

Vivswan Shah

PH.D. CANDIDATE, MACHINE LEARNING AND QUANTUM COMPUTING

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Education

Ph.D., **University of Pittsburgh** & **Carnegie Mellon University** Machine Learning and Quantum Computing, 08/2020 - 12/2024
Computer Engineering, 08/2020 - 12/2024
M.S., **University of Pittsburgh** Electrical and Computer Engineering, 08/2020 - 04/2022
B.S., **Illinois College** Computer Science and Physics, 08/2017 - 05/2020

Selected Publication

- **Real-Time 4K 480 fps Low Power Object Detection System**, ongoing.
- **Photonics-Layers: Translating Photonics Components into Layers for Deep Learning Augmentation**, ongoing.
- **Optimal gradient transportation method for Analog Neural Networks**, ongoing.
- **Convolution Neural Networks using non-reciprocal photonic computing**, in review
- **AnalogVNN: A fully modular framework for modeling and optimizing analog neural networks**, *Applied Physics Letters Machine Learning (2023)*, **Vivswan Shah**, Nathan Youngblood. DOI: 10.1063/5.0134156

Technical Skills

AI/ML Computer Vision, Reinforcement Learning, Quantum/Analog Machine Learning, Large Language Models
Past Roles AI/ML Engineer/Researcher, Linux Engineer, Lab Automation, Lab Management, Software Engineer, Web Developer
Frameworks PyTorch, TensorFlow, Qiskit, Cirq, Keras, scikit-learn, Lumerical, Node.JS, Mathematica, MATLAB, Firebase, Docker, GCP
NanoFab E-Beam Lithography, PhotoLithography, Thin Film Deposition, Dry Etching (ICP-RIE), Surface Profiler, SEM, FEI, BEAMER
Languages Python, Typescript, Kotlin, GoLang, JavaScript, C/C++, JAVA, LaTeX, SQL (MySQL, PostgreSQL, NoSQL)

AI/ML Research Experience

Research Assistant (AI/ML) 06/2020 - Present
ELECTRICAL AND COMPUTER ENGINEERING, SUPERVISE BY DR. NATHAN YOUNGBLOOD Pittsburgh, US

- U.S. Department of Defense (**DOD Project**): *Real-Time 4K 480 fps Low Power Object Detection System*.
- Used image recognition to identify and label optical and SEM images of research samples.
- Built and set up new research lab, including research equipments and internal networking, as the **first PhD student** in the lab.
- Worked on projects with **Google X**, **Accipiter Systems**, **TD Securities**, and **U.S. Department of Defense**.

E. Coli Chemotaxis in a Mixed Environment 05/2019 - 08/2019
COMPUTATIONAL BIOLOGY, SUPERVISED BY DR. KEENAN MACK Jacksonville, US

- Repaired and rebuilt RapidCell program, and added new GUI, decreasing runtime by 60%.
- Used unsupervised k-means clustering to analyze data of *E. coli* two component systems, and set a baseline for future research.

Analyzing Biological Protein Networks using Differential Graph Properties 05/2019 - 08/2019
COMPUTATIONAL BIOLOGY, SUPERVISED BY DR. KEENAN MACK Jacksonville, US

- Found high correlation between degree correlation and degree distribution of protein, DNA, RNA, and natural neural networks.

Self Deep Reinforcement Learning to Increase Human Knowledge using Chess 08/2018 - 01/2019
COMPUTER SCIENCE, SUPERVISED BY DR. TAKAKO SOMA Jacksonville, US

- Modeled self-learning neural networks which can learn and teach chess to new players based on their expertise.

Work Experience

Head Lab Technician (DevOps Engineer) 08/2020 - Present
YOUNGBLOOD PHOTONICS LAB University of Pittsburgh

- Unified process fabrication and characterization into a single software for UPitt & CMU Ebeams, MLAs, SEMs, etc.
- Built and developed unified software for automated photonic multiple probe stations for testing photonic integrated circuits.
- Developed novel software utilizing photonic chips to perform optical convolutions over fiber optic channels.

Linux System Administrator

YOUNGBLOOD PHOTONICS LAB

03/2021 - 07/2022

University of Pittsburgh

- Added new High Computing Server to Lab, and trained coworkers on the use of all functionalities.
- Implemented secured internal network for all devices and computers of the lab with DHCP, DNS, and Kemp load balancer.
- Implemented RDP, VPN, and configured non-networked devices to add work from home functionality.
- Deployed Jupyterhub, NI server, and other management tools to control lasers, DAQ, and other measurement equipment.

Software Engineer - Backend

INTERNSHIP

05/2018 - 08/2018

Pehla Kadam Foundation

- Set up and tested the new donation system, decreasing errors by 20%.
- Optimized the main website's api functions, decreasing latency by 30%.

Software Engineer - Backend & Database

INTERNSHIP, IT DEPARTMENT

08/2017 - 05/2018

Illinois College

- Developed alarm system for Illinois College Archives, increasing lifespan of antique books and artifacts.
- Automated IT service request system, decreasing 15% workload, and updated Sharepoint 13 to 16, improving 20% performance.
- Migrated databases and workflows from SharePoint 2013 to 2016, improving the performance by 20%.

Projects

- **gdsfactory, as Developer for Google X**, gdsfactory.github.io, analog, photonic, quantum chip design Since 04/2023
Feature development, bug fixes, and documentation for gdsfactory on behalf of University of Pittsburgh for YPL Lab.
- **AnalogVNN**, analogvnn.github.io, framework for modeling and optimizing analog neural networks Since 08/2022
- **DeDuplicationDict**, deduplicationdict.github.io, HashMap with deduplication to optimize memory Since 05/2023
- **DynPartition**, Optimal Pipeline Parallelism of Dynamic Neural Networks over Heterogeneous GPU Systems
- **ChatGPTAdversarialAttack2023**, LLM Adversarial Attack Challenge using ChatGPT for The Pitt Challenge 2023
- **YPL-Servers-Setup**, Configure internal network, DNS, DHCP, access control, backup server, and activity logger for research lab.
- **Probe-Automation**, Centralized web interface/server for probe station enabling automated measurement of 1000's of devices.
- **EBeam-Processor**, Unified workflow to convert chip layouts into compatible formats for E-Beams, MLA, ICP-RIE, etc.
- **SEM-Image-Labeler**, Image Labeler for SEM Image from University of Pittsburgh and Carnegie Mellon University NanoFab

Contributions to Open Source Projects: pytorch, torchmetrics, tensorboard

Leadership & Activities

Organizer & Mentor	Pitt Challenge (Hackathon) at University of Pittsburgh	08/2022 - Present
Mentor	AWAP'23 at CMU, HackCMU'22 at CMU, HackMIT'22 at MIT	2022 - 2023
Hackathon	iQuHACK (interdisciplinary Quantum HACKathon) at MIT	01/2023
Outreach	Upitt LEADS program, teaching High School students about Electronics	07/2022
Tutor	Physics, Mathematics, Computer Science, and Chemistry at Illinois College	08/2018 - 05/2020
Teaching Assistant	College Physics and Calculus at Illinois College	08/2018 - 01/2020
Secretary	Physics Club at Illinois College	08/2018 - 05/2019

Honors & Presentations

2022	IEEE Photonics Conference , AnalogVNN	Vancouver, Canada
2020	OnePlus Crackables 2.0 , Among top 10 hackers to solve all the puzzles	OnePlus
2018-2020	HackMIT Puzzles 2018, 2019, and 2020 , One of first 10 hackers to solve all the puzzles	MIT
2019	1st Prize in ISAS in the Physics, Math, and Astronomy Division , MorseCodeRS2	ISAS

Selected Coursework

Deep Reinforcement Learning & Control, Adv. Computer Vision, Probabilistic Graphical Models, Adv. Machine Learning & Deep Learning, Quantum Computing Systems, Computational Game Solving, Quantum Information, Adv. Operating System & Distributed Systems, Modern Computer Architecture & Design, Adv. Machine Learning: Theory and Methods, Algorithm Design and Analysis, Complexity Theory, etc.