Ahmet Inci

Email: ainci@andrew.cmu.edu • Website: https://inciaf.github.io • GitHub: https://github.com/inciaf

RESEARCH INTERESTS

- Computer Architecture, Machine Learning, Hardware-Aware Machine Learning

EDUCATION

Carnegie Mellon University, Pittsburgh, PA — Aug 2017 – Present

- Ph.D. in Electrical and Computer Engineering
  - Advisors: Prof. Diana Marculescu & Prof. Gauri Joshi

Sabanci University, Istanbul, Turkey — Sep 2012 – Jul 2017

- Bachelor of Science (B.Sc.) in Electronics Engineering
  - **GPA:** 3.84 / 4.00, *Salutatorian, Summa Cum Laude*

RESEARCH EXPERIENCE

Energy-Aware Computing Lab, Carnegie Mellon University

- Advisor: Prof. Diana Marculescu — Aug 2017 – Present
  - Designing scalable and efficient systems and ML models using HW/ML model co-design techniques to achieve the best of both worlds. Currently, I have been working on quantization-aware DNN accelerator and model co-exploration through architecture-level modeling and efficient design space exploration. Recently, I have been working on scalable and efficient RL training on CPU-GPU systems. Additionally, my previous work has explored how to utilize emerging non-volatile memories in GPU architectures for DL workloads.

Performance and Energy-Aware Computing Lab, Boston University

- Advisor: Prof. Ayse Coskun — Jun 2016 – Sep 2016
  - Project: Temperature Dependent DRAM Power and Performance Model
  - Modeling 3D-stacked DRAM power consumption under various temperatures and embedding this temperature dependent power model into already existing DRAM simulators to optimize overall performance of 3D-stacked systems.

Signal Processing and Information Systems Lab, Sabanci University

- Advisor: Prof. Mujdat Cetin — Jan 2015 – Jul 2017
  - I had multiple projects within the common theme of signal processing and machine learning. In my junior year, I worked on error-related potentials (ErrP) in brain-computer interfaces applications to better understand the relation between ErrP and error severity.

Neuroelectronics Lab, University of California, San Diego

- Advisor: Prof. Duygu Kuzum — Jun 2015 – Sep 2015
  - Calculating local field potentials (LFP) by using a network and performing simulations on NEURON simulator. Understanding the contributions of spikes and synaptic potentials to sharp wave-ripple complexes.

WORK EXPERIENCE

NVIDIA

- Research Intern, Architecture Research Group (ARG) — May 2021 – Aug 2021
  - Optimizing Power Management of Deep Learning Systems with Reinforcement Learning
- Research Intern, Architecture Research Group (ARG) — May 2020 – Aug 2020
  - Towards Scalable and Efficient Reinforcement Learning on CPU-GPU Systems

ARM

- Research Intern, ML Technology Group — May 2019 – Aug 2019
  - Implementing hardware-aware neural architecture search (NAS) methods for mobile platforms

Cadence Design Systems

- Research Intern, Virtuoso ML Team — May 2018 – Aug 2018
  - Creating a machine learning based recommendation system for EDA tools, particularly for Virtuoso in order to alleviate the designer's workload, reduce design time, and improve productivity.

PUBLICATIONS

CONFERENCES

[1] **Inci, A.**, Isgenc, M., Marculescu, D., "**DeepNVM: A Framework for Modeling and Analysis of Non-Volatile Memory Technologies for Deep Learning Applications**" *DATE'20*

WORKSHOPS

[1] **Inci, A.**, Virupaksha, S., Jain, A., Thallam, V., Ding, R., Marculescu, D., "**QADAM: Quantization-Aware DNN Accelerator Modeling for Pareto-Optimality**" *ML for Computer Architecture and Systems Workshop (ISCA'21)*

[2] **Inci, A.**, Virupaksha, S., Jain, A., Thallam, V., Ding, R., Marculescu, D., "**QAPPA: Quantization-Aware Power, Performance, and Area Modeling of DNN Accelerators**" *2nd On-Device Intelligence Workshop (MLSys'21)*

[3] **Inci, A.**, Isgenc, M., Marculescu, D., "**Cross-Layer Design Space Exploration of NVM-based Caches for Deep Learning**" *12th Non-Volatile Memories Workshop (NVMW'21)*

[4] **Inci, A.**, Bolotin, E., Fu, Y., Dalal, G., Mannor, S., Nellans, D., Marculescu, D., "**The Architectural Implications of Distributed Reinforcement Learning on CPU-GPU Systems**" *6th Workshop on Energy Efficient Machine Learning and Cognitive Computing (EMC2'20)*

[5] **Inci, A.**, Marculescu, D., "**Solving the Non-Volatile Memory Conundrum for Deep Learning Workloads**" *8th Workshop on Architectures and Systems for Big Data, (ISCA'18)*

JOURNALS

[1] **Inci, A.**, Virupaksha, S., Jain, A., Chin, R., Thallam, V., Ding, R., Marculescu, D., "**QUIDAM: A Framework for Quantization-Aware DNN Accelerator and Model Co-Exploration**" *under review for ACM Transactions on Embedded Computing Systems*

[2] **Inci, A.**, Isgenc, M., Marculescu, D., "**DeepNVM++: Cross-Layer Modeling and Optimization Framework of Non-Volatile Memories for Deep Learning**" *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, November 2021*

[3] Canakci, S., Toy, M. F., **Inci, A.**, Liu X., and Kuzum, D., "**Computational Analysis of Network Activity and Spatial Reach of Sharp Wave-Ripples**" *PLoS One, September 2017*

PATENTS

[1] **Inci, A.**, Loh, D., Meng, L., Suda, N., Kunze, E. "**Specializing Neural Networks for Heterogeneous Systems**" *US Patent Application 16/724,849, Filed: December 2019*

HONORS AND AWARDS

- Finalist for Qualcomm Innovation Fellowship 2020
  - Hardware-Aware Multimodal 3D Object Detection for On-Device Augmented Reality Applications
- Bob Lee Gregory Fellowship, Carnegie Mellon University 2019
- Best Project Award for *Hardware Architectures for Machine Learning* 2018
  - MAGNETO: Evaluation of Non-Volatile Memory Technologies for Deep Learning Workloads
- CMU ECE Finalist for Google PhD Fellowship 2018
- Best Project Runner-Up Award for *Energy-Aware Computing* 2017
  - Power/Performance Analysis and Optimization for Deep Learning on a CPU-GPU Platform
- Best Project Award for *Networks in the Real World* 2017
  - Who Speaks to Whom? Spatiotemporal Analysis of Phone Call Networks
- Carnegie Institute of Technology Dean's Fellow 2017
- Graduated as *Salutatorian* (2nd highest ranking) student in Electronics Engineering Department 2017
- Dean's High Honor List for all semesters 2013 – 2017
- Massachusetts Institute of Technology - Sabanci University Freshman Scholars Program 2015
  Chosen for MIT - Sabanci University Freshman Scholars Program for outstanding success in freshman courses.
- Dilek Sabanci Scholarship, Sabanci University 2015
  Full-tuition scholarship with stipend for undergraduate studies. It is only given to 5 students each year.
- Sakip Sabanci Encouragement Scholarship, Sabanci University 2014
  Full-tuition scholarship with stipend for undergraduate studies.
- Merit Scholarship, Sabanci University 2012 – 2017
  Awarded for ranking in top 0.15 percent among 1.8 Million participants in the Nationwide University Entrance Exam.

SKILLS

- **Programming Languages:** C / C++, C#, Python, Verilog, Assembly, MATLAB, Java, SKILL
- **Tools:** TensorFlow, Caffe, PyTorch, gem5, GPGPU-Sim, HotSpot, DRAMSim2, McPAT, Sniper
- **CAD Tools:** Xilinx ISE, Cadence Virtuoso, Mentor Graphics ModelSim, Synopsys Design Compiler, Cadence SoC Encounter, Agilent ADS

COURSEWORK

Carnegie Mellon University, Pittsburgh, PA

- Hardware Architectures for Machine Learning, Energy-Aware Computing, Machine Learning, Computer Architecture and Systems, System-on-Chip Design, Networks in the Real World

Sabanci University, Istanbul, Turkey

- Computer Architectures, VLSI Systems Design, Data Structures, Operating Systems, Digital IC, Microcomputer Based System Design

TEACHING EXPERIENCE

Carnegie Mellon University, Pittsburgh, PA

- TA for Energy-Aware Computing (18-743) Fall 2018
  - Instructor: Prof. Diana Marculescu
  - Designed and evaluated research projects, graded reports, presentations, and homeworks, and held weekly office hours.
- TA for ULSI Technology Status and Roadmap for SoC and SiP (18-664) Fall 2020
  - Instructor: Prof. Andrzej Strojwas
  - Gave tutorials on several architectural tools, evaluated research projects and presentations.

Sabanci University, Istanbul, Turkey

- TA for Introduction to Computing (CS-201) Spring 2015
  - Instructor: Gulsen Demiroz
  - Held weekly office hours and helped students to overcome their problems on programming concepts.
- TA for Logic and Digital System Design (CS-303) Fall 2016
  - Instructor: Prof. Ilker Hamzaoglu
  - Held weekly office hours, supervised students in laboratory sessions, and evaluated their performances.

PROJECTS

Senior Graduation Project

- Advisor: Prof. Mujdat Cetin Sep 2016 – Jun 2017
  - In this project, I investigated applying DNNs for brain-computer interfaces that I implemented previously. Our results show that testing accuracy significantly increased by using DNNs.

Error Related Potentials in BCI Applications

- Advisor: Prof. Mujdat Cetin Sep 2015 – Jun 2016
  - In this project, I investigated error-related potentials (ErrP) in electroencephalography (EEG) data by using two brain-computer interfaces which stimulate subjects. I investigated the relation between ErrP and error severity for different tasks by performing experiments with 8 subjects. I implemented interfaces by using C#. It is accessible in my GitHub profile. I used machine learning algorithms to analyze EEG data.

Sozlukus

- Co-founder & Developer Sep 2014 – Nov 2015
  - An interactive social network with ID management and a database for Sabanci University students. It was coded in Python by using Django. It was an open lexicon created by the users. We had more than 150 members who actively used it. There were more than 500 topics. We reached 5% of the population of Sabanci University without using any digital advertisements.

Social Awareness About Street Art and Performers

- Project Owner Apr 2012 – Jan 2013
  - Sabanci University was the sponsor of this project. I have made a documentary interviewing with street performers in Amsterdam, Paris, and Brussels. Goal of this project was to raise social awareness to the problems and life conditions of street performers, their expectations from the society and vice versa.

Recycling in Campus (Civic Involvement Project)

- Volunteer Sep 2012 – Jun 2013
  - We had weekly meetings for a year to raise social awareness about significance of recycling in campus. We organized discussions about global and local problems of environment.

[*CV compiled on 2022-01-10*]