Oluwaseun Alo

Ph.D. Candidate, Electrical Engineering | University of Kentucky, Lexington, KY
859 894 0498 | oluwaseunalo@gmail.com | linkedin.com/in/seunalo | snalo.github.io
Work Authorization: U.S. Permanent Resident/Green Card Holder

Summary

Ph.D. candidate in Electrical Engineering specializing in hardware designs, acceleration, photonic computing, and energy-efficient architecture. Experienced in designing and analyzing advanced computing systems for machine learning workloads. Research integrates novel photonic integrated circuit (PIC) designs with emerging ML algorithms to enhance performance and scalability.

Research & Industry Interests

- Hardware Design Engineering
- Energy-Efficient and Scalable Architectures
- Photonic and Neuromorphic Computing
- Optical and Photonic Interconnect Systems

Education

Doctor of Philosophy (Ph.D.), University of Kentucky, Lexington, KY Aug 2022 – Present
Dissertation (in progress): *Design of an Efficient, Scalable, and Flexible Tensor Processing Architecture with Photonic Integrated Circuits*

Master of Science (M.Sc.), University of Ibadan, Nigeria, Electrical/Electronic Engineering Nov 2019

Bachelor of Engineering (B.Eng.), Federal University of Akure, Nigeria, Electrical/Electronic Engineering

Experience

Graduate Researcher, Unconventional Computing Architectures and Technologies (UCAT) Lab, University of Kentucky Aug 2022 to Present

- Designing and evaluating photonic-based hardware accelerators for geometric and deep learning applications.
- Developed scalable tensor processing architectures and optimized dataflow for high-throughput, energy-efficient neural computation.
- Conducting Ferromagnetic Resonance (FMR) experiments for spintronic material characterization to model damping, anisotropy, and magnetic resonance behavior in thin-film heterostructures.
- Modeling device-level performance of photonic integrated circuits (PICs) focusing on optical interconnect optimization.
- Published multiple peer-reviewed papers in IEEE and ACM venues; ongoing research targets next-generation GEMM accelerators, photonic tensor cores, and neuromorphic hardware systems.

Project Manager, Huawei Technologies Nig. Co. Ltd Sep 2017 to Aug 2022

- Managed large-scale network infrastructure and system integration projects with an emphasis on hardware reliability, signal optimization, and system performance analysis.
- Collaborated with cross-functional engineering teams to evaluate hardware modules, troubleshoot design bottlenecks, and implement data-driven improvements in system throughput and latency.
- Coordinated with architects and vendors to deploy scalable, energy-efficient telecom solutions leveraging embedded and optical communication hardware principles.

Research Assistant, University of Ibadan Aug 2016 to Mar 2019

- Conducted computational experiments in signal and image analysis, applying feature-extraction and pattern-recognition algorithms relevant to early machine-learning and data-driven hardware applications.
- Supported simulation and modeling tasks, integrating MATLAB and Python workflows for algorithmic efficiency evaluation.
- Co-authored research on statistical texture analysis and retrieval systems, establishing a foundation in applied computing and hardware-accelerated data processing.

Selected Publications

I. Thakkar, S. S. Vatsavai, V. S. P. Karempudi and O. A. Alo, "Scaling Up the Sustainability of Photonic Tensor Cores with Device-Circuit-Signaling Co-Design," Accepted at the 2025 IEEE International Conference on Computer Design (ICCD 2025), Dallas, TX, USA, Nov. 2025.

S. Afifi, O. A. Alo, I. Thakkar, and S. Pasricha, "ASTRA: A Stochastic Transformer Neural Network Accelerator with Silicon Photonics," *ACM Transactions on Embedded Computing Systems*. Online: `https://dl.acm.org/doi/10.1145/3769092`.

S. Afifi, O. A. Alo, I. Thakkar, and S. Pasricha, "A Light-Speed Large Language Model Accelerator with Optical Stochastic Computing," *Great Lakes Symposium on VLSI 2025*, pp. 922–928. Online: `https://dl.acm.org/doi/full/10.1145/3716368.3735299`.

O. A. Alo, S. S. Vatsavai, and I. Thakkar, "Scaling Analog Photonic Accelerators for Byte-Size, Integer General Matrix Multiply (GEMM) Kernels," *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Knoxville, TN, USA, Jul. 2024, pp. 409–414. `https://doi.org/10.1109/ISVLSI61997.2024.00080`.

Selected Conference Presentation & Attendance

A. R. Zubair, O. A. Alo, "Content-based image retrieval system using second-order statistics," 1st International Conference on Electrical, Electronic, Computer Engineering & Allied Multidisciplinary Fields (1st ICEECE & AMF), University of Ibadan, Nigeria, Dec. 2021. Oral Presentation.

O. A. Alo, S. S. Vatsavai, and I. Thakkar, "Scaling Analog Photonic Accelerators for Byte-Size, Integer GEMM Kernels," IEEE Computer Society Annual Symposium on VLSI (ISVLSI), Knoxville, TN, USA.

Selected Projects

Ferromagnetic Resonance (FMR) Experiment (in progress) : Conducting FMR-based material characterization to study magnetic damping, anisotropy, and resonance properties in thin-film heterostructures. Focus on microwave-frequency measurement, field-swept response analysis, and modeling of magnetization dynamics for potential spintronic and photonic-magnetic hybrid computing applications.

Photonic Tensor Processing Architecture (in progress) : Designed scalable tensor processing cores leveraging photonic integrated circuits for energy-efficient deep learning workloads. Focus on architecture design, dataflow optimization, and throughput improvement.

GEMM Accelerator for Neural Networks (SPOGA): Developed and optimized low-power GEMM accelerator architectures targeting integer and byte-size matrix multiplication kernels for ML workloads.

Optical Stochastic Computing Accelerator (ASTRA): Contributed to design and simulation of stochastic transformer-based accelerator using silicon photonics, improving speed and reducing dissipation for LLM workloads.

Technical Skills

Hardware & Design Tools: Cadence (schematic, layout, DRC, LVS), Lumerical, MATLAB, VLSI Design, EDA Tools, Accelerator Architecture
Programming: Python, C++, Git, Linux, SystemVerilog (basic)
Machine Learning & Simulation: PyTorch, TensorFlow

Professional Memberships

- ACM Student Member, 2022 to Present
- IEEE Graduate Member, 2021 to Present
- SPIE Member, 2023 to Present
- Council for the Regulation of Engineering in Nigeria (COREN), 2021 to Present
- Eta Kappa Nu – HKN, 2023 to Present