

# Daniel Zhan

732-208-3730 / dz268@cornell.edu / <http://dzhan27.github.io/>  
Edison, NJ, USA

## EDUCATION

### B.S. Engineering Physics & Computer Science – May 2023

Cornell University

Relevant Coursework:

- Physics: Analytical Mechanics, Electromagnetism I + II, Quantum Mechanics I + II, Statistical Thermodynamics, Electronic Circuits, Controlled Fusion, Mathematical Physics I + II, Astronomy and Cosmology, Experimental Lab
- Computer Science: Machine Learning, Algorithms, Operating Systems, Computer Systems Organization, Functional Programming, Honors Discrete Structures, Market Networks, Computer Game Architecture, Robot Learning
- Teaching Assistant for the following courses: Mechanics, Electromagnetism, Waves, Data Analytics

## EXPERIENCE

### Undergraduate Research Assistant – Sept. 2022 - May 2023

Cornell Laboratory of Plasma Studies - Ithaca, NY

- Expanded upon two and three-dimensional magnetohydrodynamics simulations under the direction of Prof. Seyler. Used Fortran 90 to simulate magnetic fields ablating a metal solid to produce coherent plasma jets of various shapes and sizes for use in nuclear fusion applications. Utilized explicit concurrent programming methods in the space domain along with interacting boundaries between cells to reduce computation time by approximately 3000%.

### Undergraduate Research Assistant – Sept. 2021 - May 2023

Fuchs Group, Cornell University - Ithaca, NY

- Developed a computational quantum dynamics model of the NV center, which is a point defect in the diamond lattice which is photoluminescent (PL) under certain state transitions. The objective is to quantify the rates at which certain PL transitions occur, and how the presence of magnetic fields affect these transition rates. Near-resonant magnetic fields were found to lower the PL rate by ~20%, implying the NV center is useful as a magnetic field quantum sensor.
- The model is written in Python using the QuTiP package, which provides time-dependent solvers for the Lindblad master equation and provides functionalities to facilitate computation on state matrices and vectors.

### Software Engineer – Sept. 2020 - May 2023

Cornell Mars Rover - Ithaca, NY

- Worked with a team of 70 engineers to build a rover from scratch to analyze soil for extant life, navigate autonomously, and perform various dexterous tasks with its arm as a competitor in the University Rover Challenge.
- Designed and implemented a direct joystick-to-joint-motor control scheme using the principles of Forward Kinematics for the arm that allows a rover operator to control individual arm joint motors.
- Implemented an Inverse Kinematics-based control scheme for the arm that gives a rover operator direct control over the position and orientation of the end effector to enable execution of more complicated arm tasks efficiently.
- The control schemes offer two different logical and communication intermediaries between inputs from an abstracted rover controller (i.e. a joystick) and electrical signals (motor velocities and efforts) sent to arm joint motors. They are implemented in C++ using ROS 2 and with Inverse Kinematics and Motion Planning algorithms provided by MoveIt 2.

### Physics Lab Technician Intern – Jun. 2021 - Aug. 2021

Honeywell - Broomfield, CO

- Developed an automated tester for Honeywell's ion trap qubit chip (these chips serve as the core computation units for a trapped ion quantum computer) to verify that the electrical functionalities of the chip are working as intended to streamline chip testing and ensure proper electromagnetic manipulation of the trapped ion.
- Designed and implemented live hardware calibration, capacitance and resistance tests over electrode pairs, various test statistics, support for custom test settings, and a GUI to measure the electrical characteristics of the ion trap chip using Python and digital multimeters. It reduces testing time by over 95% and eliminates sources of human error.

### Automation Developer Intern – Jun. 2020 - Aug. 2020

Merck - Kenilworth, NJ

- Developed various web scraping and other automation tools (using Python and Selenium) to analyze competitor medication documentation and accelerate time-consuming business processes by up to 2000%.

## PROJECTS

### Aphelion Defense

- Served as team lead and programmer for an interdisciplinary team of 10 to develop a mobile video game.
- Implemented unit pathfinding algorithms and designed an intuitive user interface to help newcomers to learn quickly.
- The game is currently available in beta and includes robust networking features for multiplayer.

### Mechanical Resonator Research Project

- Analyzed the oscillation properties of a piezoelectric quartz resonator using circuit-based methods, and fit resulting data to the Butterworth-Van Dyke equivalent circuit. Produced a paper and presentation of my findings.

## SKILLS & TECHNOLOGIES

### Skills:

Research, Computational Modelling, Numerical Methods, Circuit Design and Analysis, Arduino Microcontrollers, Systems Programming, Robotics, Concurrent Programming, Website Development

### Technologies:

Python, Flask, Java, C++, OCaml, HTML/CSS, Git, Unix, Fortran, Docker, ROS, MoveIt

### Activities:

Team Captain @ Cornell Badminton Club Team, Instructor for PE 1441 (Intermediate Badminton), Vice President &

Mentor @ Cornell Applied and Engineering Physics Society, Mentor @ Association for Computer Science Undergraduates