학기술과 기술경영관점을 통합하여 미디어 산업을 과거, 현재를 분석하고, 미래 미디어 기술 및 산업의 진화 방향 예측과 함께 emerging 제품 및 기술을 학습한다.

EE675 디지털 컴퓨터 연산 (Digital Computer Arithmetic) 3:0:3
컴퓨터 계산 방식은 디지털 시스템의 설계 복잡도와 전력소비에 큰 영향을 미치므로 수 체계와 계산 방식을 이해하는 것은 VLSI 설계에 있어서 매우 중요하다. 이 과목에서는 다양한 수 체계와 하드웨어 계산 방식을 다루며 고속 및 저전력 연산에 대해서도 깊게 다룬다.

EE676 아날로그 집적회로 (Analog Integrated Circuits) 3:0:3
기초적인 전자회로 지식을 바탕으로 실제 아날로그 회로를 설계할 때 널리 쓰이는 기본 블록들 (광대역 연산 증폭기, 비교기, 연속시간 아날로그 필터, 스위치-커패시터 필터, 아날로그 디지털 변환기, 디지털 아날로그 변환기 등)에 대해서 CMOS 중심으로 다루는 고급과정이다. (선수과목 : EE571)

EE678 디지털 집적회로 (Digital Integrated Circuits) 3:0:3
본 교과목을 통하여 고성능 CMOS 회로 설계의 중요한 이슈들을 이해하고 맞춤형 설계 방법을 이용한 데이터 패스 설계, 클럭킹, CMOS 로직 스타일 등에 대해 이해한다.

EE681 비선형제어 (Nonlinear Control) 3:0:3(6)
비선형 시스템의 해석과 비선형 제어 시스템의 설계에 관한 제반 기법을 소개한다. 비선형 시스템의 해석기법으로 Liapunov stability, singular perturbations, averaging method등을 다루고 비선형제어 기법으로 feedback linearization, sliding mode control, backstepping, Liapunov redesign technique등을 논한다. (선수과목 : EE581)

EE682 지능제어이론 (Intelligent Control Theory) 3:0:3
지능제어 기법으로 알려진 여러 가지 제어기법 중에서 불확실성 처리와 학습 능력의 관점에서 매우 효과적인 fuzzy 제어기 및 신경회로망 학습제어기 설계 방법론을 중심으로 공부한다. 이를 위하여 먼저 fuzzy set 이론 및 fuzzy 논리를 이용한, fuzzy 제어기의 설계 방법 및 응용예를 다루고, ANN을 Review한 후 이에 기반하여 dynamic 시스템 제어를 위한 ANN-기반 학습 제어 기법과 최적화를 위한 유전자 알고리즘(GA)등을 포함한 최근 소개되고 있는 지능

제어 기법들을 취급한다. (선수과목 : EE581)

EE683 로보트제어 (Robot Control) 3:0:3
로봇 매니퓰레이터의 기구학, 동역학 및 제어 알고리즘의 설계방법을 다룬다. 특히, homogeneous transformations, kinematics equations, motion trajectory planning을 공부한 후 여러 가지 제어 방법을 다루며 시뮬레이션을 통하여 이의 유용성을 비교 학습한다.

EE688 최적제어이론 (Optimal Control Theory) 3:0:3
최대원칙의(maximum principle)의 유도, 최적제어 시스템의 설계에 대해 공부한다. 최소시간, 최소연료, 최소에너지 시스템의 설계방법과 계산방법을 다루고, dynamic progrmming, discrete maximum principle과 응용 등을 학습한다. 또한 optimal control의 advanced topic을 다룬다. (선수과목 : EE581)

EE691 통신망 관리 (Telecom. Network Management) 3:0:3
본 강의에서는 네트워크 관리에 관한 중요 이슈와 관리 기법에서 필요한 새로운 패러다임에 관하여 살펴보고, 추후 연구 이슈를 토론한다.

EE692 병렬분산 알고리즘 (Parallel and Distributed Computation in Communication Network) 3:0:3
이 과목은 네트워크, 통신, 제어, 신호처리 및 OR 분야의 중요한 문제들을 풀기 위한 병렬 분산 알고리듬에 관한 수학적 이론을 다룬다. 계산, 수렴성, 프로세싱 노드간 통신 및 동기 문제를 배우며 특히, 비동기 병렬 분산 알고리듬을 중점적으로 다룬다. 연립 방정식, 비선형 최적화, 변동 부등식, 최단 경로 문제, 동적 프로그래밍, 네트워크 흐름 문제의 경우를 실제 응용 예를 가지고 다룬다.

EE696 통신소프트웨어 설계 (Telecommunication Software Design) 3:1:3(6)
물리 계층, 데이터 링크 계층, 네트워크 계층 프로토콜의 설계와 구현을 설명한다. 또한, UNIX 및 윈도우 소켓을 사용한 클라이언트/서버 프로그래밍을 공부하며, SDR 기반의 단말 구조를 살펴본다. 마지막으로, 이 과목은 프로토콜 설계, 검증 및 최적화를 다룬다. (선수과목 : EE527)

EE722 고등검파론 (Advanced Signal Detection) 3:0:3
이 과목에서는 검파 이론의 고급 내용을 다룬다. 효능, 점근상대효율, 점근 최적성과 같은 개념을 먼저 다룬 뒤, 알려진 신호의 국소 최적 검파, 일반화된 상관기 검파기, 충격성 잡음과 그 모형, 확률신호의 국소최적검파를 다룬다. (선수과목: {EE528 and EE622} 또는 {담당교수의 허락})

EE727 광대역 네트워크 설계 및 분석 (Broadband Network Design and Analysis) 3:0:3
본 강의는 기존 망과 미래 망에 대하여 7 계층 프로토콜 모델에 따라서 성능 분석을 한다. 특히, 스위치, 라우터, 서버/게이트웨이 및 무선 기지국 등 같은 네트워크 장비의 성능을 분석한다. 특히, 흐름제어, 라우팅, 폴링 및 스케듈링 방식에 따라 성능이 어떠한 영향을 받는 지 수식적인 분석과 더불어 시뮬레이션으로 비교한다.

EE731 적응신호처리 (Adaptive Signal Processing) 3:0:3
적응 신호처리의 기반기술 및 핵심기법을 소개한 후 응용분야를 다룬다. 구체적으로 신호모델, 최적 예측이론, Wiener 및 Kalman Filter, Eigen Filter, LMS/RLS 알고리즘 및 그들의 변형, 그리고 적응등화, 적응 Beamforming, 간섭제거 등에의 응용을 고려한다. (선수과목 : EE432, EE528)

EE733 다표본신호처리 (Multirate Signal Processing) 3:0:3
표본주파수가 다른 다표본신호처리에 대한 전반적인 이론과 실제 응용분야에 대하여 소개한다. 구체적으로는 표본감소, 표본확대, 다표본 필터뱅크의 이론과 설계방법, 웨이브릿 변환 등에 대하여 공부하고 이의 응요에 대해서도 알아본다. (선수과목 : EE432)

EE734 영상이해 (Image Understanding) 3:0:3
이 과정에서는 정지영상 및 동영상의 내용을 이해하기 위한 이론과 방법론에 대해 공부한다. 여러 가지 패턴인식 기법들이 소개되고 그들을 영상 이해에 적용하는 방법에 대해 설명한다. (선수과목 : EE535)

EE735 컴퓨터를 이용한 시각기법 (Computer Vision) 3:0:3
본 과목에서는 광학 영상으로부터 유용한 정보를 컴퓨터를 이용하여 추출하는 다양한 방법론의 원리와 응용을 다룬다. 구체적 주제는 (1) 영상 취득에 관한 기하학적 및 측광학적 모델, (2) 영상으로부터 유용한 특징정보를 얻어내는 방법, (3) 다중 영상 분석을 통해 3차원 구조를 알아내는 방법, (4) 영상 분할 및 추적 등 중간 단계의 비전 기술 및 (5) 궁극적인 물체 인식 방법론의 다섯 부분으로 구성된다. (선수과목 : EE535)

EE737 의료영상공학 (Medical Imaging Technology) 3:0:3
이 과목에서는 몇 가지 의료영상시스템과 여러 영상처리 기법을 기반으로 하는 의료영상 관련 응용분야에 대해 다룬다. 주제로는 영상 재구성 알고리즘, X선 단층촬영기, 단광자 방출 단층촬영기, 양전자 방출 단층촬영기, 자기공명 영상장치, 초음파 영상장치와 관련 후처리 기법들이다.

EE738 음성인식 시스템 (Speech Recognition Systems) 3:0:3
본 교과목은 음성인식 알고리즘 및 시스템을 개발하는데 있어서 요구되는 이론 및 구현 기술들에 대하여 다룬다.

특히 음성신호 모델링에 자주 이용되는 HMM 기법의 이론 등 패턴인식 기법, 연속음성인식을 위한 탐색기법 등 관련된 주제들을 깊이 있게 공부한다. (선수과목 : EE432)

EE739 인지정보처리 (Cognitive Information Processing) 3:0:3
인간다운 인지시스템을 위한 두뇌에서의 인지정보처리 메카니즘과 이의 계산모델을 다룬다. 먼저 신경정보가 두뇌에서 어떻게 표현되는지 살펴본 후, 이를 바탕으로 감각, 주의, 사회성, 기억, 학습, 추론 및 문제해결 등 주요 인지기능의 계산모델을 다룬다.

EE742 전자파를 위한 광선법 (Ray Analysis for Electromagnetic Scattering Problems) 3:0:3
전자파의 산란현상을 규명하고 이해하기 위하여 광선법 (ray analysis)을 이용하여 해석한다. 광선법의 한 가지 방법인 GTD (Geometrical Theory of Diffraction)를 소개하고, 이 해석 방법을 이용하여 여러 가지 산란체에 의한 전자파 산란을 구한다.

EE745 EMI/EMC 설계 및 해석 (EMI/EMC Design and Analysis) 3:0:3
본 교과과정에서는 EMI/EMC 설계 및 해석에 필요한 기본 원리를 강의하고 회로, 모듈, 시스템 수준의 설계 실습을 통하여 실제 경험을 쌓는다. (선수과목 : EE204, EE304)

EE746 레이다 시스템 (Radar Systems) 3:0:3
레이다와 초소형 레이다가 많이 사용됨에 따라서 이것들의 원리 및 구조들을 다룬다.

EE755 고급부호이론 (Advanced Coding Theory) 3:0:3
본 과목은 EE621 부호이론 과목의 심화과정으로 고급 부호이론에 대해 다룬다. Rateless code 및 dirty paper codes를 포함한 최신 부호 이론에 기반한 LDPC, 터보코드 등에 대해 살펴본다.

EE756 고급정보이론 (Advanced Information Theory) 3:0:3
본 과목은 고급 정보이론에 대해 다룬다. 특히 다중 사용자 정보이론 및 네트웍 정보이론을 중점적으로 학습한다.

EE757 비선형 광섬유 광학 (Nonlinear Fiber Optics) 3:0:3
본 과목에서는 광비선형현상과 광섬유에서의 광신호 전파특성을 바탕으로 광섬유에서의 여러 가지 광비선형현상들을 강의하고, 이러한 광비선형현상의 응용과 광통신 시스템에 미치는 영향을 강의한다.

EE758 광통신망 (Optical Networks) 3:0:3
광통신망의 전반적인 소개를 위하여 광통신의 기초, 광회선 스위칭, 광패킷 스위칭, 전광 패킷망, PON, WDM/IP, OPS/OBS, 광계층 망관리 기술에 관한 강의를 제공한다. (선수과목 : EE441, EE520, EE527)

EE761 고급반도체 메모리 기술 (Semiconductor Memory Technology) 3:0:3
본 과정은 대학원생들에게 반도체 메모리 디바이스 및 설계에 관한 최신 기술 내용을 전달 할 수 있도록 구성됨. DRAM 및 NAND 플래시 메모리 기술의 디바이스 및 설계 문제에 특히 중점을 둠. 차세대 메모리 디바이스, 프로세싱-인-메모리(PIM), CMOS 이미지 센서(CIS) 및 반도체 메모리용 데이터 과학을 포함한 몇 가지 고급 주제에 대하여 논의한다. (선수과목 : EE362, EE561)

EE762 고급 MOS 소자 물리 (Advanced MOS Device Physics) 3:0:3
MOSFET 소자의 물리현상과 소자 소형화에 따른 효과를 밀도 있게 다룬다. 최근 나노소자 MOSFET에서 활발하게 진행되고 있는 신구조, 신물질을 이용한 기술 동향에 대해 소개를 하고, 구체적 응용 사례로서, 다양한 메모리 소자를 다룬다. 또한 양자효과, 소자의 신뢰성, 모델링을 다룸으로써 차세대 소자에 대한 충분한 기본 지식과 응용 능력을 갖추도록 한다. (선수과목 : EE362, EE561)

EE764 나노 전자 소자 양자 엔지니어링 (Quantum Engineering for Nanoelectronic Devices) 3:0:3
본 과목에서는 RTD, FinFETs, 나노와이어 MOSFET, 탄소 나노튜브, 그래핀 나노 리본, 양자점, 스핀 소자 등 첨단 나노 소자에 대한 기본 동작 원리, 응용, 그리고 최신 이슈 등을 다룬다. 본 과목은 이론적인 해석과 온라인 시뮬레이션 세션으로 구성된다. (선수과목 : EE565)

EE766 플라즈마 전자공학 (Plasma Electronics) 3:0:3
본 교과는, 반도체 및 태양전지 공정, 디스플레이, 광원 등에 다양하게 사용되는 플라즈마를 이용한 전자공학 소자 및 공정에 대한 기본 개념과 원리를 익힌다. 특히 기체 상태에서의 전자공학 및 플라즈모닉스의 기본 이론이 다루어진다.

EE768 플렉시블 전자공학 (Flexible Electronics) 3:0:3
본 강의에서는 전자공학의 새로운 흐름인 플렉시블 전자공학과 관련된 내용을 공부한다. 플렉시블 소자, 공정 및 재료에 대한 기본적인 개념을 알아보고, 이를 응용한 유연TFT, 유연디스플레이 소자, 유연태양전지 및 유연센서 등에 대해 공부한다.

EE772 그린에너지 전자회로 (Electronic Circuits for Green Energy) 3:0:3
본 교과는, 에너지 생산 시스템을 위한 고효율 회로 기술과, 전력소모를 최소화하기 위한 전력관리 IC회로 기술의

기본 개념 및 설계기술을 강의한다.

EE773 바이오-메디칼 CMOS IC 설계 (Bio-Medical CMOS IC Design) 3:0:3
전기 및 전자공학의 기초 개념 및 원리, 발전과정, 여러 가지 응용 분야 등을 다룬다. 또한, 현대 과학기술 사회에서의 전기 전자공학의 역할과 발전 가능성 등을 폭넓게 다룬다.

EE783 적응제어이론 (Adaptive Control Theory) 3:0:3
미지의 시스템 매개변수를 알아내기 위하여 시스템 동정화법을 다루고 이를 이용한 간접 적응제어기 설계 및 시스템 동정화 없이 직접 적응제어기 설계를 연속시간 및 이산시간대에서 한다. 시스템의 비모델 동특성과 불확실성을 고려한 강인 적응제어 및 비선형 시스템에 대한 적응제어기법을 다룬다. (선수과목 : EE581)

EE785 강인제어시스템 (Robust Control System) 3:0:3
물리적인 시스템의 모델링은 실제 시스템의 근사화를 통하여 이루어지고 또한 프랜트는 모델 피라미터의 변화와 외란의 영향을 받게 된다. 이러한 모델링 오차, 파라미터의 변화 및 외란의 영향에도 강인한 다변수 제어 시스템을 설계하고 해석하는 방법론을 연구한다. (선수과목 : EE581, EE681)

EE788 로보트 인지 및 계획 (Robot Cognition and Planning) 3:0:3
로보트 인지는 다른 AI와는 달리 실시간 처리가 요구되는 상황에 적용되기 때문에 입력센서의 해석 및 판단 그리고 시간에 따라 변하는 정보처리 방법이 중요하다. 이를 위해 higher level program solving 방법을 다루며 응용으로서 task planning, scheduling 및 navigation planning을 다룬다. (선수과목 : EE682, EE683)

EE790 메모리 및 SoC기술 (Memory and its SoC Technology) 3:0:3

기본적인 pn 접합 이론, MOSFET 동작 원리 등을 학습한다. 이후 DRAM, SRAM, Flash Memory 소자의 구조와 동작 원리, 설계 기술에 대해서 학습하고, 차세대 미래형 소자 및 메모리 구조 및 설계, 로직 소자 및 회로 설계 관련 기술을 KAIST 교수진과 삼성전자 임원들로 이루어진 강사진으로부터 배우고 익히도록 한다.

EE791 전력변환회로 및 시스템 (Power Conversion Circuits and Systems) 3:0:3
전력 컨버터 분야에서 DC/DC 컨버터, 고주파 변압기, 인덕터, Magnetic Amplifier, Snubber, Resonant Converters, Feedback Stabilization 및 역률개선회로에 동작원리, 해석, 모델링 및 설계에 대한 기본 기술을 습득한다. (선수과목 : EE391, EE594)

EE793 인공지능 머신러닝시스템과 응용 (Systems and Applications of Artificial Intelligence and Machine Learning) 3:0:3

기본적인 pn 접합 이론, MOSFET 동작 원리 등을 학습한다. 이후 DRAM, SRAM, Flash Memory 소자의 구조와 동작 원리, 설계 기술에 대해서 학습하고, 차세대 미래형 소자 및 메모리 구조 및 설계, 로직 소자 및 회로 설계 관련 기술을 KAIST 교수진과 삼성전자 임원들로 이루어진 강사진으로부터 배우고 익히도록 한다.

EE807 전기공학특강 (Special Topics in Electrical Engineering) 3:0:3

EE808 전기전자공학특강Ⅰ (Special Topics in Electrical Engineering Ⅰ) 1:0:1

EE809 전기전자공학특강Ⅱ (Special Topics in Electrical Engineering Ⅱ) 2:0:2
전기공학분야에서 중요하거나 현재의 흐름을 파악할 수 있는 주제를 집중적으로 다룬다.

EE817 컴퓨터공학특강 (Special Topics in Computer Engineering) 3:0:3
컴퓨터공학 분야에서 중요하거나 현재의 흐름을 파악할 수 있는 주제를 집중적으로 다룬다.

EE827 통신특강 (Special Topics in Communication) 3:0:3
통신 분야에서 중요하거나 현재의 흐름을 파악 할 수 있는 주제를 집중적으로 다룬다.

EE837 신호처리특강 (Special Topics in Signal Processing) 3:0:3
신호처리분야에서 중요하거나 현재의 흐름을 파악 할 수 있는 주제를 집중적으로 다룬다.

EE838 영상공학특강 (Special Topics in Image Engineering) 3:0:3
최근 연구가 활성화 되고 있는 영상 관련 알고리즘, 영상시스템들 중 한 주제에 대해 깊이 있게 다룬다.
(선수과목 : EE432, EE535)

EE847 전자기특강 (Special Topics in Electromagnetics) 3:0:3
본 과목은 정규과목에 포함되어 있지 않은 전자기 분야의 최신 연구 동향을 강의하기 위한 것이다.

EE857 광공학특강 (Special Topics in Optical Engineering) 3:0:3
본 과목은 정규과목에 포함되어 있지 않은 광공학 분야의 최신 연구 동향을 강의하기 위한 것이다.

EE867 물리전자특강 (Special Topics in Physical Electronics) 3:0:3
물리전자공학에서의 새롭게 등장하는 분야를 깊이 있게 다룬다.

EE868 고체물리특강 (Special Topics in Solid-State Physics) 3:0:3
고체물리학에서의 새롭게 등장하는 분야를 깊이 있게 다룬다.

EE877 집적회로특강 (Special Topics in Integrated Circuits) 3:0:3
집적회로분야의 최근 동향 및 연구 분야에 관한 내용을 다룬다.

EE878 VLSI 특강 (Special Topics in VLSI) 3:0:3
최신의 VLSI 시스템의 설계와 관련된 주제를 깊이 있게 다룬다.

EE887 로보트 특강 (Special Topics in Robotics) 3:0:3
로보틱스 분야의 최신 주제를 깊이 있게 다룬다.

EE888 제어이론특강 (Special Topics in Control Theory) 3:0:3
제어공학자에게 필수적인 최적 파라미터 추정과 제어 알고리즘을 연구한다. 그 내용은 최소 분산 비편이 추정, Cramer-Rao 한계, 최대 가망성 추정, 재귀적 최소 자승, Wiener Filtering, Kalman Filtering, 적응제어 등이다. 적용 예는 관성항법장치, 항행 및 유도 Filtering, Global Positioning System이다.

EE897 전력전자특강 (Special Topics in Power Electronics) 3:0:3
전력전자분야의 특징 topic에 대하여 특별히 필요하다고 판단될 경우에 한하여 개설한다.

EE898 지능정보처리특강 (Special Topics in Intelligent information Processing) 3:0:3
지능과 정보에 대하여 알아본다. 정보를 처리하는 최신의 지능 시스템 구현 기술에 대하여 설명한다. 지능 시스템을 정보의 흐름과 상관하여 디자인하는 방법을 설명한다.

EE901 현장문제연구 (Field Issue Research) 0:3:3
반도체 산업현장에서 필요한 요소기술들을 조사하고 분석하게 하여 핵심기술에 대한 이해도를 높이고, 반도체 업계가 첨단기술을 선도할 수 있도록 나아갈 방향을 제시하는 능력을 배양하도록 한다.

EE960 논문연구(석사) (M.S. Thesis Research)

EE965 개별연구(석사) (M.S. Individual Study) 0:6:1
교과석사 과정학생들이 연구를 지도할 수 있는 교수를 선정하고, 연구주제를 정해서 관련 연구를 수행한다.

EE966 세미나(석사) (M.S. Seminar) 1:0:1
전기전자공학 분야뿐만 아니라 타 분야의 연구 활동 및 방향에 대해 내외부의 전문가를 초청하여 강의를 듣는다.

EE969 논문세미나(석사) (M.S. Thesis Seminar) 0.5:0:0.5
EE989 논문세미나(박사)와 공동으로 운영되며 박사과정 학생들이 자신의 연구 결과를 졸업하는 학기에 세미나 형식으로 발표하도록 하고 그것을 석사과정학생들이 듣게 하여 다양한 분야의 연구주제를 접할 수 있게 한다.

EE980 논문연구(박사) (Ph.D. Thesis Research)

EE986 세미나(박사) (Ph.D. Seminar) 1:0:1
전기전자공학 분야뿐만 아니라 타 분야의 연구 활동 및 방향에 대해 내외부의 전문가를 초청하여 강의를 듣는다.

EE989 논문세미나(박사) (Ph.D. Thesis Seminar) 0.5:0:0.5
EE969 논문세미나(석사)와 공동으로 운영되며 박사과정 학생들이 자신의 연구 결과를 졸업하는 학기에 세미나 형식으로 발표하도록 하고 그것을 박사과정 학생들이 듣게 하여 다양한 분야의 연구주제를 접할 수 있게 한다.

EE998 석사인턴십 (M.S. Internship) 0:9:3

현장 학습형 연구를 위하여 봄・가을 학기에 주당 9시간 (여름・겨울 학기는 주당 18 시간)의 산업체 파견을 통하여 협력 연구를 수행하고 파견 기업과 산업계에 진로에 대한 이해를 습득하게 됨 (ITRC Co-Op 프로그램 인정). 지도교수는 산업체, 또는 산업현장형 연구를 수행하는 기관을 선정하고, 사전협의를 통해 협력 연구 목표를 구체화하여, 인턴 파견 학생이 연구 학점으로 인정받을 수 있는 수준으로 해당 분야 기술을 체계적으로 습득하고 협력 연구를 통하여 고급 산업화 연구 경험을 습득하게 지도함. 3학점을 부여함.

EE999 박사인턴십 (Ph.D. Internship) 0:9:3

현장 학습형 연구를 위하여 봄・가을 학기에 주당 9시간 (여름・겨울 학기는 주당 18시간)의 산업체 파견을 통하여 협력 연구를 수행하고 파견 기업과 산업계에 진로에 대한 이해를 습득하게 됨 (ITRC Co-Op 프로그램 인정). 지도교수는 산업체, 또는 산업현장형 연구를 수행하는 기관을 선정하고, 사전협의를 통해 협력 연구 목표를 구체화하여, 인턴 파견 학생이 연구 학점으로 인정받을 수 있는 수준으로 해당 분야 기술을 체계적으로 습득하고 협력 연구를 통하여 고급 산업화 연구 경험을 습득하게 지도함. 3학점을 부여함.

교과목 일람표

KAIST

KAIST

교과목 일람표 (학사과정)

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
기초선택	EE105	35.105	세상을 바꾸는 전자공학	3:0:3	가을	
	CoE202	B6.202	인공지능 입문 <빅데이터 분석 및 기계학습>	3:0:3	가을	
전공필수	EE201	35.201	회로이론	3:1:3	봄, 가을	
	EE202	35.202	신호 및 시스템	3:1:3	봄, 가을	□MAS101
	EE204	35.204	전기자기학 Ⅰ	3:0:3	봄, 가을	
	EE209	35.209	전자공학을 위한 프로그래밍 구조	3:0:3	봄, 가을	
	EE210	35.210	확률과 기초 확률과정	3:0:3	봄, 가을	
	EE211	35.211	물리전자개론	3:0:3	봄, 가을	
	EE305	35.305	전자설계 및 실험	1:6:3	봄, 가을	□EE201,EE202, EE204,EE209
	EE405	35.405	전자 디자인 랩	1:6:3	봄, 가을	□EE305
전공선택	EE205	35.205	전자공학을 위한 자료구조 및 알고리듬	3:0:3	가을	
	EE212	35.212	전자설계실습	1:6:3	가을	
	EE213	35.213	전자공학을 위한 이산 방법론	3:0:3	봄	
	EE214	35.214	기계학습 기초와 실습	2:3:3	봄, 가을	
	EE303	35.303	디지털시스템	3:1:3	봄, 가을	
	EE304	35.304	전자회로	3:1:3	봄, 가을	□EE201
	EE309	35.309	전기공학을 위한 고급 프로그래밍 기술	3:0:3	가을	□EE209
	EE312	35.312	컴퓨터구조개론	3:1:3	가을	□EE303
	EE321	35.321	통신공학	3:0:3	봄, 가을	□EE202
	EE323	35.323	컴퓨터 네트워크	3:0:3	봄	□EE209
	EE324	35.324	네트워크 프로그래밍	3:0:3	가을	□EE209,EE323
	EE326	35.326	정보이론 및 부호화 개론	3:0:3	가을	□EE210
	EE331	35.331	기계학습개론	3:0:3	봄	
	EE341	35.341	전기자기학 Ⅱ	3:0:3	봄	□EE204
	EE342	35.342	무선공학	3:1:3	가을	□EE204,EE304
	EE352	35.352	광공학 개론	3:0:3	봄	
	EE362	35.362	반도체소자	3:0:3	봄, 가을	
	EE372	35.372	디지털 전자회로	3:0:3	가을	
	EE381	35.381	제어시스템공학	3:0:3	봄	□EE202
	EE391	35.391	전력전자제어	3:0:3	봄	□EE202
	EE402	35.402	미래사회와 전자공학	2:0:2	가을	◎
	EE403	35.403	아날로그 전자회로	3:0:3	봄, 가을	◎ □EE201,EE304
	EE411	35.411	스위칭 및 오토마타이론	3:0:3	봄	◎ □EE303
	EE412	35.412	빅데이터 분석개론	3:0:3	가을	◎ □MAS212,EE209,EE210
	EE414	35.414	임베디드 시스템	3:1:3	가을	◎ □EE303
	EE415	35.415	전자공학을 위한 운영체제 및 시스템 프로그래밍	3:0:3	봄	◎ □EE209
	EE421	35.421	통신시스템	3:0:3	봄	□EE321
	EE424	35.424	최적화개론	3:0:3	가을	◎ □MAS212
	EE425	35.425	무선 통신망	3:0:3	봄	◎
	EE426	35.426	인공지능 반도체 시스템	3:1:3	봄	◎ □EE303,EE312,SS321
	EE432	35.432	디지털신호처리	3:0:3	봄,가을	◎ □EE202
	EE441	35.441	광통신개론	3:0:3	봄	◎

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
	EE450	35.450	과학기술 기업가 정신	3:0:3	가을	◎
	EE451	35.451	IT 벤처창업의 실제	3:0:3	봄	◎
	EE453	35.453	광전자소자의 이해	3:0:3	가을	◎ □EE211
	EE463	35.463	반도체 집적회로 기술	3:0:3	봄	◎ □EE211,EE362
	EE464	35.464	그린에너지 전자공학	3:0:3	가을	◎
	EE465	35.465	이종집적 반도체소자	3:0:3	봄	◎ □EE211,EE362
	EE466	35.466	바이오 및 의용 전자공학 개론	3:0:3	가을	◎
	EE467	35.467	센서전자공학	3:0:3	봄	◎ □EE211
	EE468	35.468	박막 트랜지스터	3:0:3	가을	◎ □EE211,EE362
	EE469	35.469	뇌, 기계, 사회	3:0:3	봄	◎
	EE474	35.474	멀티미디어개론	3:0:3	봄	◎ □EE202
	EE476	35.476	시청각 인지 모델	3:0:3	가을	◎ □EE202
	EE477	35.477	데이터베이스 및 빅데이터 시스템	3:0:3	봄	◎
	EE478	35.478	융합적 로봇공학 개론	3:0:3	봄	◎
	EE479	35.479	과학계산 및 데이터	3:0:3	봄	◎
	EE480	35.480	양자 정보 및 컴퓨팅 기초	3:0:3	봄	◎
	EE481	35.481	지능시스템	3:0:3	봄	◎ □EE381
	EE485	35.485	전자공학특강Ⅰ	1:0:1	봄, 가을	◎
	EE486	35.486	전자공학특강Ⅱ	2:0:2	봄, 가을	◎
	EE488	35.488	전기 전자공학특강	3:0:3	봄, 가을	◎
연구	EE490	35.490	졸업연구	0:6:3	봄, 가을	
	EE495	35.495	개별연구	0:6:1		
	EE496	35.496	세미나	1:0:1	봄	

※ □: 선수과목 ◎: 학사·대학원 상호인정교과목
※ 해당 이수요건 연도에 따라 교과목 구분, 교과목명, 상호인정 여부 등이 다를 수 있음.

교과목 일람표 (대학원과정)

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
선택	EE509	35.509	연구논문작성법	1:0:1	봄	◎
	EE511	35.511	전산기구조	3:0:3	봄	◎ □EE303,EE312
	EE513	35.513	네트워크 시스템 및 보안	3:0:3	봄	◎ □EE209,EE323
	EE514	35.514	병렬컴퓨터구조	3:1:3	봄	◎ □EE312
	EE515	35.515	보안 공격론	3:0:3	가을	◎ □EE323,EE415
	EE516	35.516	임베디드 소프트웨어	1:6:3	가을	◎ □EE209
	EE517	35.517	소프트웨어 해킹 이론과 실습	3:1:3	봄	◎ □EE209
	EE520	35.520	정보통신네트워크	3:0:3	봄	◎
	EE522	35.522	통신이론	3:0:3	가을	◎ □EE412
	EE523	35.523	볼록 최적화 기법	3:0:3	봄	◎ □MAS212,EE424
	EE527	35.527	데이타통신	3:0:3	봄	◎
	EE528	35.528	공학 확률과정	3:0:3	봄,가을	◎
	EE529	35.529	무선통신	3:0:3	가을	◎ □EE421
	EE531	35.531	통계적 학습이론	3:0:3	봄	◎ □EE210,CS101
	EE532	35.532	브레인 IT 개론	3:0:3	봄	◎
	EE533	35.533	디지털음성처리	3:0:3	봄	◎ □EE202
	EE534	35.534	패턴인식	3:0:3	가을	◎
	EE535	35.535	영상처리	3:0:3	봄	◎ □EE432
	EE538	35.538	신경회로망	3:0:3	가을	◎ □EE202,210
	EE539	35.539	비선형 통계학적 신호처리	3:0:3	가을	◎
	EE541	35.541	전자장이론	3:0:3	봄	◎
	EE542	35.542	마이크로파공학	3:1:3	가을	◎ □EE204
	EE543	35.543	안테나 공학	3:1:3	봄	◎
	EE546	35.546	장 및 파동론	3:0:3	가을	◎
	EE547	35.547	양자정보처리개론	3:0:3	가을	◎
	EE548	35.548	신호처리를 위한 행렬계산	3:0:3	가을	◎
	EE552	35.552	양자컴퓨팅	3:0:3	봄	◎
	EE555	35.555	광전자공학	3:0:3	봄	◎
	EE561	35.561	집적회로소자 개론	3:0:3	봄	◎ □EE362
	EE563	35.563	디스플레이공학	3:0:3	봄	◎
	EE565	35.565	공학자를 위한 현대물리	3:0:3	봄	◎
	EE566	35.566	MEMS 전자공학	3:0:3	봄, 가을	◎
	EE567	35.567	태양광발전	3:0:3	봄	◎ □EE211
	EE568	35.568	유기전자공학	3:0:3	가을	◎

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
	EE569	35.569	나노바이오 전자 공학	3:0:3	가을	◎
	EE570	35.570	미래 반도체 회로기술	3:0:3	가을	◎
	EE571	35.571	전자회로특론	3:0:3	봄	◎ □EE304,EE403
	EE573	35.573	VLSI시스템개론	3:0:3	봄	◎
	EE574	35.574	VLSI를 위한 CAD	3:0:3	봄	◎
	EE575	35.575	엔터테인먼트 프랫폼	3:0:3	가을	◎
	EE576	35.576	저잡음 전자회로	3:0:3	가을	◎
	EE577	35.577	미래 반도체 소자기술	3:0:3	봄	◎
	EE581	35.581	선형시스템	3:0:3	봄	◎ □EE381
	EE582	35.582	디지털제어	3:1:3	봄	◎ □EE381
	EE585	35.585	모바일 로봇공학 및 자율주행	3:0:3	가을	◎
	EE591	35.591	전기자동차개론	3:1:3	봄	◎
	EE594	35.594	전력전자시스템	3:0:3	가을	◎ □EE391
	EE595	35.595	전기전자컴퓨터공학특강	3:0:3	봄, 가을	◎
	EE612	35.612	이산사건시스템 모델링 시뮬레이션	3:0:3	가을	
	EE613	35.613	분산컴퓨팅시스템	3:0:3	봄	□EE324
	EE614	35.614	서비스지향형 컴퓨팅시스템	3:0:3	가을	□EE324
	EE616	35.616	고급 빅데이터-인공지능 융합	3:0:3	가을	
	EE618	35.618	고급 컴퓨터 네트워크 및 클라우드 컴퓨팅	3:0:3	봄	
	EE619	35.619	강화학습이론	3:0:3	봄	
	EE621	35.621	부호이론	3:0:3	봄	□EE522,EE528
	EE622	35.622	검출 및 추정	3:0:3	가을	
	EE623	35.623	정보이론	3:0:3	가을	□CC511,EE528
	EE624	35.624	셀룰라망 시스템 및 프로토콜	3:0:3	가을	
	EE626	35.626	고급통신이론	3:0:3	봄	□EE522,EE529
	EE627	35.627	통신망 성능분석	3:0:3	봄	
	EE628	35.628	영상 압축 및 응용	3:0:3	가을	□EE432
	EE631	35.631	고급디지털 신호처리	3:0:3	봄	□EE432,EE528
	EE635	35.635	뇌기능영상	3:0:3	가을	
	EE636	35.636	디지털비디오처리	3:0:3	가을	
	EE637	35.637	음성 및 오디오 부호화 이론	3:0:3	봄	□EE432
	EE639	35.639	신경로봇공학	3:0:3	가을	□EE581
	EE641	35.641	초고주파 집적회로	3:0:3	봄	□EE204,EE304
	EE643	35.643	밀리미터파집적회로설계	3:0:3	봄	
	EE645	35.645	무선 송수신 시스템	3:0:3	봄	
	EE647	35.647	나노 포토닉스	3:0:3	봄	
	EE650	35.650	통신망 최적화기법	3:0:3	봄	
	EE652	35.652	광통신공학	3:0:3	가을	□EE204
	EE654	35.654	다중안테나 무선통신	3:0:3	가을	
	EE655	35.655	통신망 경제	3:0:3	봄	
	EE657	35.657	근거리통신망	3:0:3	봄	
	EE658	35.658	큐잉이론 및 응용	3:1:3	가을	
	EE659	35.659	무선망 프로토콜 및 해석	3:0:3	봄	
	EE661	35.661	고체물리	3:0:3	가을	
	EE663	35.663	고주파전자소자	3:0:3	봄,가을	□EE362
	EE664	35.664	디스플레이 응용 광기술	3:0:3	봄	□EE204

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
	EE665	35.665	CMOS 프론트-앤드 공정기술	3:0:3	가을	□EE211,EE362,EE463
	EE666	35.666	반도체 광전자소자와 응용	3:0:3	가을	□EE362
	EE667	35.667	다중 시점 기하학	3:0:3	봄	
	EE672	35.672	미래학과 공학기술:미디어기술과 비즈니스 전략	3:0:3	가을	
	EE675	35.675	디지털 컴퓨터 연산	3:0:3	봄	
	EE676	35.676	아날로그집적회로	3:0:3	가을	□EE571
	EE678	35.678	디지털집적회로	3:0:3	가을	
	EE681	35.681	비선형제어	3:0:3	가을	□EE581
	EE682	35.682	지능제어이론	3:0:3	가을	□EE581
	EE683	35.683	로보트제어	3:0:3	가을	□EE581
	EE688	35.688	최적제어이론	3:0:3	가을	□EE581
	EE691	35.691	통신망 관리	3:0:3	봄	
	EE692	35.692	병렬분산 알고리즘	3:0:3	가을	
	EE696	35.696	통신소프트웨어설계	3:1:3	가을	□EE527
	EE722	35.722	고등 검파론	3:0:3	가을	□EE622
	EE727	35.727	광대역네트워크 설계 및 분석	3:0:3	가을	
	EE731	35.731	적응신호처리	3:0:3	봄	□EE432,EE528
	EE733	35.733	다표본신호처리	3:0:3	가을	□EE432
	EE734	35.734	영상이해	3:0:3	봄	□EE535
	EE735	35.735	컴퓨터를 이용한 시각기법	3:0:3	가을	□EE535
	EE737	35.737	의료영상공학	3:0:3	봄	
	EE738	35.738	음성인식 시스템	3:0:3	봄	□EE202
	EE739	35.739	인지정보처리	3:0:3	가을	
	EE742	35.742	전자파를 위한 광선법	3:0:3	가을	
	EE745	35.745	EMI/EMC 설계 및 해석	3:0:3	봄	□EE204,EE304
	EE746	35.746	레이다 시스템	3:0:3	가을	
	EE755	35.755	고급 부호이론	3:0:3	가을	□EE621
	EE756	35.756	고급 정보이론	3:0:3	가을	□EE623
	EE757	35.757	비선형광섬유광학	3:0:3	가을	
	EE758	35.758	광 통신망	3:0:3	가을	□EE441,EE520,EE527
	EE761	35.761	고급반도체 메모리 기술	3:0:3	봄	□EE362, EE561
	EE762	35.762	고급MOS소자물리	3:0:3	가을	□EE362
	EE764	35.764	나노 전자소자 양자 엔지니어링	3:0:3	가을	□EE565
	EE766	35.766	플라즈마전자공학	3:0:3	가을	
	EE768	35.768	플렉시블 전자공학	3:0:3	가을	
	EE772	35.772	그린에너지 전자회로	3:0:3	가을	
	EE773	35.773	바이오-메디칼 CMOS IC 설계	3:0:3	봄	
	EE783	35.783	적응제어이론	3:0:3	봄	□EE581
	EE785	35.785	강인제어이론	3:0:3	봄	□EE581,EE681
	EE788	35.788	로보트인지 및 계획	3:0:3	봄	□EE682,EE683
	EE790	35.790	메모리 및 SoC기술	3:0:3	가을	
	EE791	35.791	전력변환 회로 및 시스템	3:0:3	봄	□EE391,EE594
	EE793	35.793	인공지능 머신러닝 시스템과 응용	3:0:3	봄	
	EE807	35.807	전기공학특강	3:0:3	봄,가을	
	EE808	35.808	전자공학특강Ⅰ	1:0:1	봄,가을	
	EE809	35.809	전자공학특강Ⅱ	2:0:2	봄,가을	
	EE817	35.817	컴퓨터공학특강	3:0:3	봄,가을	
	EE827	35.827	통신특강	3:0:3	봄,가을	
	EE837	35.837	신호처리특강	3:0:3	봄,가을	

과목구분	과목번호	전산코드	교 과 목 명	강:실:학	개설학기	비고
	EE838	35.838	영상공학특강	3:0:3	봄,가을	
	EE847	35.847	전자기특강	3:0:3	봄,가을	
	EE857	35.857	광공학특강	3:0:3	봄,가을	
	EE867	35.867	물리전자특강	3:0:3	봄,가을	
	EE868	35.868	고체물리특강	3:0:3	봄,가을	
	EE877	35.877	집적회로특강	3:0:3	봄,가을	
	EE878	35.878	VLSI특강	3:0:3	봄,가을	
	EE887	35.887	로보트특강	3:0:3	봄,가을	
	EE888	35.888	제어이론특강	3:0:3	봄,가을	
	EE897	35.897	전력전자특강	3:0:3	봄,가을	
	EE898	35.898	지능정보처리특강	3:0:3	봄,가을	
연 구	EE901	35.901	현장문제연구	0:3:3	봄,가을	
	EE960	35.960	논문연구(석사)		봄,가을	
	EE965	35.965	개별연구(석사)	0:6:1		
	EE966	35.966	세미나(석사)	1:0:1	봄,가을	
	EE969	35.969	논문세미나(석사)	0.5:0:0.5	봄,가을	
	EE980	35.980	논문연구(박사)		봄,가을	
	EE986	35.986	세미나(박사)	1:0:1	봄,가을	
	EE989	35.989	논문세미나(박사)	0.5:0:0.5	봄,가을	

※ □: 선수과목 ◎: 학사·대학원 상호인정교과목

※ 해당 이수요건 연도에 따라 교과목 구분, 교과목명, 상호인정 여부 등이 다를 수 있음.

대체과목 일람표

학과 내 대체교과목					
구분	운영 교과목		미운영 교과목		
	과목번호	교 과 목 명	과목번호	교 과 목 명	비 고
학사 과정	EE105	세상을 바꾸는 전자공학	EE105	전자공학의 현재와 미래	교과목 명칭 변경
학사 과정	EE204	전기자기학	EE204	전기자기학I	교과목 명칭 변경
학사 과정	EE205	전자공학을 위한 자료구조 및 알고리듬	EE205	공학적 응용을 위한 자료구성론	교과목 명칭 변경
학사 과정	EE209	전자공학을 위한 프로그래밍 구조	EE209	전기공학을 위한 프로그래밍	교과목 명칭 변경
학사 과정	EE210	확률과 기초 확률과정	EE423	전기전자공학도를 위한 확률과 기초확률과정	교과목 번호 및 명칭 변경
학사 과정	EE211	물리전자개론	EE302	물리전자개론	교과목 번호 변경
학사 과정	EE303	디지털시스템	EE203	디지털 시스템	교과목 번호 변경
학사 과정	EE304	전자회로	EE206	전자회로I	교과목 명칭 변경
학사 과정	EE304	전자회로	EE206	전자회로	교과목 번호 변경
학사 과정	EE305	전자설계및실험	EE305	전자공학실험I	교과목 명칭 변경
학사 과정	EE305	전자설계및실험	EE305	아날로그 전자설계 및 실험	교과목 명칭 변경
학사 과정	EE324	네트워크 프로그래밍	EE413	네트워크 설계 및 프로그래밍	교과목 번호 및 명칭 변경
학사 과정	EE341	전자파 및 안테나	EE341	전기자기학II	교과목 명칭 변경
학사 과정	EE362	반도체소자	EE461	반도체소자	교과목 번호 변경
학사 과정	EE372	디지털 전자회로	EE372	집적회로설계	교과목 명칭 변경
학사 과정	EE391	전력전자제어	EE391	전기전자제어	교과목 명칭 변경
학사 과정	EE403	아날로그 전자회로	EE301	전자회로 II	교과목 명칭 변경
학사 과정	EE403	아날로그 전자회로	EE301	아날로그 전자회로	교과목 번호 변경
학사 과정	EE415	전자공학을 위한 운영체제 및 시스템 프로그래밍	EE311	전자공학을 위한 운영체제 및 시스템 프로그래밍	교과목 번호 변경
학사 과정	EE421	통신시스템	EE422	통신시스템	교과목 번호 변경
학사 과정	EE421	통신시스템	EE421	무선통신시스템	교과목 명칭 변경
학사 과정	EE452	광공학개론	EE352	광공학개론	교과목 명칭 변경
대학원 과정	EE509	연구논문작성법	EE990	연구논문작성법	교과목 번호 변경
대학원 과정	EE509	연구논문작성법	EE968	연구논문작성법	교과목 번호 변경
대학원 과정	EE513	네트워크 시스템 및 보안	EE513	네트워크 시스템 운영체제	교과목 명칭 변경
대학원 과정	EE522	통신이론	EE522	고급통신시스템	교과목 명칭 변경
대학원 과정	EE528	공학 확률과정	EE521	랜덤 프로세스	교과목 번호 및 명칭 변경

학과 내 대체교과목					
구분	운영 교과목		미운영 교과목		
	과목번호	교 과 목 명	과목번호	교 과 목 명	비 고
대학원 과정	EE575	엔터테인먼트 프랫폼	EE713	엔터테인먼트 프랫폼	교과목 번호 변경
대학원 과정	EE622	검출 및 추정	EE622	신호검파론	교과목 명칭 변경
대학원 과정	EE624	셀룰라망 시스템 및 프로토콜	EE624	이동통신 시스템	교과목 명칭 변경
대학원 과정	EE628	영상 압축 및 응용	EE628	영상통신시스템	교과목 명칭 변경
대학원 과정	EE650	통신망 최적화기법	EE726	통신망 최적화기법	교과목 번호 변경
대학원 과정	EE659	무선망 프로토콜 및 해석	EE658	무선 통신망	교과목 명칭 변경
대학원 과정	EE665	CMOS 프론트-앤드 공정기술	EE564	집적회로 프로세스	교과목 번호 및 명칭 변경
대학원 과정	EE672	미래학과 공학기술:미디어기술과 비즈니스 전략	EE572	미래학과 공학기술:미디어기술과 비즈니스 전략	교과목 번호 변경
대학원 과정	EE679	저잡음 저전력 아날로그 회로	EE679	통신용 아날로그 및 혼성회로	교과목 명칭 변경
대학원 과정	EE688	최적제어이론	EE786	최적제어 이론	교과목 번호 변경
대학원 과정	EE692	병렬분산 알고리즘	EE724	병렬분산 알고리즘	교과목 번호 변경
대학원 과정	EE696	통신소프트웨어설계	EE524	통신소프트웨어 설계	교과목 번호 변경
대학원 과정	EE737	의료영상공학	EE737	영상시스템	교과목 명칭 변경
대학원 과정	EE966	세미나(석사)<콜로키움>	EE969	논문세미나(석사)	교과목 미운영
대학원 과정	EE986	세미나(박사)<콜로키움>	EE989	논문세미나(박사)	교과목 미운영

타 학과 대체 교과목					
구분	학과 교과목		타학과 교과목		
	과목번호	교 과 목 명	과목번호	교 과 목 명	비 고
학사과정	EE303	디지털시스템	CS211	디지탈시스템 및 실험	단방향
	EE312	컴퓨터 구조개론	CS311	전산기 조직	양방향
	EE450	과학기술 기업가 정신	BTM450	기업가정신과 벤처	양방향
	EE451	IT 벤처창업의 실제	BTM451	벤처창업기획과 실제	양방향
대학원과정	EE612	이산사건시스템 모델링 시뮬레이션	CS655	시스템모델링 및 분석	양방향
	EE534	패턴인식	CS676	패턴인식	양방향

※ 해당 이수요건 연도에 따라 대체과목은 다를 수 있음.

석·박사
학위논문심사 절차

KAIST

KAIST

석사과정 학위취득에 관한 서류 제출 절차

절 차	추가 설명
석사 학위논문계획서(Thesis Proposal) 제출	입학 후 10개월 이내
⬇	
석사학위논문 심사위원 위촉	심사위원 3인 위촉
⬇	
학위청구논문 제출 (심사용)	심사위원에게 직접 제출
⬇	
논 문 심 사	매학기 정해진 논문심사 일정에 따라 진행
⬇	
석사학위논문 심사결과 보고서 제출	논문심사 기간 만료 후 일주일이내
⬇	
논 문 제 출	Hard Bound 2부/ Soft Bound 2부

박사과정 학위취득에 관한 서류 제출 절차

절 차	추가 설명
박사자격시험	입학후 1년 6개월이내
⬇	
박사 학위논문계획심사	입학후 2년이내 2년내 미통과시 1년마다 심사지연경위서 및 지도교수사유서 제출
⬇	
박사학위논문계획서 구두시험 결과보고서 제출	심사위원 5인 위촉 (심사위원중 2인 학부추천)
⬇	
박사학위청구논문 심사요청서 제출	졸업하는 마지막학기
⬇	
논 문 심 사	학기중 논문심사 일정에 따라 진행
⬇	
박사학위청구논문 심사결과 및 종합시험결과보고서 제출	해당 기간내(졸업관리 시스템에 심사위원회 직접 입력
⬇	
논 문 제 출	Hard Bound 2부/ Soft Bound 2부

석사과정
복수학위 프로그램

KAIST

KAIST

석사과정 복수학위 프로그램

1. KAIST EE – DTU EE / PE Dual Degree Program

ㅇ 복수학위 수여기관

Institute	Department	Degrees
KAIST	School of Elctrical Engineering	MS in Electrical Engineering
DTU	Dept. of Photonics Engineering	MSc. Eng. in Photonics Engineering
	Dept. of Electrical Engineering	MSc. Eng. in Electrical Engineering

ㅇ 학위과정 수행내용

2년의 수학기간 중 DTU에서 연속 2학기 수학해야 하며 양 기관의 학위수여기준을 충족시켜야 함

ㅇ 대상

- 석사과정 진학 예정인 전기및전자공학부 4학년생 (학사과정의 마지막 학기 중에 지원)
- 석사과정 재학생 (석사과정의 첫 번째 학기 중에 지원)

ㅇ 지원 시기

- 봄학기 시작 과정 지원시 전년도 10월 15일까지 지원
- 가을학기 지원시 4월 1일까지 지원

ㅇ 자격 요건

- 전기및전자공학부 학사 학위를 평균 이상의 점수로 졸업한 학생
- 파견교 (DTU)에서 학업을 시작하는 시기에 요구되는 영어 요건을 충족시켜야 함.

2. KAIST EE – GT ECE Dual Degree Program

ㅇ 복수학위 수여기관

Institute	Department	Degrees
KAIST	School of Electrical Engineering	Electrical Engineering
GaTech	School of Electrical and Computer Engineering	▪Electrical Engineering ▪Computer Engineering

ㅇ 학위과정 수행내용

양측 기관에서 최소 1년씩 수학하며, 각 기관에서 요구하는 학위수여기준을 만족해야 함

ㅇ 대상

- 석사과정 진학 예정인 전기및전자공학부 4학년생/ 석사과정 재학생

ㅇ 지원 시기

- 가을학기부터 시작하는 과정만 지원 가능, 10월 초순까지 지원

ㅇ 자격 요건

- KAIST와 GT 양 기관의 입학 요건(TOEFL 최소 점수를 포함)을 충족시켜야 함.

산학교육 프로그램 소개 및 교과목 안내

- 반도체공학프로그램(KEPSI)
- 삼성반도체교육프로그램(EPSS)
- LGD 디스플레이 인력양성 교육프로그램(LGenius)
- 삼성디스플레이 인재양성프로그램(EPSD)

KAIST

반도체공학프로그램

(KEPSI: KAIST Educational Program for Semiconductor Industry)

1. 소 개 (KEPSI)

반도체공학프로그램(KEPSI: KAIST Educational Program for Semiconductor Industry)은 반도체 분야의 맞춤형 산학 교육 모델로서 1996년에 설치되어 운영되고 있다. 본 프로그램에서는 SK하이닉스의 공동지도교수 및 인턴십 등을 통하여 실무 경험을 쌓을 수 있는 기회를 제공하며, KEPSI 프로그램의 지속적인 산학 맞춤형 교육과정 개발을 통하여 고도의 학제적 지식과 기술을 갖춘 21세기 세계 반도체 기술을 선도할 수 있는 고급인력 양성에 주력할 것이다.

그 동안 KEPSI 프로그램에서 배출한 많은 고급 기술 인력들의 우수한 연구 성과로 인한 참여기업내의 기여로, 재협약을 통하여 프로그램을 연장하는데 합의하였다. KEPSI 프로그램은 기존 전기및전자공학부 외에 2008년에 물리학과, 신소재공학과, 2011년부터는 화학과, 생명화학공학과, 2013년에 전산학부, 2018년에는 산업및시스템공학과, 2022년에는 바이오및뇌공학과를 참여학과에 포함하여 석.박사과정 장학생을 선발하고 있다.

2. 연구 및 교육 분야

1) 연구 분야 : 반도체 소자, 공정, 회로 분야 및 미래기술분야(Software, 통계 등)
2) 참여 학과 : 전기및전자공학부, 전산학부, 물리학과, 화학과, 생명화학공학과, 신소재공학과, 산업및시스템공학과, 바이오및뇌공학과
3) 교과 과정 : 각 소속학과의 교과과정을 따르되, 프로그램에서 권장하는 교과목이 있으며, 석.박사과정 인턴십은 이수하여야 함.

3. 학위과정

대학원 교육과정으로서 석사 및 박사과정이 있으며, 학위는 각 소속학과의 학위수여 조건을 만족하여야 함. (각 소속학과의 공학/이학석사 또는 공학/이학박사)

4. 혜택 및 의무 사항

1) 교육경비 전액 지원
2) 논문연구비 지원 : 국비장학생 기준에 준하며, 해당 실험실에 지원함.
3) 매월 장학금 지원(※ 참여기업에서 별도 지원)
4) 해외학회참가 지원 (석사과정 중 1회, 박사과정 중 2회)
5) 참여기업에 취업 보장
6) 석사과정 중 1개월 동안 SK하이닉스 인턴십 프로그램에 참가해야 함.
7) 졸업 후 수혜기간의 2배 기간 동안 참여기업 의무 근무 필요

※ 필수 의무 준수 사항:

1) 학위과정 종료 전에 본 프로그램 탈퇴는 원칙적으로 불허함.
2) 특히, 현재 수혜받고 있는 프로그램을 탈퇴하고 경쟁관계에 있는 타회사 지원 산학프로그램으로 변경하는 것은 절대 불허함.
3) (2)항 위반 시 발생하는 법적 소송 포함 경제적/윤리적 책임은 수혜 학생이 전적으로 책임 짐.

5. 문의처

- 반도체공학프로그램 (KEPSI) : (042) 350 - 8584
- 홈페이지 : http://kepsi.kaist.ac.kr/
- 이메일 : epioffice@kaist.ac.kr

6. 참여기업 및 참여교수

1) 참여 기업 : SK하이닉스
2) 참여 교수

※ 반도체공학프로그램의 연구분야와 일치하고, 참여의사가 있는 경우에는 참여교수 명단에 제외되었더라도 참여 가능함.

학과	인원	명단
전기및전자공학부	60	권경하, 강준혁, 김대식, 김동준, 김상식, 김상현, 김용대, 김용훈, 김이섭, 김정호, 김주영, 김창익, 김현식, 김회린, 김 훈, 노용만, 류승탁, 문건우, 문재균, 박경수, 박성욱, 박인철, 박현욱, 박현철, 배현민, 손영익, 신민철, 신영수, 양경훈, 원유집, 유경식, 유승협, 유종원, 유창동, 유회준, 윤기완, 윤준보, 윤찬현, 이가영, 이성주, 이정용, 이창희, 이현주, 장동의, 장민석, 전상훈, 정명수, 정완영, 정재웅, 제민규, 조병진, 조성환, 최경철, 최성율, 최신현, 최양규, 하정석, 최정우, 함자쿠르트, 홍성철
전산학부	9	권영진, 김대영, 김명호, 김순태, 백종문, 윤성의, 조성호, 한동수, 허재혁
물리학과	5	박용근, 서민교, 심흥선, 양찬호, 조용훈
화학과	14	김우연, 김현우, 박윤수, 박정영, 변혜령, 백윤정, 서명은, 송현준, 윤동기, 이해신, 최인성, 한상우, 홍순혁, 홍승우
생명화학공학과	7	김범준, 김신현, 이도창, 이상엽, 임성갑, 정희태, 최시영
신소재공학과	27	강기범, 강지형, 김경민, 김도경, 김상욱, 김일두, 남윤성, 박병국, 박상희, 배병수, 신병하, 신종화, 오지훈, 육종민, 염지현, 이건재, 이혁모, 장재범, 정성윤, 정연식, 정우철, 조은애, 조힘찬, 최벽파, 한승민, 홍승범, Steve Park
산업및시스템공학과	9	김우창, 김희영, 문일철, 박진규, 신하용, 이문용, 이태식, 장영재, Shuping Xiong
바이오및뇌공학과	9	김철, 남윤기, 박성준, 박제균, 송성민, 장무석, 정기훈, 조광현, 최명철

삼성반도체교육프로그램

(EPSS : Educational Program for Samsung Semiconductor)

1. 소 개 (EPSS)

삼성반도체교육프로그램은 최적화된 맞춤형 교육 프로그램을 통하여, 메모리 및 시스템 LSI 분야의 반도체 설계 소자 및 공정 & 관련 소프트웨어 분야의 이론과 실무를 겸비한 우수인력을 양성하여 참여 기업에 지속적으로 차세대 부도체 고급인력을 지원하고자 2005년 8월 설립되어, KAIST 내의 6개 학과(전기및전자공학부, 전산학부, 물리학과, 화학과, 생명화학공학과, 신소재공학과)가 공동으로 참여하고 있다.

2. 교육 및 연구 분야

1) 분 야 : 메모리 및 시스템 LSI 분야의 반도체 설계, 소자 및 공정 & 관련 소프트웨어 분야
2) 교과 과정 : 소속학과 교과과정과 "반도체학제전공(STEP)"의 교과과정을 따른다.

※ 반도체학제전공(STEP) 교과목 이수 요건

과정	교 과 목 학 점				연구	계
	공통필수	학제전공선택		소속학과 인정 전공교과목		
		필수선택	일반선택			
석사	3	3	9	6	6이상	33
박사	3	6	12	9	30	60

- 석사과정에서 이수한 교과목 학점은 박사과정 이수학점에 누적 가산할 수 있음.
- 각 과정 반드시 학제전공에서 지정한 요건을 이수하는 동시에 소속학과의 이수요건을 만족시켜야 함.
- STE998(석사 인턴십, 1학점) : 석사과정에서 반드시 이수하여야 함.
- STE999(박사 인턴십, 1학점) : 박사과정에서 반드시 이수하여야 함.

3. 학위과정

대학원 교육과정으로서 석사 및 박사과정이 있으며, 학위기에는 "반도체학제전공"과 학생이 소속한 참여학과 명칭이 동시에 기록된다.(단, 소속학과와 반도체학제전공의 이수요건을 동시에 만족한 경우)

4. 혜택 및 의무 사항

1) 교육경비 전액 지원
2) 논문연구비 지원 : 국비장학생 기준에 준하며 해당 실험실에 지원
3) 매월 장학금 및 주거보조비 지원
4) 참여기업에 취업 보장
5) 졸업 후 수혜기간의 2배 기간 동안 참여기업 의무 근무 필요

※ 필수 의무 준수 사항:

1) 학위과정 종료 전에 본 프로그램 탈퇴는 원칙적으로 불허함.
2) 특히, 현재 수혜받고 있는 프로그램을 탈퇴하고 경쟁관계에 있는 타회사 지원 산학프로그램으로 변경하는 것은 절대 불허함.
3) (2)항 위반 시 발생하는 법적 소송 포함 경제적/윤리적 책임은 수혜 학생이 전적으로 책임 짐.

5. 문의처

삼성반도체교육프로그램(EPSS) 사무국 : (042) 350 - 8584
홈페이지 : http://epss.kaist.ac.kr/
이메일 : epioffice@kaist.ac.kr

6. 참여기업 및 참여교수

1) 참여기업: 삼성전자(주)
2) 참여교수

※ 삼성반도체교육프로그램의 연구 분야와 일치하고, 참여의사가 있을 경우 참여교수 명단에 제외되었더라도 추가 참여 가능함.

학과	인원	명단
전기및전자공학부	68	권경하, 강준혁, 김대식, 김동준, 김문철, 김상식, 김상현, 김용대, 김용훈, 김이섭, 김정호, 김주영, 김창익, 김현식, 김회린, 김 훈, 노용만, 류승탁, 문재균, 박경수, 박동조, 박성욱, 박인철, 박현욱, 박현철, 배현민, 성영철, 손영익, 신민철, 신영수, 양경훈, 원유집, 유경식, 유민수, 유승협, 유종원, 유창동, 유회준, 윤기완, 윤준보, 윤찬현, 이가영, 이성주, 이정용, 이창희, 이현주, 장동의, 장민석, 전상훈, 정명수, 정세영, 정완영, 정재웅, 제민규, 조병진, 조성환, 최경철, 최성율, 최신현, 최양규, 최정우, 최준일, 하정석, 한동수, 한민수, 한영남, 함자쿠르트, 홍성철
전산학부	11	권영진, 김대영, 김명호, 김문주, 김순태, 백종문, 신인식, 윤성의, 조성호, 최호진, 허재혁
물리학과	4	박용근, 심흥선, 양찬호, 조용훈
화학과	17	김우연, 김현우, 박윤수, 박정영, 변혜령, 백무현, 백윤정, 서명은, 윤동기, 이해신, 이효철, 이희윤, 최인성, 한상우, 홍순혁, 홍승우, David G. Churchill
생명화학공학과	9	김범준, 김신현, 김범준, 김지한, 김희탁, 이도창, 임성갑, 정희태, 최시영
신소재공학과	28	강기범, 강지형, 김경민, 김도경, 김상욱, 김일두, 박병국, 박상희, 박찬범, 배병수, 서동화, 신병하, 신종화, 육종민, 오지훈, 염지현, 이건재, 이혁모, 장재범, 정성윤, 정연식, 정우철, 조은애, 조힘찬, 최벽파, 홍승범, 한승민, Steve Park

반도체학제전공

반도체학제전공 전공과목 이수요건
(석사과정용)

논문석사

▣ **졸업이수학점:** 총 33학점 이상 이수

▣ **공통필수:** 3학점 이상 및 1AU 이수

- CC500(Scientific Writing), CC510(전산응용개론), CC511(확률 및 통계학), CC512(신소재과학개론), CC513(공업경제 및 원가분석학), CC522(계측개론), CC530(기업과 정신과 경영전략), CC531(특허분석과 발명출원), CC532(협력시스템설계) 중에서 택 1 하여 이수.
- CC010 (리더십강좌), CC020(윤리및안전 I) 반드시 이수

▣ **학제전공 필수선택:** 3학점 이상 이수

- STE505(반도체 공정실험), EE571(전자회로특론), CS550(소프트웨어공학) 중에서 1과목 이상 반드시 이수해야 함.

▣ **학제전공 일반선택:** 9학점 이상 이수

- 본 학제전공에서 지정한 일반선택 교과목 중에서 택 3하여 9학점 이상 이수

▣ **소속학과 인정 전공교과목:** 6학점 이상 이수

- 각 소속학과/전공의 이수요건으로 인정한 전공교과목 중 택 2하여 6학점 이상 이수.

▣ **연구:** 6학점 이상 이수

○ 반드시 STE998 석사인턴십 (1학점)을 포함하여 연구 6학점 이상 이수

- 논문연구, 개별연구, 세미나 등으로 6학점 이상 이수.
  (각 소속학과/전공의 연구과목으로 대체 가능함)

※ 학제전공에서 지정한 요건을 이수하는 동시에 소속학과의 이수요건을 만족시켜야 함.

교과석사

상 동

□ 경과조치

- 대체교과목 변경

2009학년도 입학생부터 EE665(CMOS프론트-앤드공정기술), MS696(신소재공학특론I(고급반도체공정설계)) 중 한 과목만 수강,

2009학년도 이전 입학생은 EE665(CMOS프론트-앤드공정기술), MS635(반도체공정설계) 중 한과목만 수강해야함.

반도체학제전공 전공과목 이수요건
(박사과정용)

▣ **졸업이수학점:** 총 60학점 이상 이수

▣ **공통필수:** 3학점 이상 및 1AU 이수
- 석사과정과 동일. (단, 석사과정에서 이수한 경우 이수하지 않아도 됨)

▣ **학제전공 필수선택:** 6학점 이상 이수
- 석사과정에서 이수한 교과목을 포함하여 6학점 이수.
- STE505(반도체공정실험), STE605(메모리및SoC기술), EE571(전자회로특론), CS550(소프트웨어공학) 중에서 2과목 이상 반드시 이수하여야 함.

▣ **학제전공 일반선택:** 12학점 이상 이수
- 석사과정에서 이수한 교과목을 포함하여 12학점 이상 이수.

▣ **소속학과 인정 전공교과목:** 9학점 이상 이수
- 각 소속학과/전공의 이수요건으로 인정한 전공교과목 중 석사과정에서 이수한 교과목을 포함하여 9학점 이상 이수.

▣ **연구:** 30학점 이상 이수

○ 반드시 STE999 박사인턴십 (1학점)을 포함하여 연구 30학점 이상 이수
- 논문연구, 개별연구, 세미나 등으로 30학점 이상 이수.
  (각 소속학과/전공의 연구과목으로 대체 가능함)

□ **경과조치**
- 대체교과목 변경

2009학년도 입학생부터 EE665(CMOS프론트-앤드공정기술), MS696(신소재공학특론I(고급반도체공정설계)) 중 한 과목만 수강,

2009학년도 이전 입학생은 EE665(CMOS프론트-앤드공정기술), MS635(반도체공정설계) 중 한과목만 수강해야함.

교과목 일람표

과목구분		과목번호	전산 코드	교 과 목 명	강:실:학 (숙제)	개설학기	비고
공통필수 (택 1)		CC500	11.500	Scientific Writing	3:0:3(4)	봄·가을	
		CC510	11.510	전산응용개론	2:3:3(10)	봄·가을	
		CC511	11.511	확률 및 통계학	2:3:3(6)	봄·가을	
		CC512	11.512	신소재과학개론	3:0:3(3)	봄·가을	
		CC513	11.513	공업경제 및 원가분석학	3:0:3(6)	가을	
		CC522	11.522	계측개론	2:3:3(8)	가을	
		CC530	11.530	기업가 정신과 경영전략	3:0:3(6)	가을	
		CC531	11.531	특허분석과 발명출원	3:0:3(6)	봄·가을	
		CC532	11.532	협력시스템설계	4:0:4	봄	
학제 전공 선택	필수 선택	STE505	48.505	반도체 공정실험	2:6:3	여름	
		STE605	48.605	메모리 및 SoC기술	3:0:3	가을	◆
		EE571	35.571	전자회로특론	3:0:3(6)	봄	
		CS550	36.550	소프트웨어공학	3:0:3(4)	봄	
	일반 선택	PH441	20.441	플라즈마물리학개론	3:0:3(4.5)	가을	◎
		PH611	20.611	고체물리학특론 I	3:0:3(4.5)	봄·가을	
		PH613	20.613	반도체물리학	3:0:3(4.5)	봄·가을	
		PH621	20.621	응용파동광학	3:0:3(4.5)	봄·가을	
		PH643	20.643	응용플라즈마물리학	3:0:3(4.5)	봄·가을	
		CH471	23.471	고분자화학개론	3:0:3(3)	봄or가을	◎
		CH521	23.521	고급유기화학	3:0:3(3)	봄	
		CH671	23.671	유기고분자화학	3:0:3(3)	봄or가을	
		CH672	23.672	특성고분자화학	3:0:3(3)	봄or가을	
		CH674	23.674	유기전자소재화학	3:0:3(3)	봄or가을	
		CH675	23.675	리소그래피개론	3:0:3(3)	봄or가을	
		CH774	23.774	고분자화학특강II	3:0:3(3)	봄or가을	
		MS536	34.536	박막제조공학	3:0:3(2)	봄	◎
		MS591	34.591	차세대 나노팹공학	3:0:3(3)	가을	◎
		MS592	34.592	무기나노소재	3:0:3(3)	봄	◎
		MS613	34.613	고체물리	3:0:3(3)	가을	□ EE661
		MS625	34.625	디스플레이용 박막트랜지스터	3:0:3(3)	가을	
		MS635	34.635	반도체 공정설계	3:1:3(3)	가을	
		MS642	34.642	전자패키징기술	3:0:3(2)	봄	
		MS654	34.654	표면과학	3:0:3(2)	봄	
		MS684	34.684	반도체 소자공학	3:0:3(3)	봄	□ EE561
		MS696	34.696	신소재공학특론I (고급 반도체공정설계)	3:0:3(3)	봄·가을	□ EE665 (해당 부제만 인정)
		MS697	34.697	신소재공학특론II <화합물 반도체와 나노소자>	3:0:3(3)	봄·가을	(해당 부제만 인정)
		EE432	35.432	디지털신호처리	3:0:3(6)	봄·가을	◎
		EE511	35.511	전산기구조	3:0:3(6)	봄	◎
		EE535	35.535	영상처리	3:0:3(6)	봄	◎
		EE561	35.561	집적회로소자 개론	3:0:3(6)	봄	◎ □ MS684
		EE566	35.566	MEMS 전자공학	3:0:3(6)	봄or가을	◎
		EE568	35.568	유기전자공학	3:0:3(6)	가을	◎

과목구분		과목번호	전산 코드	교 과 목 명	강:실:학 (숙제)	개설학기	비고
		EE573	35.573	VLSI시스템개론	3:0:3(6)	봄	◎
		EE576	35.576	저잡음 전자회로	3:0:3(6)	가을	◎
		EE641	35.641	초고주파 집적회로	3:0:3(6)	봄	
		EE661	35.661	고체물리	3:0:3(6)	가을	□ MS613
		EE663	35.663	고주파전자소자	3:0:3(6)	봄or가을	
		EE665	35.665	CMOS프론트-앤드 공정기술	3:0:3(6)	가을	□ MS696
		EE676	35.676	아날로그집적회로	3:0:3(6)	가을	
		EE678	35.678	디지털집적회로	3:0:3(6)	가을	
		EE762	35.762	고급MOS소자물리	3:0:3(6)	가을	
		EE766	35.766	플라즈마 전자	3:0:3(6)	가을	
		EE772	35.772	그린에너지 전자회로	3:0:3(6)	가을	
		CS453	36.453	소프트웨어 테스팅 자동화기법	3:0:3(6)	봄	◎
		CS500	36.500	알고리즘 설계와 해석	3:0:3(6)	봄	◎
		CS510	36.510	컴퓨터 구조	3:0:3(6)	봄	◎
		CS530	36.530	운영체제	3:0:3(6)	봄or가을	◎
		CS540	36.540	네트워크 아키텍춰	3:0:3(6)	봄or가을	◎
		CS570	36.570	인공지능 및 기계학습	3:0:3(6)	봄	◎
		CS572	36.572	지능형 로보틱스	3:0:3(6)	가을	◎
		CS632	36.632	내장형 운영체제	3:0:3(6)	가을	
		CBE473	39.473	미세전자공정	3:0:3(3)	봄·가을	◎
		CBE512	39.512	촉매공학개론	3:0:3(4)	봄·가을	◎
		CBE525	39.525	분자전자학	3:0:3(3)	봄·가을	◎
		CBE554	39.554	고분자의 물리적 원리	3:0:3(3)	가을	◎
		CBE556	39.556	고분자구조와 물성	3:0:3(3)	봄	◎
		CBE572	39.572	무기재료공정	3:0:3(4)	봄·가을	◎
		CBE581	39.581	미세생명화학시스템	3:0:3(3)	봄	◎
		CBE623	39.623	나노박막공학	3:0:3	가을	
		CBE682	39.682	유기나노구조재료	3:0:3(3)	가을	
		CBE683	39.683	고분자 전자재료 및 소자	3:0:3	봄·가을	
		CBE773	39.773	생명화학공학의 최근동향 (고분자 광전자 재료)	3:0:3(3)	봄·가을	해당 부제만 인정
연구		STE998	48.998	석사 인턴십	0:0:1	여름·겨울	
		STE999	48.999	박사 인턴십	0:0:1	여름·겨울	
		STE960	48.960	논문연구(석사)			
		STE980	48.980	논문연구(박사)			

◆ : 석사과정에서는 일반선택으로 인정 ◎ : 학사·대학원 상호인정교과목 □ : 대체과목

※ 대체과목 중복 수강 불가

(예) 1. EE561(집적회로소자개론), MS684(반도체 소자공학) 중 한 과목만 수강

2. EE665(CMOS프론트-앤드공정기술), MS696(신소재공학특론I(고급반도체공정설계)) 중 한 과목만 수강

3. EE661(고체물리), MS613(고체물리) 중 한 과목만 수강

LGD 디스플레이 인력양성 교육프로그램
(LGenius 프로그램)

1. 소개

KAIST와 LG 디스플레이(주)의 맞춤형 선발 및 교육과정을 통하여 이론과 실무를 겸비한 디스플레이 분야의 전문 인력 양성을 지원하기 위한 산업체와의 협력 프로그램이다.

참여기업인 LG 디스플레이(주)의 공동 논문 지도 위원 및 인턴십 등을 통하여 참여 학생들에게 실무 경험을 쌓을 수 있는 기회를 제공하며, KAIST의 양질의 교육시스템을 통하여 고도의 학제적 지식과 기술을 갖춘 디스플레이 분야의 고급핵심인력을 공동 육성하여 안정적·지속적으로 지원하는데 목적이 있다.

2. 교육 및 연구분야

1) 분야 : 디스플레이 분야에 관련된 소자, 재료, 공정, 회로, 장비 분야
   - LCD, LED, OLED, 3D, 플렉시블 및 투명 디스플레이 등
   - 디스플레이 소자, 재료, 공정, 설계, 회로, 영상처리
2) 참여학과 : 전기및전자공학부, 물리학과, 화학과, 기계공학과, 생명화학공학과, 신소재공학과
3) 교과과정 : 각 소속학과의 교과과정을 따르되, 프로그램에서 권장하는 교과목이 있으며, 석.박사과정 인턴십은 이수하여야 함.

3. 학위과정

대학원 교육과정으로서 석사 및 박사과정이 있으며, 학위는 각 소속학과의 학위수여 조건을 만족하여야 함. (각 소속학과의 공학/이학석사 또는 공학/이학박사)

4. 혜택 및 의무사항

1) 교육경비 전액 지원
2) 실험실 배정 : LGenius 연구분야 우선배정
3) 논문연구비 지원 : 국비장학생 기준에 준하며 해당 실험실에 지원
4) 매월 장학금 지원
5) 참여기업에 취업 보장
6) 재학과정 중 1개월 동안 LG Display 인턴십 프로그램에 참가해야 함.
7) 졸업 후 수혜기간의 2배 기간 동안 참여기업 의무 근무 필요

※ 필수 의무 준수 사항:

1) 학위과정 종료 전에 본 프로그램 탈퇴는 원칙적으로 불허함.
2) 특히, 현재 수혜받고 있는 프로그램을 탈퇴하고 경쟁관계에 있는 타회사 지원 산학프로그램으로 변경하는 것은 절대 불허함.
3) (2)항 위반 시 발생하는 법적 소송 포함 경제적/윤리적 책임은 수혜 학생이 전적으로 책임 짐.

5. 문의처

LGenius 사무국 : (042) 350 - 8584
홈페이지 : http://lgenius.kaist.ac.kr
이메일 : epioffice@kaist.ac.kr

6. 참여기업 및 참여교수

1) 참여기업 : LG Display(주)
2) 참여교수

※ LGenius 프로그램의 연구 분야와 일치하고, 참여의사가 있을 경우 참여교수 명단에 제외되었더라도 추가 참여 가능함.

학과	인원	명단
전기및전자공학부	46	권경하, 김대식, 김상식, 김상현, 김용훈, 김이섭, 김정호, 김창익, 김현식, 김회린, 김 훈, 노용만, 류승탁, 문건우, 문재균, 박인철, 박현욱, 배현민, 손영익, 신민철, 양경훈, 유경식, 유승협, 유창동, 윤준보, 이가영, 이정용, 이창희, 이현주, 장동의, 장민석, 전상훈, 정명수, 정완영, 정재웅, 제민규, 조병진, 조성환, 최경철, 최성율, 최신현, 최양규, 최정우, 최준균, 한민수, 함자쿠르트,
물리학과	3	박용근, 서민교, 조용훈
화학과	14	김우연, 김현우, 박윤수, 박정영, 변혜령, 백윤정, 서명은, 송현준, 윤동기, 이해신, 최인성, 한상우, 홍순혁, 홍승우
기계공학과	10	김경수, 김성진, 김정원, 김택수, 민범기, 박인규, 박형순, 유승화, 이봉재, 이승섭
생명화학공학과	6	김범준, 김신현, 이도창, 임성갑, 정희태, 최시영
신소재공학과	23	강기범, 강지형, 김경민, 김도경, 김상욱, 김일두, 박상희, 배병수, 신병하, 신종화, 육종민, 오지훈, 염지현, 이건재, 이혁모, 장재범, 정성윤, 정연식, 조은애, 조힘찬, 홍승범, 한승민, Steve Park

삼성디스플레이 인재양성프로그램
(EPSD 프로그램)

1. 소개

삼성디스플레이 인재양성프로그램은 최첨단 디스플레이 분야에서 세계를 선도하고 있는 삼성디스플레이(주)와 디스플레이 제 분야 및 유관 분야에서 세계적 수준의 연구진과 교육 제도를 보유하고 있는 KAIST가 협력하여 차세대 고급 디스플레이 인력양성을 위한 산학협력 프로그램으로 2022년 2월에 설치되었다.

2. 교육 및 연구분야

1) 분야 : 디스플레이 발광 및 구동 소자, 디스플레이 광학, 디스플레이 재료, 회로설계 및 시스템 응용, 차세대 디스플레이 응용기술, 기타 디스플레이 유관기술
2) 참여학과 : 전기및전자공학부, 물리학과, 화학과, 기계공학과, 산업및시스템공학과, 생명화학공학과, 신소재공학과, 바이오및뇌공학과
3) 교과과정 : 각 소속학과의 교과과정을 따르되, 프로그램에서 권장하는 교과목이 있으며, 석.박사과정 인턴십은 이수하여야 함.

3. 학위과정

대학원 교육과정으로서 석사 및 박사과정이 있으며, 학위는 각 소속학과의 학위수여 조건을 만족하여야 함. (각 소속학과의 공학/이학석사 또는 공학/이학박사)

4. 혜택 및 의무사항

1) 교육경비 전액 지원
2) 실험실 배정 : 삼성디스플레이 연구분야 우선배정
3) 논문연구비 지원 : 국비장학생 기준에 준하며 해당 실험실에 지원
4) 매월 장학금 지원
5) 참여기업에 취업 보장
6) 재학과정 중 1개월 동안 삼성디스플레이 인턴십 프로그램에 참가해야 함.
7) 졸업 후 수혜기간의 2배 기간 동안 참여기업 의무 근무 필요

※ 필수 의무 준수 사항:

1) 학위과정 종료 전에 본 프로그램 탈퇴는 원칙적으로 불허함.
2) 특히, 현재 수혜받고 있는 프로그램을 탈퇴하고 경쟁관계에 있는 타회사 지원 산학프로그램으로 변경하는 것은 절대 불허함.
3) (2)항 위반 시 발생하는 법적 소송 포함 경제적/윤리적 책임은 수혜 학생이 전적으로 책임 짐.

5. 문의처

LGenius 사무국 : (042) 350 - 8584
홈페이지 : http://EPSD.kaist.ac.kr
이메일 : epioffice@kaist.ac.kr

6. 참여기업 및 참여교수

1) 참여기업 : 삼성디스플레이(주)
2) 참여교수

※ EPSD프로그램의 연구 분야와 일치하고, 참여의사가 있을 경우 참여교수 명단에 제외되었더라도 추가 참여 가능함.

학과	인원	명단
전기및전자공학부	35	권경하, 김문철, 김상식, 김상현, 김용훈, 김창익, 김훈, 김현식, 노용만, 류승탁, 박성욱, 배준우, 손영익, 송익호, 신민철, 유경식, 유승협, 유창동, 윤기완, 윤준보, 윤찬현, 이가영, 이정용, 이현주, 장동의, 장민석, 전상훈, 정완영, 정재웅, 제민규, 조병진, 최경철, 최성율, 최정우, Hamza Kurt
물리학과	17	강명수, 김갑진, 김동규, 김용관, 김용현, 라영식, 박용근, 서민교, 양용수, 양희준, 양찬호, 이경진, 이상민, 이한석, 안드레이 모스칼렌크, 조성재, 조용훈
화학과	12	박기영, 박윤수, 박정영, 백윤정, 송현준, 윤동기, 이영민, 최인성, 한상우, 한순규, 홍순혁, 홍승우
기계공학과	8	경기욱, 김택수, 김형수 김산하, 심기동, 유승화, 이필승, 전원주
산업및시스템공학과	11	김우창, 김현정, 김희영, 문일철, 민승기, 박진규, 박찬영, 신하용, 안정연, 장영재, Shuping Xiong
생명화학공학과	5	김신현, 김범준, 이도창, 임성갑, 정희태
신소재공학과	19	강기범, 강지형, 김경민, 김상욱, 박상희, 스티브박, 신병하, 염지현, 육종민, 이건재, 장재범, 정성윤, 정연식, 정우철, 조은애, 조힘찬, 최벽파, 한승민, 홍승범
바이오및뇌공학과	10	김철, 남윤기, 박성준, 박성홍, 박제균, 송성민, 장무석, 정기훈, 조광현, 최명철

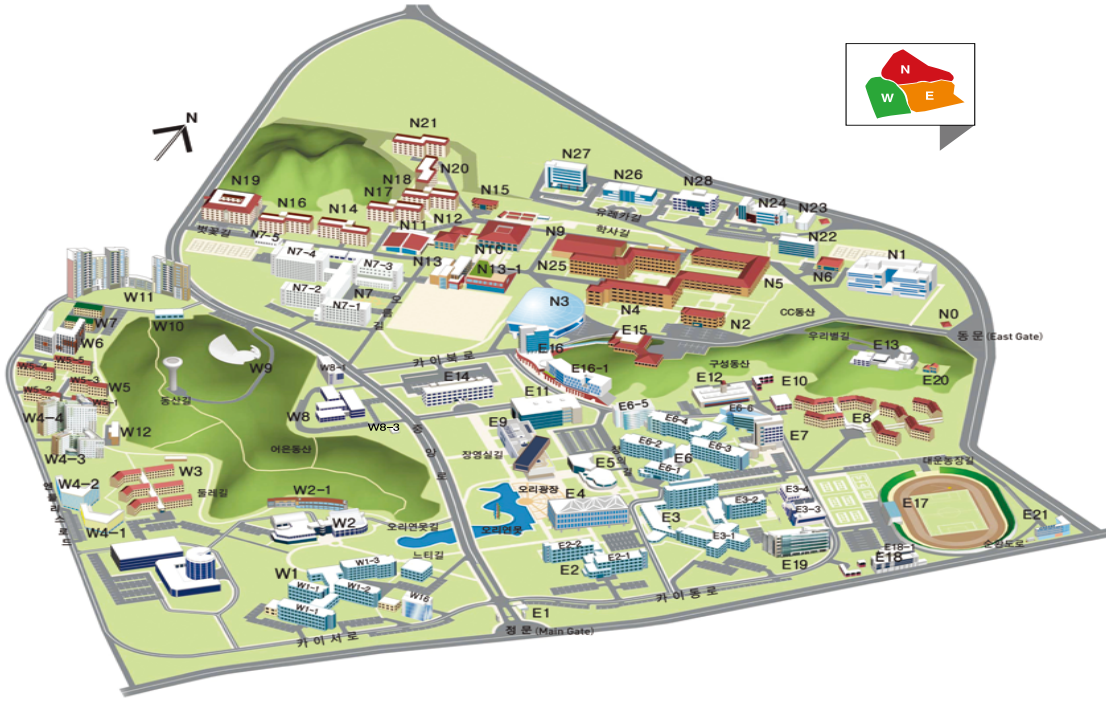
Campus Map

KAIST

KAIST MAIN CAMPUS MAP

본교 캠퍼스 안내

홈페이지 www.kaist.ac.kr
대표전화 042-350-2114
긴급연락 042-350-4000 (재난안전상황실)



N 북측건물

- **N0** 동문 (East Gate)
- **N1** 김병호·김삼열 IT융합 빌딩 (Kim Beang-Ho & Kim Sam-Youl ITC Building)
- **N2** 행정분관 (Branch Administration B/D)
- **N3** 스포츠 컴플렉스 (Sports Complex)
- **N4** 인문사회과학부동 (School of Humanities & Social Science B/D)
  - 어학센터 (Language Center)
- **N5** 융합연구동 (Convergence Research B/D)
- **N6** 교수회관 (Faculty Hall)
- **N7** 기계공학동 (Mechanical Engineering B/D)
  - 1 – 원자력및양자공학과 2405호* (Dept. of Nuclear & Quantum Engineering)
  - 2 – 항공우주공학과 2301호* (Dept. of Aerospace Engineering)
  - 3, 4 – 기계공학과 3226호* (Dept. of Mechanical Engineering)
  - 5 – 자동차기술대학원 실험동 (Automobile Technology Laboratory Building)
- **N9** 실습동 (Practice B/D)
- **N10** 교양분관 (Undergraduate Branch Library)
- **N11** 학생식당 (Cafeteria)
- **N12** 학생회관-2 (Student Center-2)
- **N13** 태울관 (Tae Wul Gwan)
  - 1 – 장영신 학생회관 (Chang Young Shin Student Center)
- **N14** 사랑관 (Sarang Hall)
- **N15** 교직원 숙소 (Staff Accommodation)
- **N16** 소망관 (Somang Hall)
- **N17** 성실관 (Seongsil Hall)
- **N18** 진리관 (Jilli Hall)
- **N19** 아름관 (Areum Hall)
- **N20** 신뢰관 (Silloe Hall)
- **N21** 지혜관 (Jihye Hall)
- **N22** 동문창업관 (Alumni Venture Hall)
- **N23** fMRI센터 (fMRI Center)
- **N24** LG이노베이션홀 (LG Innovation Hall)
- **N25** 산업디자인학과동 (Dept. of Industrial Design B/D)
- **N26** 고성능집적시스템연구센터 (Center for High-Performance Integrated Syetems)
- **N27** 유레카관 (Eureka Hall)
- **N28** 에너지환경연구센터 (Energy & Environment Research Center)

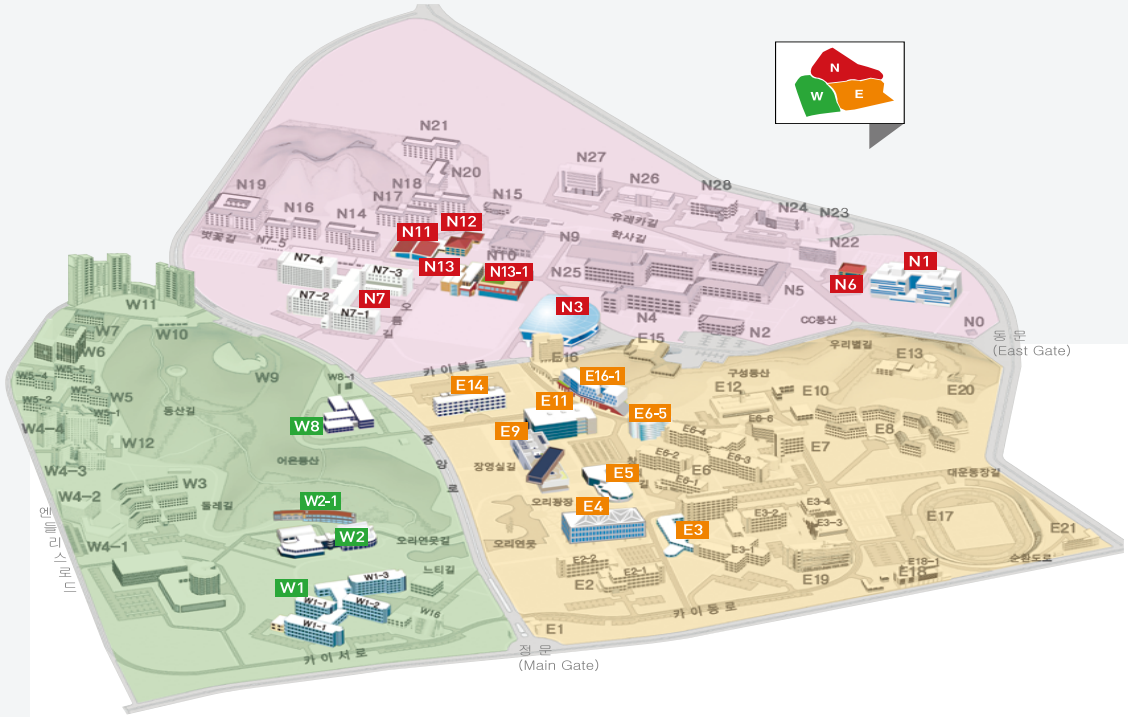
E 동측건물

- **E1** 정문 (Main Gate)
- **E2** 산업경영학동 (Industrial Engineering & Management B/D)
  - 1 – 수리과학과 2221호* (Dept. of Mathematical Sciences)
  - 2 – 산업및시스템공학과 2126호* (Dept. of Industrial & Systems Engineering)
  - 지식서비스대학원 2126호* (Graduate School of Knowledge Service Engineering)
- **E3** 정보전자공학동 (Information & Electronics B/D)
  - 1 – 전산학부 1402호* (School of Computing)
  - 2 – 전기및전자공학부 1212호* (School of Electrical Engineering)
  - 3 – 미래융합소자동 (Device Innovation Facility)
  - 4 – 새늘동 (Saeneul Dong)
- **E4** KI빌딩 (KAIST Institutes B/D)
- **E5** 교직원회관 (Faculty Club)
- **E6** 자연과학동 (Natural Science B/D)
  - 1 – 수리과학과 2401호* (Dept. of Mathematical Sciences)
  - 2 – 물리학과 1301호* (Dept. of Physics)
  - 3 – 생명과학과 1204호* (Dept. of Biological Sciences)
  - 4 – 화학과 2122호* (Dept. of Chemistry)
  - 5 – 궁리실험관 (GoongNi Laboratory Building)
  - 6 – 기초과학동 (Basic Science Building)
- **E7** 의과학연구센터 (Biomedical Research Center)
- **E8** 세종관 (Sejong Hall)
- **E9** 학술문화관 (Academic Cultural Complex)
- **E10** 중앙창고 (Storehouse)
- **E11** 창의학습관 (Creative Learning B/D)
  - 입학처 (Office of Admissions)
  - 학생정책처 (Office of Student Affairs & Policy)
  - 학생생활처 (Office of Student Life)
- **E12** 중앙기계실 (Energy Plant)
- **E13** 인공위성연구센터 (Satellite Technology Research Center)
- **E14** 본관 (Main Administration B/D)
  - 교무처 (Office of Academic Affairs)
  - 연구처 (Office of Research Affairs)
  - 기획처 (Office of Planning and Budget)
  - 행정처 (Office of Administration)
- **E15** 대강당 (Auditorium)
- **E16** 정문술빌딩 (ChungMoonSoul B/D)
  - 1 – 양분순빌딩 (YANG Bun Soon B/D)
    - 입학처 (Office of Admissions)
    - 바이오및뇌공학과 202호* (Dept. of Bio and Brain Engineering)
- **E17** 운동장 (Stadium)
- **E18** 대전질환모델동물센터 (Daejeon Disease-model Animal Center)
  - 1 – 바이오모델 시스템파크 (Bio Model System Park)
- **E19** KAIST 부설 나노종합기술원 (National Nano Fab Center)
- **E20** 계룡관 (Kyeryong Hall)
- **E21** 카이스트 클리닉 (KAIST Clinic), 약국 (Pharmacy)

* 학과 사무실 호수

W 서측건물

- **W1** 응용공학동 (Applied Engineering B/D)
  - 1 – 신소재공학과 2408호* (Dept. of Materials Science & Engineering)
  - 2 – 건설및환경공학과 2206호* (Dept. of Civil & Environmental Engineering)
  - 3 – 생명화학공학과 2102호* (Dept. of Chemical & Biomolecular Engineering)
- **W2** 학생회관-1 (Student Center-1)
  - 1 – 인터내셔널센터 (International Center)
- **W3** 갈릴레이관 (Galilei Hall)
- **W4** 1 – 여울관 (Yeoul Hall)
  - 2 – 나들관 (Nadl Hall)
  - 3 – 다솜관 (Dasom Hall)
  - 4 – 희망관 (Heemang Hall)
- **W5** 1 – 기혼자기숙사 (Married Students Housing)
  - 2 – 스타트업빌리지 (Startup Village)
  - 3 – 인터내셔널빌리지 C (International Village C)
  - 4 – 인터내셔널빌리지 A (International Village A)
  - 5 – 인터내셔널빌리지 B (International Village B)
- **W6** 미르관, 나래관 (Mir Hall, Narae Hall)
- **W7** 나눔관 (Nanum Hall)
- **W8** 교육지원동 (Educational Support B/D)
  - 1 – 중앙분석센터 (Analysis Center for Research Advancement)
  - 3 – 카이헬프 (KAIHELP)
- **W9** 노천극장 (Outdoor Theater)
- **W10** 풍동실험실 (Wind Tunnel Laboratory)
- **W11** 외국인교수 아파트 (International Faculty Apartment)
- **W12** 서측기계실 (West Energy Plant)
- **W16** 지오센트리퓨지 실험동 (Geotechnical Centrifuge Testing Center)



KAIST MAIN BUILDING

교내 주요 건물 및
편의 시설

34141 대전광역시 유성구 대학로 291
291 Daehak-ro, Yuseong-gu, Daejeon 34141
www.kaist.ac.kr

N1 김병호·김삼열 IT융합 빌딩

탐앤탐스카페, 교내 매점

N3 스포츠 컴플렉스

N6 교수회관

영빈관, 회원제 식당

N7 기계공학동

오샐러드, 카페드림

W1 응용공학동

W2 학생회관-1

DDDN 피자, 서측 학생식당,
더큰도시락, 우리은행,
교내 매점, 여행사, 미용실,
새마을금고 등

N11 학생식당(카이마루)

오늘도든든, 휴김밥, 웰차이,
북측 학생식당, 쥬스킹,
리틀하노이, 캠토

N12 학생회관-2

교내 매점, 풀빛마루, 세탁소, 우체국, 이발소 등

W2-1 인터내셔널센터

카페 잇(EAT)

W8 교육지원동

드롭탑

N13 태울관

제순식당&설렁탕, 잡화점,
안경점, 건강관리실 등

N13-1 장영신 학생회관

롯데리아

E3 정보전자공학동

파스쿠찌

E4 KI빌딩

그라지에
- 퓨전홀
- 매트릭스 홀

E5 교직원회관

홍보관, 동측 학생식당,
교내 매점, 패컬티클럽

E6-5 궁리실험관

켈리포니아베이커리

E9 학술문화관

카페 오가다, 브랜드숍(기념품숍)
- 양승택 오디토리움
- 정근모 컨퍼런스홀
- 스카이라운지

E11 창의학습관

- 터만홀

E14 본관

E16-1 양분순빌딩

써브웨이

KAIST EE

KAIST SCHOOL OF
ELECTRICAL ENGINEERING