Jacob W. Schuster

857-218-9851 / jschuste@caltech.edu

EDUCATION

California Institute of Technology, Pasadena, CA; GPA 4.1
BS, Computer Science with Robotics minor **Expected June 2026**

Polytechnic High School, Pasadena, CA, June 2022; GPA 4.28; ACT composite 36; AIME Qualifier

WORK EXPERIENCE

Software Development Intern | *Amazon* **June - September 2025**

- Will design and build innovative technologies in the field of cybersecurity

Autonomous F1 Racing Researcher | *Caltech* - Soon-Jo Chung*, PhD, & Sorina Lupu* **September 2024 - April 2025**

- Developed an Asymmetric Soft Actor-Critic reinforcement learning model to autonomously control an F1 car
- Trained the model on Trackmania simulation for realistic high-speed racing scenarios
- Enabled car navigation using first-person POV images, bypassing traditional state-based data like GPS

Drone Machine Learning Researcher | *Caltech* - *Morteza "Mory" Gharib, PhD, & Xiaozhou Fan, PhD* **June 2024 - Present**

Awarded Lynn A. Booth and Kent Kresa Summer Undergraduate Research Fellowship

- Designed and built 5-hole pitot tubes for mounting on fixed-wing drone
- Built clean flow generator for calibration of pitot tubes
- Implemented machine learning algorithm to enable drones to detect and path plan around desert twisters and improve stability within their flow fields

Bio-inspired Engineering Researcher | *Caltech* - *Morteza "Mory" Gharib, PhD, & Meredith Hooper* **June - September 2023**

Awarded John and Barbara Gee Summer Undergraduate Research Fellowship

- Re-designed, constructed, and tested a robotic fish to find an improved method of underwater propulsion
- Developed and integrated Arduino and Matlab software to perform movements and collect data

Soft-Robotic Researcher | *Cambridge* - *Thomas Thuruthel, PhD & David Hardman* **June - December 2021**

Research Program

- Adapted a MATLAB computer simulation of bacteria movement to improve soft robots' delivery of medicine in the body

PERSONAL PROJECTS

SnapAR3D

- Designed and deployed a pipeline that turns videos into 3D meshes (with textures baked) using NVDiffRec
- Implemented an AR app with built-in inertial and visual SLAM to replace COLMAP for camera pose estimation, increasing accuracy and reducing computation time by ~80% and additional speedups on plain backgrounds
- Fine tuned NVDiffRec hyperparameters to produce industry-level models in 10-15 minutes

Chess-playing Robotic Arm

- Built a ROS-driven 6-DOF robotic arm that plays a chess game using Chessify and OpenCV for piece identification
- Employed Newton-Raphson for precise arm motion and implemented fallen-piece detection and recovery
- Automated board-state-to-FEN conversion and integrated Stockfish API for chess-move calculation

Physics Engine

- Engineered a custom physics simulation framework in C, modeling body dynamics, force applications, impulse responses, momentum, and collision handling
- Linked a responsive front-end interface to provide real-time interaction with the physics engine

Medical Imaging

- Built a neural network with transfer learning to diagnose 11 pathologies from chest x-rays using the CheXpert dataset

PUBLICATIONS

Xiaozhou Fan, Fengze Xie, Julian Humml, **Jacob Schuster**, Yisong Yue, Morteza Gharib, "Realtime data-driven sensing of oscillatory crossflow using a fixed-wing drone," American Physical Society.

Schuster, Jacob (co-author), "Optimizing Motion of Lophotrichous Bodies," published by the *International Research Journal of Modernization in Engineering Technology and Science*

COURSEWORK & TECHNICAL SKILLS

Computer Science: Learning Systems, Data Mining, Algorithms, Data Structures and Parallelism, Theory of Computation
Relevant Courses: Differential Equations, Linear Algebra, Classical and Quantum Mechanics, Probability and Inferential Statistics

Programming Languages: Python, Java, C, Swift, OCaml, Matlab
Data Science: Sci-kit learn, Pandas, Tensorflow

Languages: English (native), Spanish (Intermediate)
Robotics: ROS, Solidworks