<Professor Youngjoo Lee's Lab.>

EPIC Embedded Processor & Intelligent Computing LAB

■ **Contact information**

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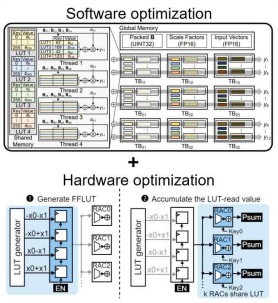
Website : https://sites.google.com/view/epiclab/home

■ **Current state of the Lab. (in 2025 Spring Semester)**

Postdoc Researchers: 1 / Ph.D. Students: 13 / Master's Students: 7

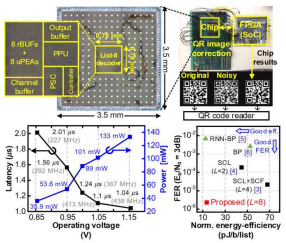
■ **Research Areas**

HW-SW Co-optimization



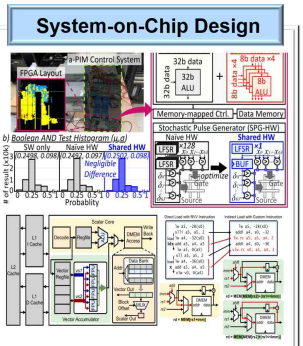
- Hardware-software co-optimization is a key topic in the field of energy-efficient ML.
- Our research focuses on developing model optimization algorithms and designing dedicated hardware architectures tailored to these algorithms.

VLSI Signal Processing



- Decoding of ECC has complex bit-domain operations. So ASIC (Application-Specific Integrated Circuit) could be better solution than commercial processor (CPU/GPU)
- We do both algorithm-level optimization and hardware-level optimization for various decoding algorithms (LDPC, Polar, GRAND, BOSS, OSD).
- We also implement hardware (chip) and evaluate the chip performance.

System-on-Chip Design



- RISC-V-based custom processor design for transformer based complex machine learning task for energy efficiency.
- End-to-end system construction to verify efficiency of target device's acceleration on widely-utilized algorithms in conventional system including PIM device.

■ **Recommended courses**

EE.30012 Introduction to Computer Architecture
EE.30003 Digital System Design
EE.30031 Introduction to Machine Learning
EE.40032 Digital Signal Processing
EE.40014 Embedded Systems

■ **Career after graduation**

EPIC Lab alumni have pursued careers across academia (e.g., national research institutes like ETRI), university, and industry (e.g., Samsung Electronics, Naver Cloud, Rebellions, FuriosaAI).

■ **Other activities besides research**

Voluntary activities include volunteering, picnic and skiing, etc.

■ **Introduction to the Lab.**

EPIC LAB at KAIST develops energy-efficient, application-specific processors for AI, communication, and IoT systems. Our research spans from algorithm–hardware co-design to full SoC implementation, focusing on compressed deep learning accelerators, 5G/6G baseband processors, and ultra-low-power embedded/IoT platforms. We are always looking for motivated and creative students to join our team and push the boundaries of embedded intelligence. For more information, visit our website or contact Prof. Youngjoo Lee at youngjoo@kaist.ac.kr.

■ **Recent research achievements**

[1] Area-efficient non-binary LDPC decoder with column-wise trellis min-max algorithm, IEEE JSSC, Mar. 2025.
[2] Panacea: Novel DNN accelerator using accuracy-preserving asymmetric quantization and energy-saving bit-slice sparsity, IEEE HPCA, Feb. 2025.
[3] LUT-GEMM: Quantized matrix multiplication based on LUTs for efficient inference in large-scale generative language models, ICLR, May 2024.
[4] A 21.9 ns, 15.7 Gbps/mm^2 (128, 15) BOSS FEC decoder for 5G/6G URLLC applications, IEEE ISSCC, Feb. 2024.