Chihyo Ahn (Mark)

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Research Interests: Computer Architecture, Front-end Compiler, MLSys

Education

Georgia Institute of Technology Sep. 2021 - Present
Ph.D. Student Atlanta, GA

- Ph.D. student in Electrical and Computer Engineering
- Kwanjung Overseas Scholarship

University of Michigan Ann Arbor | *GPA 4.0/4.0* Sep. 2018 - Aug. 2020
Master Student Ann Arbor, MI

- Master of Science in Electrical and Computer Engineering

Sungkyunkwan University | *GPA 4.47/4.5* Mar. 2011 - Aug. 2018
Undergraduate Student Seoul, Korea

- Bachelor of Science in Electronic and Electrical Engineering / Business Administration **(Valedictorian)**

Queen's University Belfast Jan. 2015 - Feb. 2016
Exchange Student Belfast, United Kingdom

- Continued studying in Electrical Engineering / Business Administration (took 7 courses)

Research Experiences

HPArch Lab: Georgia Institute of Technology Nov. 2021 – Present
Graduate Research Assistant (Adviser: Professor Hyesoon Kim) Atlanta, GA

- Efficient Deep Neural Network Framework for object detection:
  - Quantized training for hardware-limited scenarios.
  - Schemes for choosing most suitable pre-trained models with different dataset and target agents.
- Expanding CUDA:
  - Auto tuning and expanding the RISC-V GPGPU configuration for different applications.
  - Translator for CUDA execution in configurable RISC-V GPGPU (Host/Device LLVM IR translator).

Solid State Electronics Lab: University of Michigan May. 2020 – Apr. 2021
Research Intern (Adviser: Professor Robert Dick) Ann Arbor, MI

- Worked on project addressing memory-hard problems with unpredictable communications between processing elements and memory.
- Wrote codes using Pymeep FDTD Simulation tool for Free space structure demux with superimposed Bragg gratings.
- Designed Multi-channel demultiplexer using FDFD/FDTD inverse design to achieve fabricable Free space structure demultiplexer for use in global communication network architecture (can be used in network interface controllers and PCIe switches to control bus access required in the interconnection between CPUs and GPUs).
- SiP structure design for future foundry manufacturing processes.

Quantum Science Theory Lab: University of Michigan Sep. 2018 - Apr. 2020
Graduate Student Research Assistant (Adviser: Professor Mackillo Kira) Ann Arbor, MI

- Wrote programs using Fortran computing Semiconductor Bloch Equations (SBEs) to calculate dynamics of microscopic quantities of materials and other optical properties.
- Studied full doublet contribution (scattering matrix) and excitation induced dephasing models in SBEs to efficiently describe realistic quantum systems.

Nanofabrication Lab: University of Michigan Sep. 2018 - Apr. 2020

Graduate Student Research Assistant (Adviser: Professor Zetian Mi) Ann Arbor, MI

- Optimized crystalline structure (Nanowire / Epilayer) growth using Molecular Beam Epitaxy (MBE) for optoelectronic devices.
- Characterized optoelectronic properties of spontaneous nanowires with embedded GaN monolayer for deep-UV LEDs grown in MBE system.
- Studied selective area growth for LEDs and laser devices with higher efficiency and selectivity using E-Beam lithography and MBE.

Display Devices and Materials Lab: SungKyunKwan University Sep. 2016 - Aug. 2018

Research Intern (Adviser: Professor Jangkun Song) Suwon, Korea

- Conducted experiments including measuring Kerr effect in projects on 2D materials with high Kerr coefficient for optical applications.
- Characterized optical properties of α-ZrP by synthesizing, exfoliating, measuring at different conditions for future birefringence type displays.

Publications

C. Ahn, S. Jeong, L. P. Cooper, N. Parnenzini, H. Kim, "Comparative Analysis of Executing GPU Applications on FPGA: HLS vs. Soft GPU Approaches", *IPDPS Workshop 2024(CGRA4HPC) (2024).* [pdf]

Y. Wu, D. A. Laleyan, Z. Deng, **C. Ahn,** A. F. Aiello, A. Pandey, X. Liu, P. Wang, K. Sun, E. Ahmadi, Y. Sun, M. Kira, P. K. Bhattacharya, E. Kioupakis, Z. Mi, "Controlling defect formation of nanoscale AlN: Toward efficient current conduction of ultrawide-bandgap semiconductors", *Adv. Electron. Mater. 6, 2000337 (2020).* [pdf]

Y. Wu, X. Liu, P. Wang, D. A. Laleyan, K. Sun, Y. Sun, **C. Ahn,** M. Kira, E. Kioupakis, Z. Mi, "Monolayer GaN excitonic deep ultraviolet light emitting diodes", *Appl. Phys. Lett. 116, 013101 (2020).* [pdf]

C. H. Ahn, A. R. Masud, S. H. Hong, T. Z. Shen, J. K. Song, "Particle size dependence of electro-optical switching in ZrP nano colloid", *Liquid Crystals, 46:2, 159-165 (2018).* [pdf]

A. R. Masud, S. H. Hong, T. Z. Shen, **C. H. Ahn**, J. K. Song, "Electrical switching of birefringence in zirconium phosphate colloids with various solvents", *Opt. Express 26(1), 173–178 (2018).* [pdf]

Presentations

B. Tine, J. Young, L. Cooper, **C. H. Ahn**, S. Jeong, H. Kim, "Open-source RISC-V Based GPGPU (Vortex) and their usage cases", *Workshop, MICRO23,* (2023), Toronto, ON, Canada.

C. H. Ahn, Z. Mi, M. Kira, "Excitation-induced effects in semiconductors", *oral presentation, Bluesky Workshop,* (2019), Ann Arbor, MI, USA.

C. H. Ahn, K. Lee, J. Jian, W. Wu, Q. Wen, W. Jiang, R.A.Muniz, M. Kira, "Dynamic Cluster Expansion", *poster presentation, Quantum Science and Technology Workshop*, *(2019),* Ann Arbor, MI, USA.

C. H. Ahn, A. R. Masud, J. K. Song, "Electro-Optical Switching of α-ZrP", *International Meeting on Information Display 2017, (2017)*, Busan, Korea.

Experiences

Lawrence Livermore National Lab: Center for Applied Scientific Computing May. 2024 - Aug. 2024

Computing Graduate Student Intern Livermore, CA

- Sparse / Quantization of object detection models for edge devices.

Samsung Austin Research Center: Compiler Team May. 2023 - Aug. 2023

Research and Development Intern Austin, TX

- Developed checker for invalid control flow during derivative calculation in GPU.
- Designed an optimizer for redundant thread mask update instructions.

Skills

Relevant Courses

- High Performance Computer Architecture, Interconnection Networks, Adv Programming Techniques
- Machine Learning, Computer Vision

Technical Skills

- **Computer Programming:** Fortran, Python, PyTorch, PyMeep, C++, LLVM, MATLAB, LaTeX, Excel VBA
- **Device Characterization:** Scanning electron microscopy (SEM), Energy dispersive spectrometer (EDS), E-beam Lithography (EBL), Temperature dependent Photoluminescence (PL)
- **Thin Film Epitaxy:** Molecular Beam Epitaxy (MBE)

Extracurricular Activities

Gaya Global: Trade Company Jun. 2015 - Aug. 2015
Research and Development Intern Seoul, Korea

- Developed prototypes for calculating total revenue and expenses.
- Designed automated system for documenting invoice and packing list.
- Dealt with technical and communication issues.

Republic of Korea Army: 131 Engineering Battalion May 2012 - Jan. 2014
Radio Operator Yeoncheon, Korea

- Served 21 months, honorably discharged as a sergeant.
- Engaged in landmine detection removal operations at Demilitarized Zone, Korea.

Sullivan Center for the Blind Nov. 2014 - Jan. 2016
Volunteer Seoul, Korea

- Converted books into braille for the blind.

Honors and Awards

Kwanjung Overseas External Scholarship: $20,000/year towards Ph.D. Degree
- **Kwanjung Educational Foundation** 4 years

University of Michigan Program Entry Award: Full Academic Graduate Scholarship
- University of Michigan Ann Arbor 2 years

National Scholarship for Science and Engineering: Full Academic Undergraduate Scholarship
- The Korea Student Aid Foundation 8 terms

Prize in Graduation Thesis Competition: 2nd place
- Sungkyunkwan University 2018

Graduation Awards: graduated **first in class**
- Sungkyunkwan University 2018

Dean's list
- Sungkyunkwan University 5 terms

Academic Excellence Prize: **first ranked** student in engineering department ($1000)
- Sungkyunkwan University 2012

Internship Program Scholarships ($500)
- Leaders in Industry-University Cooperation Sungkyunkwan University 2015

Teaching Experiences

ECE 2031: Digital Design Laboratory FA21 ***(TA, GATech)*** Aug. 2021 - Dec. 2021

- Assisted students in understanding the implementation of digital during lab sessions and office hours.

EECS 215: Introduction to Electronic Circuits WN20 (*TA, Umich*) Jan. 2020 - Apr. 2020

- Assisted students in understanding circuit properties and conducting experiments during lab sessions and office hours.

Sungkyunkwan University International Summer Semester ***(TA)*** Jun. - Jul. 2016 / Jun. - Jul. 2018

- Assisted with two business courses covering: daily classes, office hours, course plan build-up.
- Aided foreign exchange students with adjusting to campus life and Korean culture through various activities including welcoming orientation and field trips.