Welcome to ISL Lab
For prospective students

Integrated System Lab,
Department of Electrical Engineering,
Kookmin University, Seoul, Korea

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ISL - Members

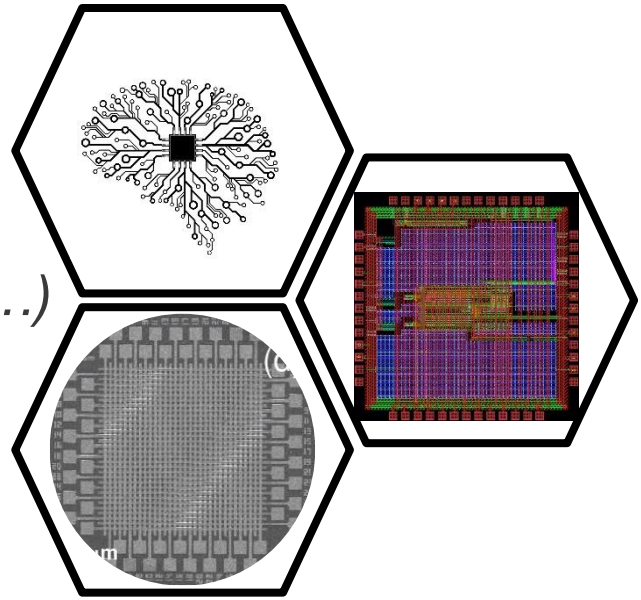
- Professor : Min, Kyeong-Sik
  - mks@kookmin.ac.kr
  - *#411*, Future-Hall
  - *Tel.* 910-4634

- Students
  - 1 Combined M.S. / Ph.D.
  - 2 M.S. student
  - 4 B.S. students

- Lab, Office
  - *#706, Future-Hall*
  - *Tel.* 910-5172
  - *https://isyslab.wordpress.com/*

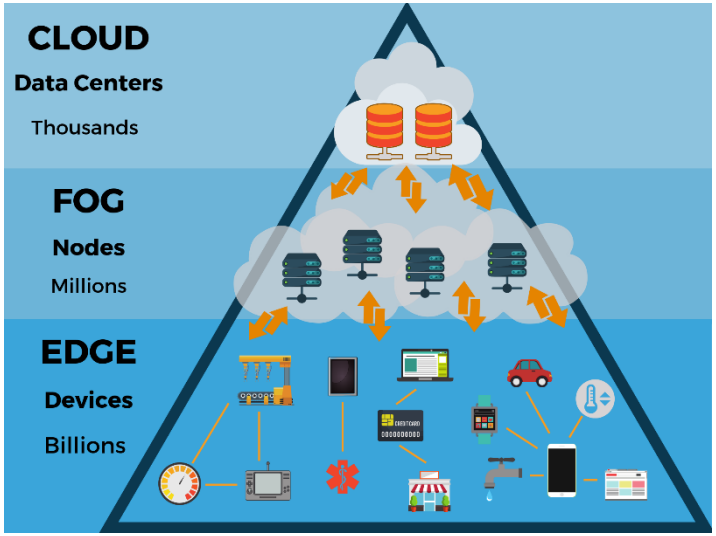
Research Fields

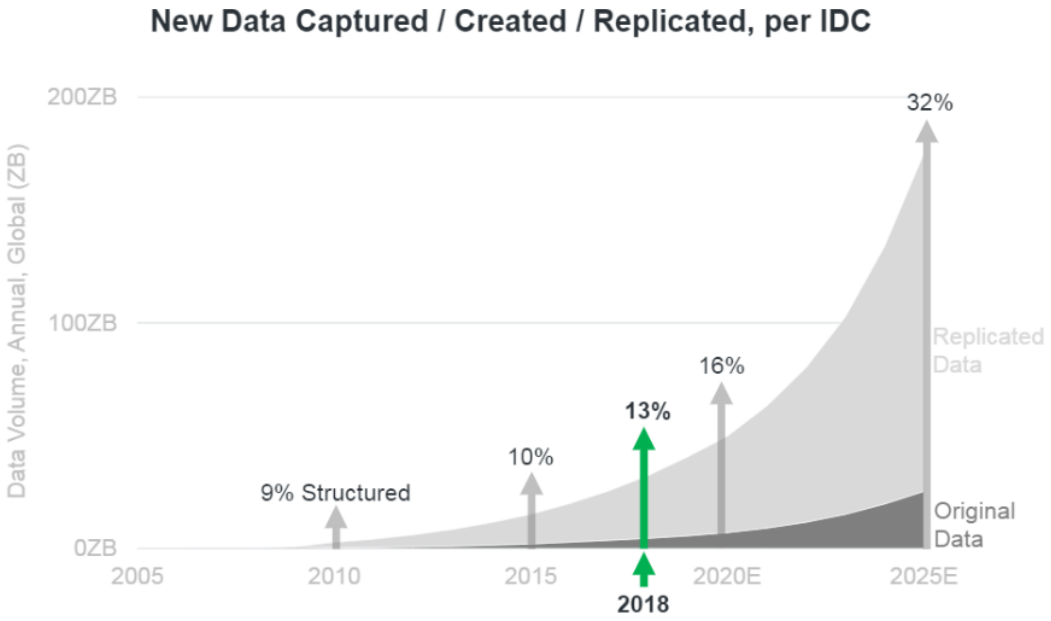
- Research Topics
  - ✓ *Neuromorphic chip*
  - ✓ *Processor In Memory*
  - ✓ *Lightweight deep learning(DNN, SNN, …)*



- Applications
  - ✓ *Edge-device computing chip for IoT*
  - ✓ *RRAM-based Crossbar*
  - ✓ *DRAM*

Research Fields - Background





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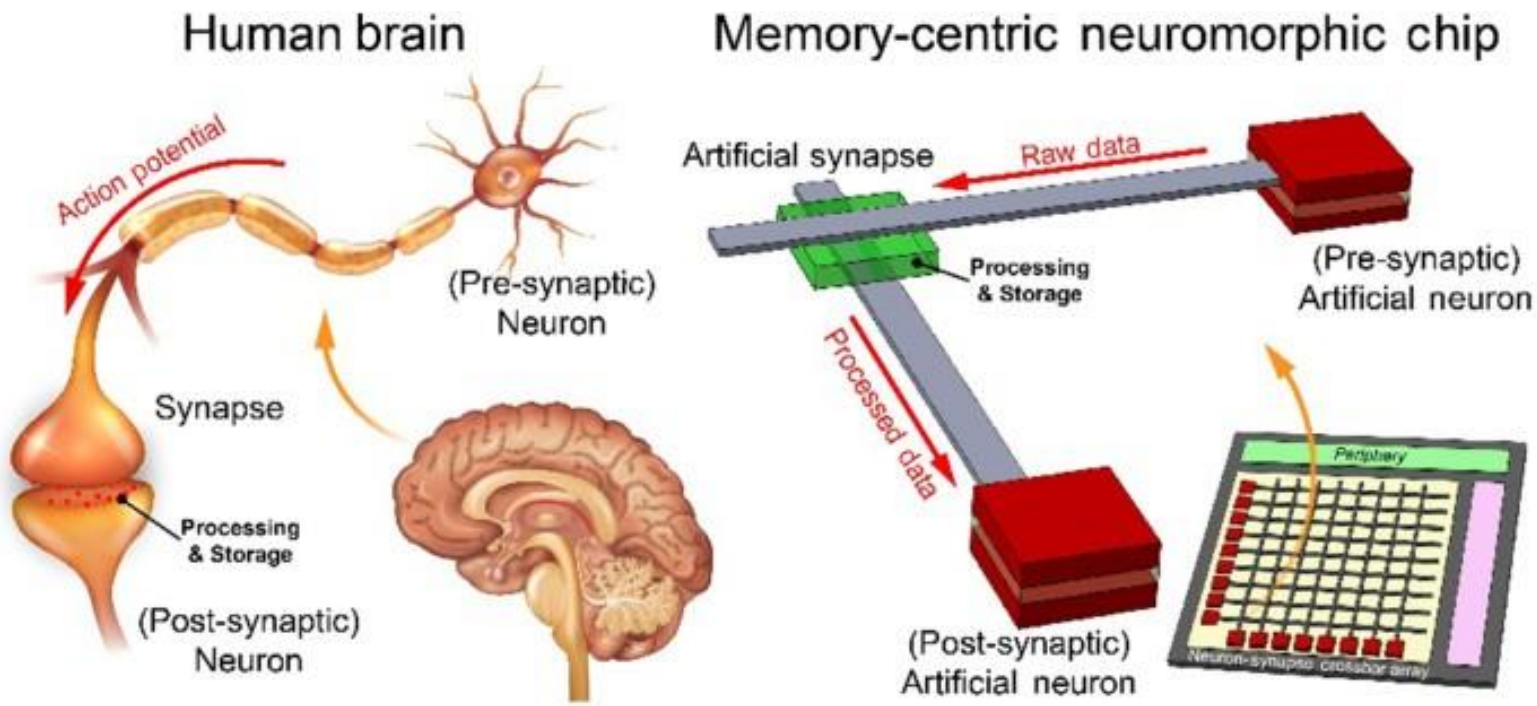
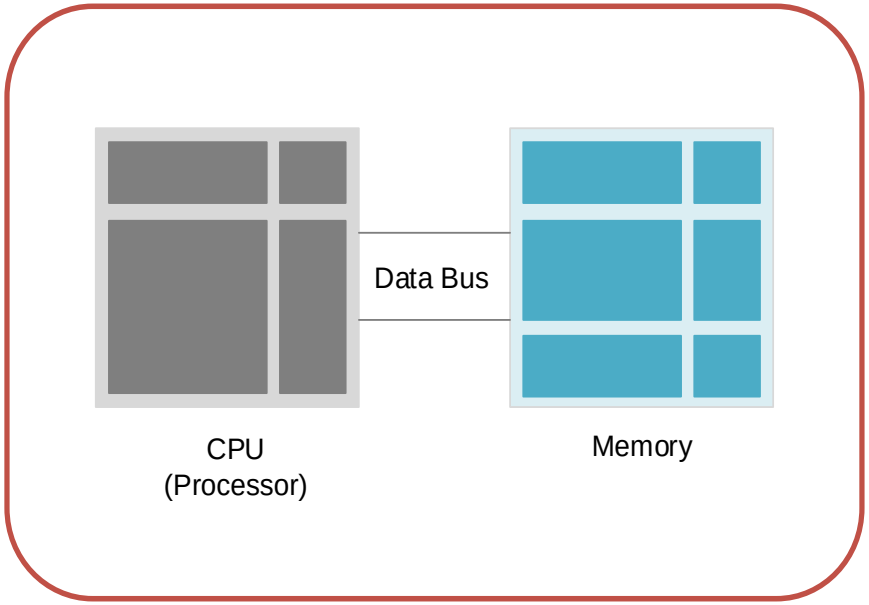
Research Fields - Neuromorphic



Sang Hyun, et al. "Memory-centric neuromorphic computing for unstructured data processing." *Nano Research* 14.9 (2021): 3126-3142.

Research Fields – Processor In Memory

Typical computing architecture



In-memory computing architecture

- ✓ Problems caused by frequently data access
- ✓ Low speed, power loss, data bottleneck

- ✓ Combine with processor and memory
- ✓ High speed, energy efficient, None bottleneck

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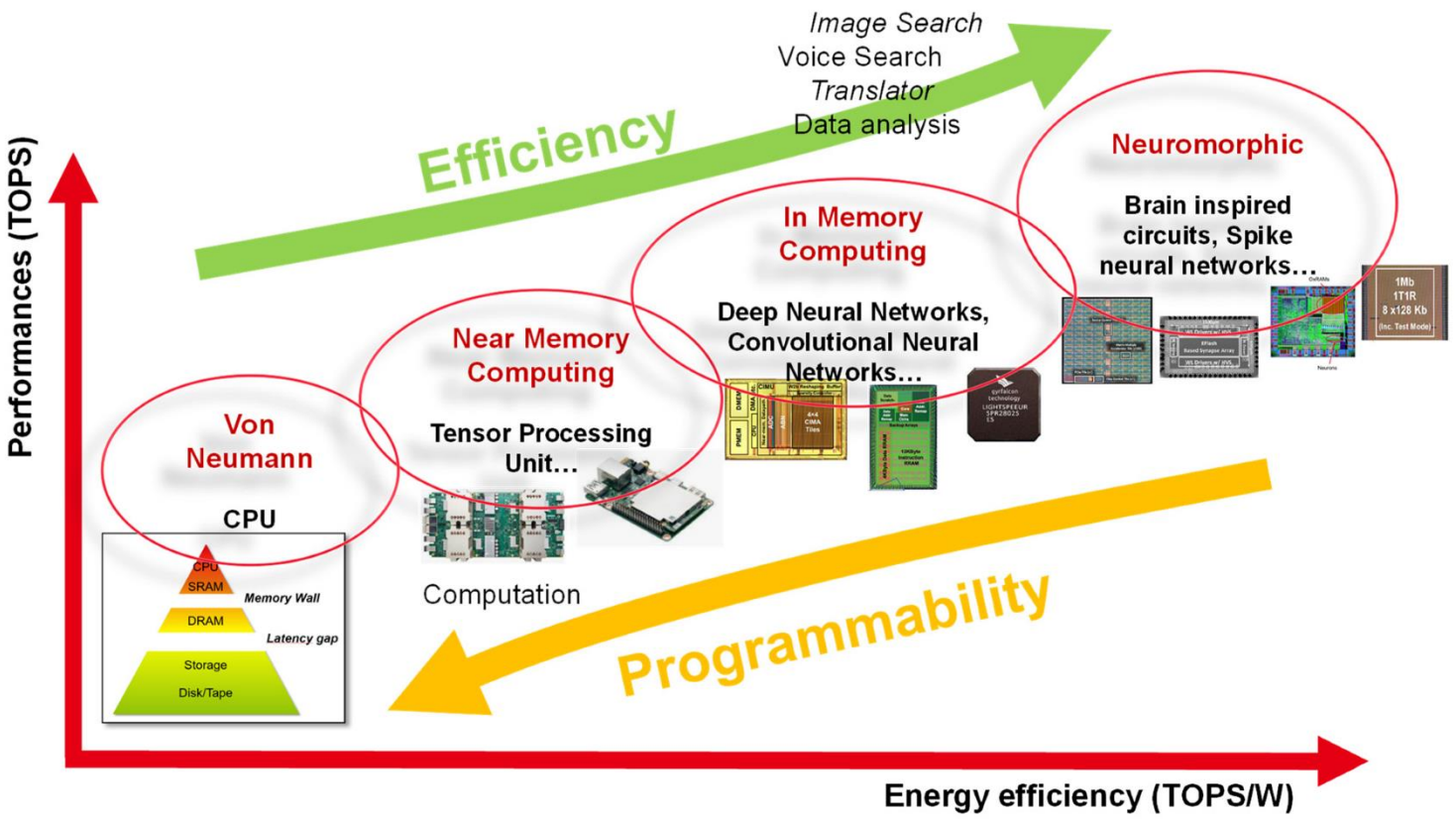
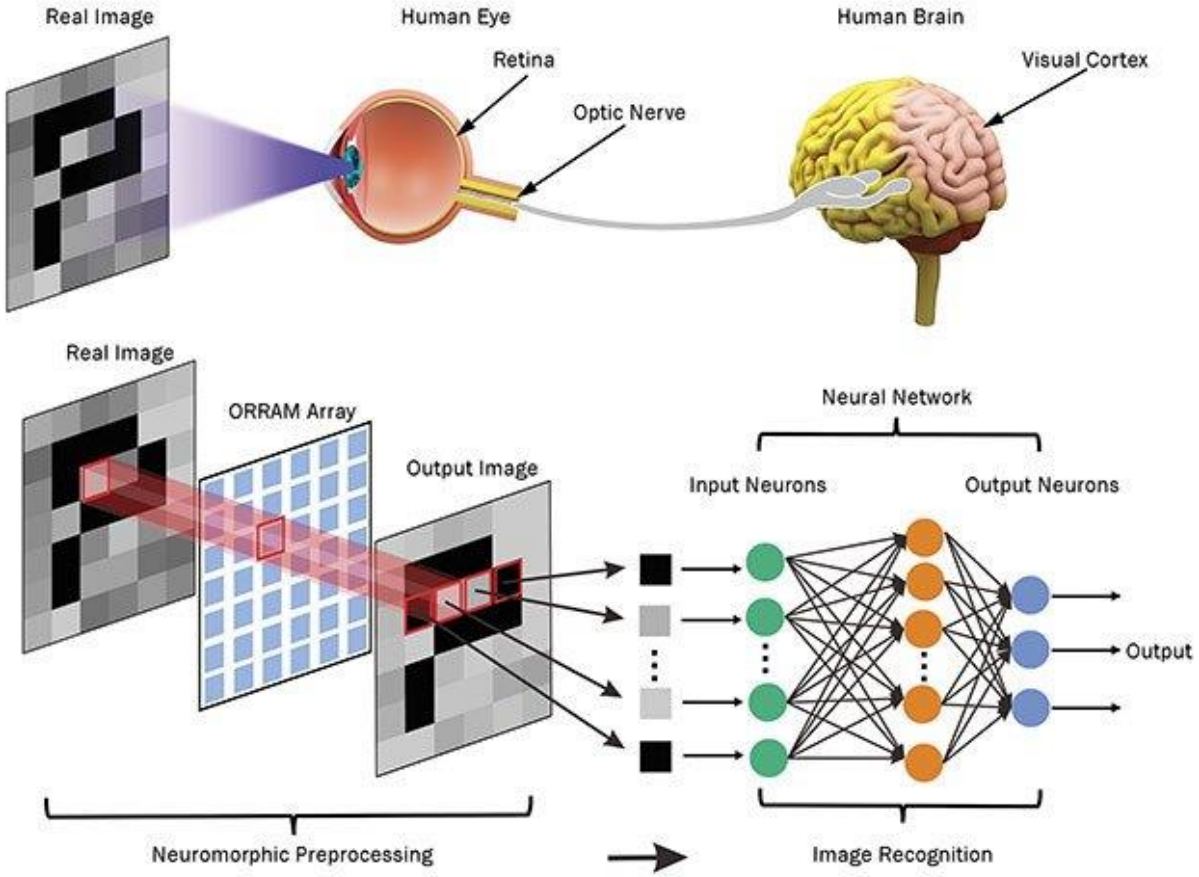
Research Fields – Processor In Memory



Molas, Gabriel, and Etienne Nowak. "Advances in Emerging Memory Technologies: From Data Storage to Artificial Intelligence." *Applied Sciences* 11.23 (2021): 11254.

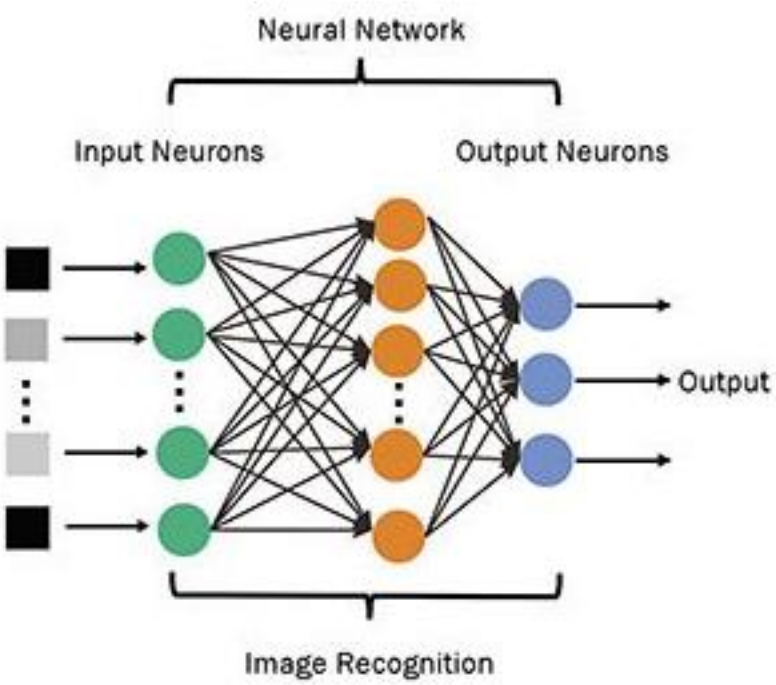
Research Fields – RRAM crossbar



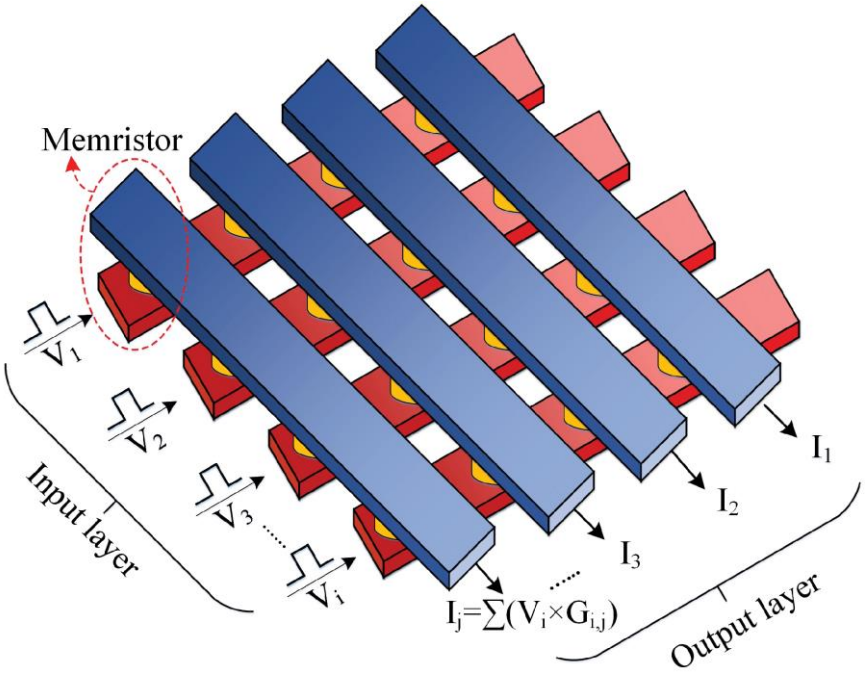
Zhou, Feichi, et al. "Optoelectronic resistive random access memory for neuromorphic vision sensors." *Nature nanotechnology* 14.8 (2019): 776-782.

Research Fields - RRAM crossbar

Software



Hardware



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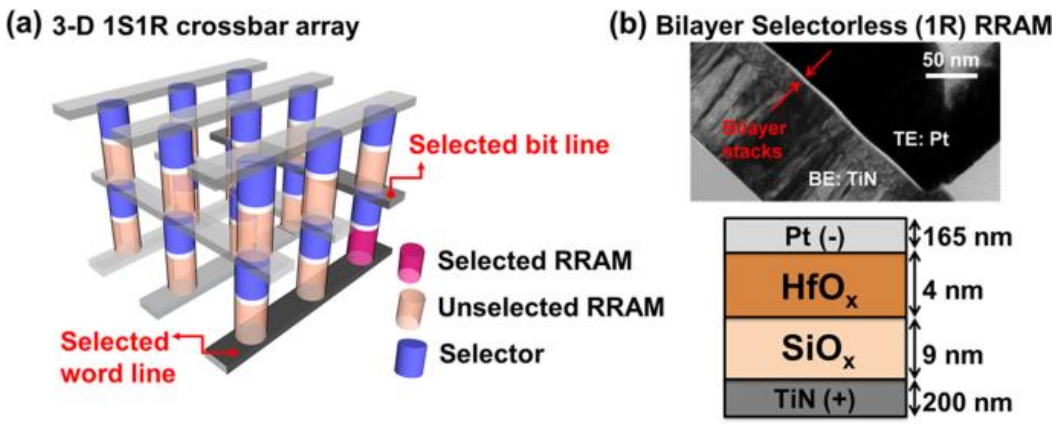
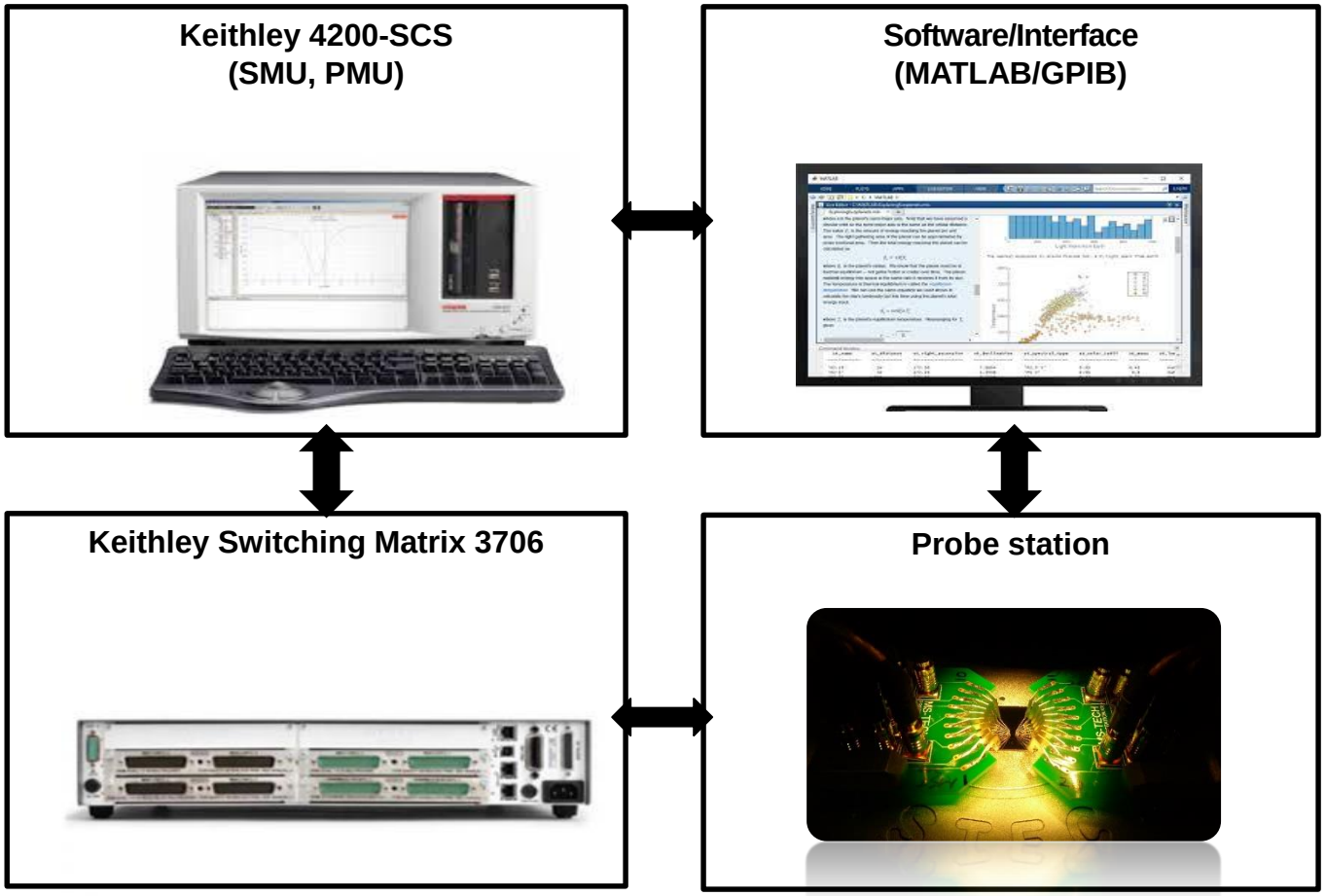
Research Fields – measurement of RRAM



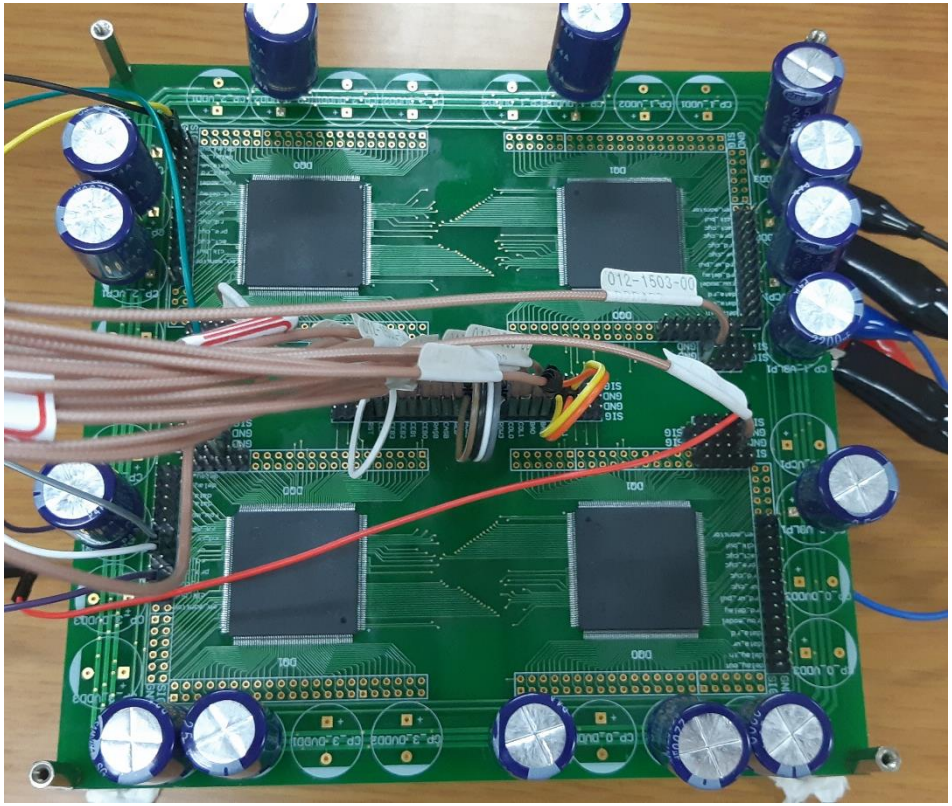
Chen, Ying-Chen, et al. "A novel resistive switching identification method through relaxation characteristics for sneak-path-constrained selectorless RRAM application." *Scientific Reports* 9.1 (2019): 1-6

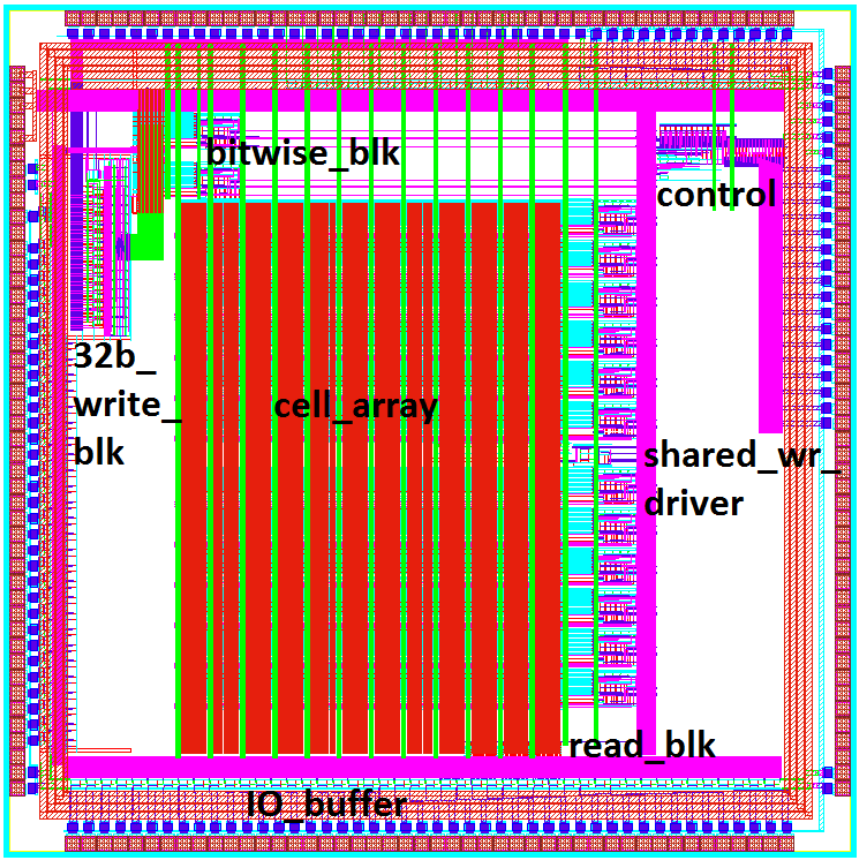
Research Fields – measurement of RRAM



Truong, Son Ngoc, et al. "New pulse amplitude modulation for fine tuning of memristor synapses." *Microelectronics journal* 55 (2016): 162-168.

Research Fields - DRAM





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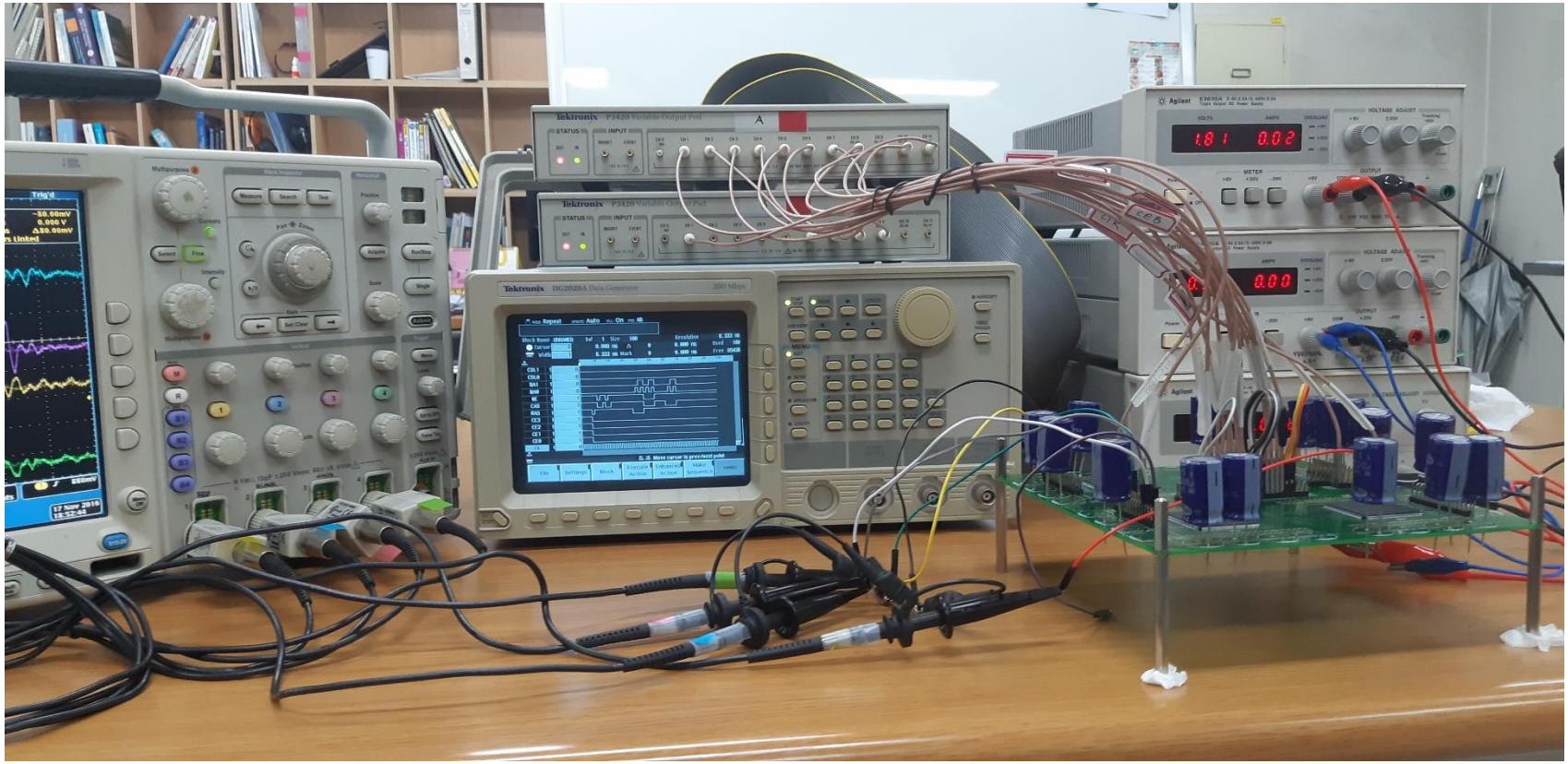
Research Fields - DRAM

DRAM Measurement



Pham, K. V., et al. "In-DRAM bitwise processing circuit for low-power and fast computation." *Electronics Letters* 53.23 (2017): 1514-1516.

Publication & Equipment

- Official working time : Flexible

- Journal & conference
  - ✓ *International : frontier, micromachines, ISCAS, ISOCC, A-SSCC, ASICON, etc.*
  - ✓ *Domestic : IEEK, IEIE, etc.*

- Equipment
  - ✓ *Software : CADENCE-spectre, ultrasim, MATLAB, Pytorch, Xilinx-vivado, etc.*
  - ✓ *Server : Intel Xeon Server 3EA*
  - ✓ *GPU : Quadro GV100, 3080Ti, 1080TI etc.*
  - ✓ *Measurement : Probe station, keithley 4200, switching matrix etc.*

Funded projects & Collaborations

Employment status

LIG Nex1

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HCMC University of Technology and Education
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Night view of Kookmin University

Thanks for your attention

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