



## Derek Fan

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🌐 Personal Website

🌐 LinkedIn Profile

## EDUCATION

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### • University of California, Irvine – Irvine, CA

Sept. 2020 – Present

Bachelor of Science in Mechanical Engineering

GPA: 3.6/4

## TECHNICAL SKILLS

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**Languages and Frameworks:** Python, MATLAB, C++, ROS

**Developer Tools and Platforms:** Git, Linux, Windows

**Engineering Software:** SolidWorks, EC-Engineer

**Additional Relevant Skills:**

## EXPERIENCE

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### • Johnson & Johnson Robotics and Digital Solutions

June 2023 – Present

Systems Integration Engineering Intern

Santa Clara, CA

- Assisted in data collection of discrepancies between motor encoders within robot arms, which aided in designing a more accurate fail-safe for dangerous motions during surgical procedures.
- Designed and manufactured a weighted fixture for robotic arm verification that met specifications, which formalized a necessary test that did not previously exist.
- Improved upon the in-house vision verification application's GUI and backend, introducing 4 new features for offline image signal processing and effectively increasing its usability by 400%.

### • 3D Infotech

Oct. 2022 – Jan. 2023

Automation Engineering Intern

Irvine, CA

- Integrated various sensors, 3D reconstruction software, robotic arms, and controller into their robotic systems.
- Troubleshooted individual components and assembled them into robot systems used for metrology inspection.
- Validated the functionality of robotic arms by controlling them manually and through programmatic software.

## PROJECTS

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### • Neural Network & MPC Research – Multirotor Multi-Payload Trajectory Tracking

May 2023 – Present

Undergraduate Researcher

- Conceptualized the system design and project goals based on research of simulation tools, drone hardware, and practical algorithms for real-time MPC and reinforcement learning.
- Formulated nonlinear quadcopter dynamics and interfaced with Acados's SQP approximation of nonlinear optimal control to engineer an efficient real-time multiple-direct-shooting MPC.
- Leveraged PyTorch's automatic differentiation in the development of nonlinear and neural network dynamics to implement adaptive gradient-based (as opposed to sampling-based) MPC.

### • Autonomous Drone Team (SUAS Competition)

Oct. 2021 – Present

Lead GN&C Engineer

- Designed an online path planning system utilizing ROS nodes and MAVLink for the first time in the team's history, effectively increasing the team's relevance in the competition by 200%.
- Developed a linear obstacle avoidance algorithm to be used with 3D point clouds, integrated it into online path planning, and optimized its calculations to decrease runtime by 90%.
- Applied point cloud processing algorithms for use with RealSense RGBD cameras, integrated them with obstacle avoidance, and optimized their parameters to decrease runtime by 50%.
- Improved the drone's performance by tuning its sensor/extended Kalman filter parameters and PID controller, bringing stable control to all 3 types of its orientations.

### • Motion Planning and Control Testbed

Apr. 2022 – Oct. 2022

Undergraduate Research Assistant

- Implemented a linear quadratic regulator (LQR) velocity controller for optimal trajectory tracking.
- Deployed a scalable OptiTrack server client that sends position feedback to a distributed network via ROS nodes.
- Introduced multiprocessing to the server client to parallelize position feedback visuals with ROS communication.

## RELEVANT COURSEWORK

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- Classical Control, Robotic Motion Planning and Algorithms, Machines and Mechanisms
- Computer-Aided Design, Dynamics, Statics, Differential Equations, Multivariable Calculus, Linear Algebra