

# Alvin Shek

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## EDUCATION

### CARNEGIE MELLON UNIVERSITY

MS IN ROBOTICS | 2021-2022

BS IN ELECTRICAL AND COMPUTER

ENGINEERING | 2017-2021

Cum. GPA: 3.92 / 4.0

### INTERESTS

Motion Planning and Controls

Reinforcement Learning

Motion Prediction

Meta Learning for Human Robot Interaction

### LINKS

Github:// [Alvinosaur](#)

LinkedIn:// [alvinshesk](#)

Portfolio: [alvinosaur.github.io/AboutMe](#)

## COURSEWORK

### MACHINE LEARNING

Deep Reinforcement Learning (TA Fall 2021)

Intro to Deep Learning

Probabilistic Graphical Models

Convex Optimization\*

Introduction to Machine Learning

### ROBOTICS AND CONTROLS

Provably Safe Robotics

Adaptive Control and Reinforcement Learning

Planning Techniques for Robotics

Computer Vision

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++ • Julia • Matlab • Java

### SOFTWARE

Pytorch • Tensorflow • CUDA • ROS

\* Denotes current semester

## RESEARCH/WORK EXPERIENCE

### MASTERS THESIS RESEARCH | ADVISOR: CHANGLIU LIU

May 2021 – Present | CMU

- (Submitted to ICRA 2022) Recurrent hand gesture control of robot arm, adaptable to unique gesture styles
- (Current) Learning manipulation tasks from human demonstration and physical interaction
- Focus in RL and IL, Meta Learning, and Visual scene understanding

### 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 comparing different algorithms in GPU occupancy and memory constraints to 60+ people

### 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
- Presented results to entire company, including non-technical audience

## PROJECTS

### LEARNED GRAPH STRUCTURE FOR ROBOT DYNAMICS

March 2021 - May 2021 | Github: [learned\\_dynamics](#)

- (Goal) Learn complex dynamics of robots for simulation
- (Novelty) Learn the graph structure of such dynamics with Graph NN's and Message Passing
- Implemented with Pytorch and MuJoCo simulator
- Voted 3rd best project among 25

### META-LEARNING FOR ROBOTICS

October 2020 - December 2020 | Github: [idl\\_project](#)

- Compared performance of popular Meta-Learning algorithms (MAML, Reptile) with classic algorithms (PPO)
- Proposed new modification to MAML, analyzed its poor performance
- Goal to train robot arm to reach a target location
- Gained experience in reward-shaping and debugging RL algorithms

### HIGH-SPEED DRONE FOLLOWING

October 2020 - December 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