

JONATHAN VARGHESE

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Summary

Passionate and motivated with a hunger for challenges and a love for learning. Strong computer science and machine learning skills, as well as an intuitive knowledge of and love for physics.

Skills

- Python, C, C++, Java, Kotlin
- TensorFlow, Pytorch, SkLearn, JAX
- AWS, SageMaker Studio
- Qiskit, QuTip, Dynamiqs, CudaQ
- Git, Linux
- CAD, Onshape, Solidworks
- Large Language Models, Prompt Engineering
- Nanophotonics, Optics, Vacuum Chambers
- FPGAs, Verilog, Digital/Analog Circuits

Education

Bachelor of Science, Applied Physics Diploma (Computer Science Minor)

Class of 2025

University of California, Davis.

- Key courses:
 - EEC 289L Quantum Information Sciences
 - ECS 171, Machine Learning and Neural Networks
 - ECS 120, Data Structures and Algorithms
 - PHY 115 series, Quantum Mechanics
 - PHY 112, Statistical Mechanics and Thermodynamics
 - PHY 117 Digital and Analog Systems

Experience

Quantum Chemistry Researcher Aug 2025 to present

IFF Technologies - PLEASANTON, CA

- If and Only If Technologies (IFF Tech.) is a Biopharma company based out of UC Davis that is utilizing Quantum Computing and Quantum Chemistry solutions for pharmaceutical use cases and drug development
- Was tasked to experiment with the simulation Linbladian dynamics of cat qubit systems onto non-bosonic modalities
- Attempted to encode and simulate open-system molecular dynamics using these cat qubits systems
- Conducted market research on current state of quantum chemistry companies/methods utilizing near-term quantum computers and produced an informal industry literature review [here](#)

Laboratory Research Assistant Feb 2024 to Aug 2025

UC DAVIS - DAVIS, CA

- Working with Prof. Nancy Aggarwal on the UC Davis LSD, a Low-Frequency Gravity Wave Detector that uses a laser to optically levitate small particles within a vacuum chamber to measure interference patterns caused by gravity waves.
- Tasked to create a Python application (ModeMatcher) that, given a set of available lenses, solves for an optical setup that manipulates an incoming beam to have desired parameters (beam width, radius of curvature, etc.) after traveling some distance. Eventually published this app for public usage.
- Currently the lead engineer of the experiment. First CADed up the existing design from a 2D schematic, and now redesigning a second iteration using this CAD and the ModeMatcher app

AI Software Developer May 2023 to May 2024

SYMTRAIN - ALPHARETTA, GA

- SymTrain is a company that creates AI solutions for training customer service employees by emulating a customer phone call and scoring employee responses.
- Replaced all previously outsourced AI modeling; dialogue generation, scoring, sentiment detection, etc.
- Responsible for data engineering using AWS Lambda functions
- Trained and deployed various LLMs (Bert, Lit-Llama) using SageMaker Studio
- Started as summer intern, eventually was asked to continue through school year.

Astronomy Research Assistant Jun 2020 to Aug 2020

CALTECH - PASEDNA, CA

- Worked on the **Farside Array for Radio Science Investigations of the Dark ages and Exoplanets (FARSIDE)** with Professor Gregg Hallinan at Caltech. This project was designed to set up a radio telescope on the far side of the moon for the study of exoplanets, coronal mass ejections from other stars, and the possible detection of magnetospheres on exoplanets.
- Worked on determining the optimal placement on the moon's surface to achieve maximum coverage and prioritize targets of interest using data from the NASA exoplanet archive.

Lab Technician Assistant Jun 2019 to Aug 2019

INTEL CORPORATION - FOLSOM, CA

- Worked as a Summer Intern in the **Visual Technologies Team (VTT)**, testing the display components of the TigerLake SOC

Projects

Simulation of Cat Qubits (iQuHack challenge)

Feb 2025 (Undergraduate - 4th year)

- As part of Alice and Bob's challenge at MIT's iQuHack Quantum Hackathon Challenge in Cambridge, our UC Davis Quantum Computing Club team learned how to use Alice and Bob's Dynamiqs SDK to simulate the Hamiltonians of Cat Qubits
- Simulated the transformations of Cat Qubits through various gate transformations
- Created Wigner plots to visualize these simulations
- Presented our project to our peers and Alice and Bob mentors

ModeMatcher App

July 2024 (Undergraduate - 3rd year)

- Created a Mode Matching application that, **given a set of available lenses** and various beam requirements, could **solve for and provide the optical setup** that maximizes mode overlap, in order to determine plausible positions of lenses in our experiment.
- Studied and mastered Gaussian Beam physics, determined the calculations to manipulate and guide a beam through a lens, and **coded from scratch** a Python script to solve for setups.
- **Developed UI** for this Python script, **available for public use**: <https://mode-matcher.streamlit.app>

Clothing Classifier

Mar 2023 (Undergraduate - 2nd year)

- Used the MNIST clothing database to create a neural network model that could correctly classify various articles of clothing, ranging from shirts, coats, boots, etc.
- Learned the principles and libraries used in creating a simple Machine Learning model, including how to engineer data, design a neural network, evaluate a model, and run hyper-parameter fine tuning.

Study of the 3 Body Problem

Mar 2023 (Undergraduate - 2nd year)

- Derived the physics and coded a Python program to model how 3 masses would orbit each other starting from some initial velocities, positions.
- Wrote an informal, 1 page report on this code.

Automatic Class Joiner

Nov 2020 (High School - Senior)

- Coded from scratch a Python program to open and log into calls on Microsoft teams
- Was able to sleep through many online high school classes during Covid lockdown.

Published Papers and Posters

Analysis of HAT-P-23 b, Qatar-1 b, WASP-2 b, and WASP-33 b with an Optimized EXOplanet Transit Interpretation Code

- Worked under the mentorship of researchers from NASA Jet Propulsion Laboratory and Stanford University. Analyzed the transits of exoplanets and optimized the photometry portions of the EXOplanet Transit Interpretation Code (EXOTIC) to enable faster image processing and curve fitting.
- Published and presented this paper at the **American Astronomical Society** (AAS) symposium, Madison, Wisconsin, June 1-3, 2020

Analysis of TrES-5 b and WASP-43 b with EXOTIC

- Analyzed and freshened the transits of the exoplanets TrES-5 b and WASP-43 b using the EXOplanet Transit Interpretation Code (EXOTIC).
- Published and presented this paper at the **Society of Astronomical Sciences** (SAS) symposium at Ontario, California on June 20, 2020

Certifications

- **MIT iQuHack Quantum Hackathon - Alice and Bob challenge** (February 2025), attended MIT's Quantum Hackathon challenge in Cambridge and participated in Alice and Bob's challenge of simulating Cat Qubits using the DynamicQ
 - **Career Path: Backend Developer** (January 2023 - Present), from Boot.dev, 13 courses of extensive knowledge into software development. Currently have completed first 2 - **Learn Python**, and **Learn Object Oriented Programming**
 - **Astrophysics Xseries Program** (March 2020), from Australian National University (ANU) through EdX (4 courses - *Greatest Unsolved Mysteries of the Universe, Exploring Exoplanets, Cosmology, and The Violent Universe*)
 - **Machine Learning Specialization** (Summer 2019), from Stanford University through Coursera
 - **Deep Learning Specialization** (Fall 2019), from DeepLearning.AI through Coursera
 - **Tech ID JavaScript Academic Camp** at Sacramento State University (June 2015)
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