SEYEDARMIN AZIZI

Curriculum Vitae

CONTACT INFORMATION

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RESEARCH INTERESTS

Machine Learning Hardware Acceleration, Deep Learning, NLP, Algorithms and Optimization, AI Efficiency

EDUCATION

Ph.D. in Electrical and Computer Engineering *Aug 2022 - Present*
University of Southern California (USC), Los Angeles, CA
Research Direction: Efficient Processing of Deep Neural Networks and Artificial Intelligence Models
Current GPA: 4/4

M.S. in Electrical Engineering *Aug 2022 – May 2024*
University of Southern California (USC), Los Angeles, CA
GPA: 4/4

B.Sc. in Electrical Engineering, Digital Systems
Sharif University of Technology (SUT), Tehran, Iran *Sep 2017 – Feb 2022*
(**QS** Global World Ranking #= **147** (Electrical Engineering Subject))
Overall GPA: 18.3 / 20.0 (3.84 / 4) via 145 credits
Last two years GPA: 18.71 / 20.0

Public Exemplary School *Sep 2013 – June 2017*
High school, Mathematics and Physics
Overall GPA: **19.71 / 20 (4 / 4)**

RESEARCH EXPERIENCES

- **University of Southern California, SPORT LAB** *Fall 2022 – Present*
  Designing efficient and effective compression and acceleration methodologies for deep neural networks, including the vision and language models. Key innovations include devising sensitivity-base and layer-specific model quantization, pruning, and low-rank approximations strategies, and targeting resource-constrained edge devices. Moreover, developing novel LLM fine-tuning and LLM context generalization techniques for broad and diverse LLM applications. Memory- and parameter-efficient training and inference are the primary objectives of this research.
  Supervisor: Prof. Massoud Pedram

- **University of Southern California, collaboration with SRC** *Jan 2023 – Sep 2023*
  Working on adding support for accelerating DNNs using Posit numbers and Mixed-Computation (Posit + floating-point) system for inference on edge devices, targeting accuracy and efficiency improvements over the IEEE-754 floating-point implementation. Key innovations include designing a framework for mapping models to mixed-computation representation, customized training, and efficient kernel computation design (MAC unit).
  Supervisors: Prof. Massoud Pedram & Professor Mehdi Kamal

- **Sharif University of Technology BSc Project** *Feb 2021 – Jan 2022*
  Academic research on "**Vehicle Type Classification in Traffic Videos using Deep Learning (Computer Vision)**"
  - Developing a detection model based on YOLOv5 architecture targeting different types of cars for traffic and surveillance applications. The project included data collection, annotation, training, and pre/post-processing.

  Supervisor: Prof. Matin Hashemi

- **Sharif University of Technology** (Voluntarily) *March 2020 – July 2020*
  Implementation of the physical layer (PHY) of the well-known WLAN standard **(IEEE Std 802.11a-1999)** in both **MATLAB** and **HDL (FPGA)**
  Supervisor: Prof. Mahdi Shabany

- **Sharif University of Technology (**Voluntarily**)** *Oct 2020 – Sep 2021*
  Academic research on "**Video Synopsis using Deep Learning (Computer Vision)**"
  Object re-identification & synopsis & merge using deep methods (YOLO objection + Deep Sort object tracking).
  Supervisor: Prof. Hoda Mohammadzadeh

HONORS AND AWARDS

- Secured 2nd place in the System Design Contest at the 2024 Design Automation Conference (DAC) among 31 international teams. DAC is recognized as the world's premier conference in design automation.
- Ranked 1st in the ECE PhD Screening Exam, University of Southern California, 2023.
- Recipient of the ACM Complimentary Membership Award, 2024 (Membership Number: 2512940).
- Awarded the DAC 2023 Young Fellows Award, Design Automation Conference 2023.
- Graduated with the highest GPA in the "Digital Systems" major among the undergraduate class of 2021, Electrical Engineering, Sharif University of Technology.
- Achieved 9th place out of 60,000 participants in Iran's Universities' Entrance Exam for the B.Sc. degree, 2017.
- Received a full scholarship from Sharif University of Technology for the B.Sc. degree, 2018.
- Accepted into Iran's Public Exemplary Schools and Exceptional Talents Program through Entrance Exam, 2013.
- Ranked 1st in the class of 2017 (Mathematics major) in high school.

PUBLICATIONS

- S. Azizi, R. Soleimani, M. Ahmadi, A. Malekan, L. Abualigah, F. Dashti Ahangar, "**Performance Enhancement of an Uncertain Nonlinear Medical Robot with Optimal Nonlinear Robust Controller**", Elsevier Computer in Biology and Medicine 2022.

- S. Azizi, M. Nazemi, A. Fayyazi, M. Pedram, "**Automated optimization of Deep Neural Networks: Dynamic Bit-Width and Layer-Width Selection via Cluster-Based Parzen Estimation**", DATE 2024 conference.

- S. Azizi, M. Nazemi, M. Kamal, M. Pedram, "**Low-Precision Mixed-Computation Models for Inference on Edge**", IEEE Transactions on Very Large Scale Integration (VLSI) Systems.

- J. Heo, S. Azizi, A. Fayyazi, M. Pedram, "**Training-Free ViT Acceleration with Delayed Spatial Merging**", ICML ES-FoMO-II 2024 Poster.

- M. Sadeghi, A. Fayyazi, S. Azizi, M. Pedram, "**PEANO-ViT: Power-Efficient Approximations of Non-Linearities in Vision Transformers**", ISLPED 2024.

- S. Azizi, S. Kundu, M. Pedram, "**LaMDA: Large Model Fine-tuning via Spectrally Decomposed Low-Dimensional Adaptation**", Submitted to ACL June 2024 cycle, collaboration with Intel's Lab.
- S. Azizi, M. Nazemi, M. Pedram, "**Memory-Efficient Vision Transformers: An Activation-Aware Mixed-Rank Strategy**".

- J. Heo, S. Azizi, A. Fayyazi, M. Pedram, "**CrAFT: Compression-Aware Fine-Tuning for Efficient Visual Task Adaptation**", submitted to WACV2024.

TECHNICAL SKILLS

Engineering Software	Modelsim, Keil, Mars, Proteus, PSPICE, Cadence Integrated Tools, Vivado, Xilinx ISE, MATLAB (GUI and Simulink), Visual Studio, Quartus II, ns3, GNS3
Programming Languages	C, C++/CUDA, Python, Verilog, VHDL, Assembly, AVR, Java, Tcl, HTML
Deep Learning frameworks	Tensorflow, Pytorch
Miscellaneous	HLS, Comfortable with gcc/make/command-line tools. Experienced with Linux, GitLab, Bash Scripting, MapReduce Programming System

RELEVANT COURSES

Advanced Programming (4/4), Data Structures & Algorithms (4/4), Machine Learning Theory (4/4), Linear Algebra (4/4), Probability Theory (4/4), Convex Optimization (4/4), Artificial Intelligence (4/4), Computer-Aided Design (4/4), Pattern Recognition (4/4), VLSI system Design (4/4).

COURSE PROJECTS

- **PyTorch** implementation of a neural architecture search (NAS) framework for hyperparameter tuning of deep and parameter-heavy models using Bayesian Search. *Course Project for Machine Learning*
- **Python** and **HLS** implementation of **Asymmetric Numeral System** (ANS) coding for compression of Neural Network parameters. *Course Project for Computer-Aided Design of Digital Systems*
- HDL implementation and simulation of **"MIPS-based Single-Cycle, Multi-Cycle Pipelined Specific Processor".** *Course Project for Computer Architecture & Microprocessors*
- **MATLAB** implementation of a **word recognition system (P300) by analyzing EEG signals and using DSP and machine learning algorithms.** *Course Project for Signals and Systems.*
- Design, implementation & verification of a **complete signed floating-point adder using Verilog HDL.** *Course Project for Logic Circuits & Digital Systems*

PROFESSIONAL SERVICES

- Reviewer for the ICML 2024 Workshop on "Efficient Systems for Foundation Models" *June 2024*
- Reviewer for the EMNLP (ACL June 2024 Cycle) Conference *July 2024*

- Teaching Assistant (Voluntarily)

  - Digital Circuits and Pulse Technique, Dr. Bagheri *Spring 2020*
    - Course Projects Assistant
  - Machine Learning, Dr. Mohammadzade *Fall 2021*
    - Computer Assignments and Simulations Assistant
  - Logic Circuits and Digital Systems and Lab, Dr. Mohammadzade *Fall 2020*
    - Senior Assistant and Coordinator at Digital Systems Lab at the EE department
  - Machine Learning, Dr. Golestani *Fall 2021*
    - Computer Assignments and Simulations Assistant
  - Principle of Electronics, Dr. Fakharzadeh *Spring 2019*
    - Theoretical Assignments