Alvan Caleb Arulandu

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Education

Harvard University Cambridge, MA
S.M. in Computer Science, A.B. in Math and Computer Science, GPA: 3.982 *Aug 2023 – Dec 2027 (Expected)*

Graduate Coursework
MIT 8.371 (Q. Info. II). PHYS 251B (Q. Mech II). APPHYS 216 (Q. Interaction with Matter). CS 2243 (Algorithms for Data Science). CS 2210 (Advanced Complexity Theory). CS 252R (Advanced Programming Language Theory). APMTH 254 (High-Dim. Statistics and Information). Math 212 (Functional Analysis).

Thomas Jefferson High School for Science and Technology Alexandria, VA
Advanced High School Diploma, GPA: 4.594 *Aug 2019 – May 2024*
2023 Regeneron Science Talent Search Scholar. 2023 Atlas Fellow. Co-Captain of Varsity Math Team. USACO Gold. 3x AIME Qualifier.

AWS Certified Solutions Architect Associate Feb 2023 - Feb 2026
IBM Qiskit Global Summer School Certificate of Quantum Excellence Aug 2021 + Aug 2022

Experience

Neuralink San Francisco, CA
Surgical Robotics Software Intern *Sep 2025 – Present*
- Owned the Time-of-Flight camera subsystem of the surgical robot for automatic patient positioning.
- Configured hardware, wrote Rust bindings, and built computer vision algorithms for perception.

University of Washington Seattle, WA
Quantum Algorithms Researcher (REU) *Jun 2025 – Present*
- Gave an efficient algorithm for agnostic product mixed state tomography as well as a non-adaptive lower bound.
- Advised by Prof. Jerry Li at the Quantum@UW REU program.

Massachusetts Institute of Technology Cambridge, MA
Quantum Algorithms Researcher *Oct 2024 – Present*
- Accelerating imaginary time evolution via randomized real-time evolution, with applications to quantum chemistry.
- Advised by Prof. Isaac Chuang and Dr. John Martyn.

Harvard University Cambridge, MA
Machine Learning Researcher *Nov 2024 – Present*
- Joint project on the universality of approximate message passing for a particular matrix sensing problem.
- Researching model collapse in generative models and interested in rigorous treatments of diffusion.
- Advised by Prof. Yue Lu.

Teaching Assistant *Aug 2024 – May 2025*
- Office hours, lecture notes, and logistics for Math 55 A (Fall 2024) and Math 55 B (Spring 2025) under Dr. Denis Auroux.
- Content review and grading for CS 1240 (Algorithms and Data Structures) under Dr. Sitan Chen and Dr. Madhu Sudan.

Programming Language Theory Researcher *Jan 2024 – Jan 2025*
- Contributed formally verified Pareto and Beta distributions to proof assistant Lean's mathlib4 probability module.
- Pondered discovery systems for theory exploration, probabilistic programming, and proof assistants.
- Advised by Dr. Nada Amin.

Associate Director of Undergraduate Quantum Computing Association *Oct 2024 – Dec 2024*
- Organizing speaker events and spearheading logistics for qRamP, a quantum mentorship program partnered with qBraid.
- Implementing Jordan's single query algorithm for numerical gradient estimation in Qiskit.

qBraid Chicago, IL
Quantum Software Intern *Nov 2024 – Jan 2025*
- Wrote a transpiler from OpenQASM 3 to CUDA-Q kernels. Contributed to QIR and PyQasm, an OpenQASM semantic analyzer.
- Spearheaded a web editor for OpenQASM 3 programs, with support for logical constructs.

University of North Carolina at Greensboro Greensboro, NC
Statistics Researcher (REU) *May 2024 – Aug 2024*
- Proved theoretical bounds for vineyard distance in topological data analysis under Dr. Thomas Weighill.
- Posited new sensitive variable sampling technique with asymptotically better density estimators under Dr. Sat Gupta.

George Mason University Fairfax, VA
Applied Mathematics Researcher *Aug 2020 – Aug 2023*
- Parameter estimation framework for infectious disease via physics-informed neural networks in TensorFlow.
- Applications in calibrating agent-based model simulations like Covasim and optimal vaccine distribution for public health.
- Advised by Dr. Padmanabhan Seshaiyer.

U.S. Naval Research Laboratory Washington, DC
Machine Learning Researcher *Jun 2022 – Aug 2022*

- Grant project to replace computational fluid dynamics simulations with acoustic image-to-image translation.
- Proposed a hybrid U-Net architecture for adversarial training in PyTorch and scripted HPC training pipelines in Bash.
- Advised by Dr. Leslie Smith.

Marble Technologies: Pearl (YC S19) San Francisco, CA
Early Engineer *Mar 2021 – Oct 2021*

- Second hire at creator economy startup funded by YCombinator S19 and the Thiel Fellowship.
- Developed a Serverless GraphQL API and Next.js application and a product push-notification microservice in AWS.

Duke University Durham, NC
Machine Learning Researcher *Jun 2020 – Dec 2020*

- Domain adaptation and multinomial time series classification for EEG data in PyTorch at Carlson Lab under Noah Lanier.

HKP Solutions Durham, NC
Lead Developer, Scrum Master *Jun 2020 – Jun 2021*

- Developed and shipped a hotel payroll management system and directed 3 teams of 4 university student interns at age 13.
- Configured DevOps and lead development for a SwiftUI mobile app with a serverless Node.js backend on AWS Lambda.

Projects | arulandu.com/projects

Young Game Developers Association ygda.org

- Founded indie game studio of 80+ student members with 2 published games and multiple organized community game jams.
- Started a Math/CS YouTube channel with 900+ subscribers and 40K views.

tjvmt.com tjvmt.com

- Built an online ecosystem for the TJ Varsity Math Team with ~2k lifetime users.
- Club attendance for teacher sponsors, LaTeX rendering for problem of the day, automated rankings, and Discord integration.

Showroom PoS showroom.arulandu.com

- Back of office for Yamaha motorcycle showrooms capable of closing sales, tracking inventory, and generating sales reports.
- Deployed at “Joven Motors” in Kalayarkovil, India.

VitalityAI github.com/vitalityAI

- Built an AI/human call center management system, winning HackTJ 10.0 by creating National Suicide Hotline’s alternative.
- Adapted STT and TTS services in AWS for real-time calls using Twilio and OpenAI APIs, allowing operators to view/summarize chat logs and seamlessly transfer queued callers from AI to human support.

Chordy github.com/arulandu/chordy

- A configurable, multi-threaded, real-time chord detector available for all platforms, engineered for performance in C++.
- Used lock-free SPSC queues, Fast Fourier Transform, pitch chroma extraction, and Viterbi’s algorithm.

Flight Simulator arulandu.github.io/flight-simulator

- A real-time simulation of fixed-wing aerodynamics in Unity Game Engine. Inspired by Waqas Khan’s Ph.D. thesis.

Publications

Arulandu, A., Diakonikolas, I., Kane, D., & Li, J. (2025). Agnostic Product Mixed State Tomography via Robust Statistics. *arXiv:2510.08472. Submitted to QIP 2026*.

Schaeffer, R., Kazdan, J., Arulandu, A., & Koyejo, S. (2025). Position: Model Collapse Does Not Mean What You Think. *arXiv:2503.03150*.

Arulandu, A. C., & Gupta, S. (2025). Kernel Density Estimation for Joint Scrambling in Sensitive Surveys. *Mathematics, 13(13), 2134*.

Arulandu, A. C., & Seshaiyer, P. (2023). Physics-informed Neural Networks for Informed Vaccine Distribution in Meta-Populations. *Journal of Machine Learning for Modeling and Computing, 4(3), 83–99*.

Arulandu, A. C., & Seshaiyer, P. (2023). Physics-informed Neural Networks for Agent-Based Epidemiological Model Calibration. *16th International Symposium on Biomathematics and Ecology Education and Research.*

Zhou, B.* & Arulandu, A.* (2023). A Framework to Apply Natural Language Processing Techniques to Analyze Public Opinions on Peace and Governance in Africa. *79th Annual AAPOR Conference.*