

# Alvin Shek

ashek@andrew.cmu.edu | 415.828.7032

## EDUCATION

### CARNEGIE MELLON UNIVERSITY BS IN ELECTRICAL AND COMPUTER ENGINEERING

ADDITIONAL MAJOR IN ROBOTICS  
Expected May 2021 | Pittsburgh, PA  
Cum. GPA: 3.90 / 4.0

### INTERESTS

Sensor/Image Processing  
Back-End Infrastructure  
Motion Planning and Controls  
Machine Learning

### LINKS

Github:// [Alvinosaur](#)  
LinkedIn:// [alvinsherk](#)  
Portfolio: [alvinosaur.github.io/AboutMe](#)

## COURSEWORK

### MACHINE LEARNING

Deep Reinforcement Learning\*  
Intro to Deep Learning\*  
Introduction to Machine Learning

### ROBOTICS AND CONTROLS

Adaptive Control and Reinforcement Learning  
Planning Techniques for Robotics  
Computer Vision  
Advanced Mobile Robot Design  
Robot Kinematics and Dynamics

### COMPUTER SCIENCE

Introduction to Embedded Systems  
Parallel Computer Architecture and Prog.  
Introduction to Computer Systems  
Fundamentals of Imperative Computation

## SKILLS

### PROGRAMMING

Python • C/C++ • Matlab • Java

### SOFTWARE

CUDA • ROS • Tensorflow • Pytorch •  
Docker • Django • Android Studio

\* Denotes current semester

## RESEARCH/WORK EXPERIENCE

### UBER ATG | SOFTWARE ENGINEERING INTERN ON MOTION PLANNING

May 2020 – August 2020 | Remote from Pittsburgh, PA

- Optimized GPU runtime of expensive cost functions
- Built full pipeline and interface using CUDA and Tensorflow in C++
- Achieved 238x speedup to make costing real-time
- Presented 1-hour talk on pros and cons of various approaches using Nvidia's profiling tools

### PLANNING OVER ROUGH, UNCERTAIN TERRAIN

March 2020 – August 2020 | Github: [rough\\_terrain\\_planning](#)

- Goal: Handle uncertainty in terrain and soil interaction for off-road AV planning and replanning
- Built experimental framework to try different planners and execute plan in NREC rough terrain simulator
- Implemented and compared A\* and D\* Lite performance and runtime
- Used lattice motion primitives with instantaneous steer assumption and kinematic bicycle model

### CANVAS CONSTRUCTION | ROBOTICS SOFTWARE INTERN

May 2019 – August 2019 | San Francisco, CA

- Compared LiDAR accuracy with point-to-plane projections in Python
- Developed point cloud feature extractor for obstacle avoidance in C++
- Designed 2D, grid-based path planner for max area coverage with obstacle avoidance in Python and C++
- Integrated feature detection and path planning with global map association into fully functional system

## PROJECTS

### HIGH-SPEED DRONE FOLLOWING

April 2020 – May 2020 | Github: [drone\\_controls](#)

- Explored minimum snap(4th derivative of position) trajectory generation
- Implemented LQR and MPC for drone controls and compared performance
- Learned how and when to apply differential flatness to solve nonlinear controls with linear systems

### AUTOMATIC SCORING FOR AXE-THROWING

September 2019 – Present | CMU

- Explored three approaches to locate and score axe tip in images for a local business under Dr. George Kantor
- Classical CV with image difference, blob detection, principal axis
- Single layer NN with vectorized image as input
- MaskRCNN for end-to-end detection and scoring

### ROBOTIC AIR HOCKEY TABLE

December 2018 – January 2019 | Github: [robotic\\_air\\_hockey](#)

- Designed system architecture and state machine ranging from user interaction to sensor communications
- Built two 2 Degree-of-freedom robot arms to play against people with only camera feedback, no sensors
- Puck trajectory prediction and velocity kinematics for motion planning
- Track puck with color-filtering and Kalman Filter