# Philip (Yizhou) Huang

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## Education

**Carnegie Mellon University** — Pittsburgh, USA
Ph.D. in Robotics — Aug 2023 - Current

- Research Topic: Multi-robot task and motion planning
- Advisor: Jiaoyang Li, GPA: 4.17/4.33

**University of Toronto** — Toronto, Canada
M.Sc. in Computer Science — Sept 2021 - August 2023

- Thesis: Planning and navigation for autonomous surface vessels
- Advisors: Florian Shkurti and Tim Barfoot, cGPA: 4.00/4.00

**University of Toronto** — Toronto, Canada
BASc. in Engineering Science (Machine Intelligence Major) — Sept 2016 - June 2021

- Thesis: Improving regularization-based continual learning with hypernetworks [pdf]
- Advisor: Florian Shkurti, cGPA: 3.88/4.00 (90.2%)

## Publications

1. **Philip Huang***, Ruixuan Liu*, Shobhit Aggarwal, Changliu Liu, and Jiaoyang Li, "APEX-MR: Multi-Robot Asynchronous Planning and Execution for Cooperative Assembly", *Robotics: Science and Systems (RSS)*, 2025 [pdf] [website] [video]

2. Yewon Lee, Andrew Z. Li, **Philip Huang**, Eric Heiden, Krishna Murthy Jatavallabhula, Fabian Damken, Kevin Smith, Derek Nowrouzezahrai, Fabio Ramos, Florian Shkurti, "STAMP: Differentiable Task and Motion Planning via Stein Variational Gradient Descent", *IEEE Robotics and Automation Letters (R-AL)*, 2025 [doi] [pdf] [website] [video]

3. **Philip Huang**, Tony Wang, Florian Shkurti, and Timothy D. Barfoot, "Field Testing of a Stochastic Planner for ASV Navigation Using Satellite Images", *IEEE Transactions on Field Robotics (T-FR)*, 2024, vol. 1, page 131-160. [doi] [pdf] [video]

4. **Yizhou Huang**, Hamza Dugmag, Timothy D. Barfoot, and Florian Shkurti, "Stochastic Planning for ASV Navigation Using Satellite Images", In proceedings of *IEEE International Conference on Robotics and Automation (ICRA)*, 2023 [pdf] [website] [video]

5. **Yizhou Huang**, Kevin Xie, Homanga Bharadhwaj, and Florian Shkurti, "Continual Model-Based Reinforcement Learning with Hypernetworks", In proceedings of *IEEE International Conference on Robotics and Automation (ICRA)*, 2021 [pdf] [website] [video]

6. Keenan Burnett, Jingxing Qian, Xintong Du, Linqiao Liu, David J. Yoon, Tianchang Shen, Susan Sun, Sepehr Samavi, Michael J. Sorocky, Mollie Bianchi, Kaicheng Zhang, Arkady Arkhangorodsky, Quinlan Sykora, Shichen Lu, **Yizhou Huang**, Angela P. Schoellig, Timothy D. Barfoot, "Zeus: A System Description of the Two-Time Winner of the Collegiate SAE AutoDrive Competition", *Journal of Field Robotics*, 2021 [doi] [pdf] [video]

7. Qiyang Li, Xintong Du, **Yizhou Huang**, Quinlan Sykora, Angela P. Schoellig, "Learning of Coordination Policies for Robotic Swarms", *arXiv:1709.06620*, 2017 [pdf]

## Professional Experience

**Artificial Intelligence for Robot Coordination at Scale Lab, CMU** Pittsburgh, USA
Robotics Researcher Sept 2023 - Current

- Developed a safe, efficient, and scalable multi-robot planning and asynchronous execution framework for long-horizon (**250+ steps**) tasks; reduced the execution time by **48%** compared to sequential planning and **36%** compared to synchronous planning on average
- Led the development of a **multi-level** reasoning pipeline for automated LEGO assembly system with two Yaskawa GP4 industrial robots; integrated physics reasoning, assembly planning, task planning, and online action generation with real-time monitoring
- Proposed an ontology and skill graph for autonomous multi-robot assembly in collaboration with the DoD funded ARM (Advanced Robotics for Manufacturing) Institute
- Developing efficient and high-performance multi-robot motion planning and postprocessing algorithms

**Robot Learning and Vision Lab, University of Toronto** Toronto, Canada
Robotics Researcher Jan 2020 - Aug 2023

- Conducted **field tests** of an autonomous surface vessel (ASV) on multiple **km-scale missions** in Northern Ontario; developed the GPS-, vision-, and sonar-enabled perception and local motion planning system in ROS
- Proposed and implemented a novel robust mission-planning algorithm using satellite images; simulated on a dataset of **1000+** lakes and reduced the expected travel time by up to **15%** compared to baselines
- Developed a hypernetwork-based, **continual learning** algorithm for model-based reinforcement learning; demonstrated state-of-the-art performance in multiple robotic simulations, including a door-opening experiment

**Qualcomm Inc.** Toronto, Canada
Machine Learning Engineering Intern May 2019 - May 2020

- Developed and streamlined C++ test apps for Qualcomm's HTA neural networks (NN) compiler on Snapdragon devices; reduced test time by **20% for a team of 15+** engineers
- Created a compiler profiling tool capable of reducing NN inference latency by **>15%**
- Developed a GUI application with Electron.js for visualizing neural networks in custom representation and running different test apps, which significantly improved the efficiency of day-to-day development

**Civil, Environmental, Agricultural and Learning Lab, Technion** Haifa, Israel
Undergraduate Research Assistant May 2018 - Aug 2018

- Designed a depth-camera-based quadcopter localization and tracking pipeline in C++ running at 30Hz
- Re-trained a Mask-RCNN network in Keras to detect sunflowers using a custom dataset of 75 images
- Developed a ROS-based demo where a **Crazyflie** nano-quadcopter autonomously navigates between 2-4 sunflowers to perform artificial pollination. [video]

**Dynamic Systems Lab, University of Toronto** Toronto, Canada
Undergraduate Research Assistant May 2017 - Aug 2017

- Designed and implemented a software framework (with ROS, C++, and Python) capable of flying **a swarm of 9 Crazyflie nano-quadcopters indoors**
- Built a simulation environment in Gazebo to debug controller and planning modules in ROS
- Developed an interactive demo with six quadcopters flying a synchronized "wave" motion. [video]

## Teaching and Services

- **Teaching Assistant** for CSC384 Spring 2023
  *Introduction to Artificial Intelligence (University of Toronto)*
- **Teaching Assistant** for CSC317 Fall 2022

*Computer Graphics (University of Toronto)*

- **Teaching Assistant** for CSC477 — Fall 2021
  *Introduction to Mobile Robotics (University of Toronto)*
- **Mentor** for RISS Program — Summer 2024
  *CMU Robotics Institute Summer Scholars (RISS) program*
- **Mentor** for CMU Undergraduate Students — Fall 2023
  *CMU AI Undergraduate Research Mentoring Program*
- **Mentor** for PRISM Workshop — Spring 2022
  *Preparation for Research through Immersion, Skills, and Mentorship (University of Toronto)*
- **Reviewer** for IEEE International Conference on Robotics and Automation, *ICRA* — 2023, 2024, 2025
- **Reviewer** for IEEE/RSJ International Conference on Intelligent Robots and Systems, *IROS* — 2022, 2023, 2025
- **Reviewer** for International Workshop on the Algorithmic Foundations of Robotics, *WAFR* — 2024
- **Reviewer** for Workshop on Meta Learning, *NeurIPS* — 2020

## Extracurricular Activities

**You're Next Career Network** — Toronto, Canada
Marketing Associate — May 2020 - March 2021

- Worked for a student club that hosts the largest student-run career fair at the University of Toronto, connecting over **3000 students** and **100 companies** a year
- Designed event graphics for different social media platforms
- Analyzed event participant data and created a dashboard with Google Data Studio

**University of Toronto Self-Driving Car Team** — Toronto, Canada
Object Detection Sub-Team Co-Lead and Member — Feb 2018 - Aug 2020

- Finished **1st place in three consecutive years** of SAE AutoDrive Challenge
- Led the object detection sub-team of 5+ students in reproducing a 3D object detection network (PointPillar) and developed custom software for accelerating inference on the Intel OpenVINO platform
- Improved the performance of our squeezeDet pedestrian detector from **41% to 85%** average precision while maintaining runtime at 40ms
- Reproduced a lidar-based, birds-eye-view object detection algorithm (PIXOR) on the KITTI self-driving dataset; Published open-source PyTorch code **(280+ stars)** on GitHub

## Scholarships and Awards

- Best Poster Award Finalist in ICRA Workshop on Language and Semantics of Task and Motion Planning — 2025
- Alan Guisewite Memorial Fellowship from CMU Robotics Institute — 2024
- 3rd place, UofT Robotics Institute Three Minute Thesis Competition — 2022
- Canada Graduate Scholarships-Master's (CGS-M) award - CAD $17000 — 2021
- Vector Scholarship in Artificial Intelligence - CAD $17000 — 2021
- 2nd place, Engineering Science Select Equity Den - CAD $1000 — 2020
- University of Toronto Excellence Award - CAD $6,000 — 2020
- William V. Hull Scholarship - CAD $520 — 2019
- 1st place, Engineering Science Roshambo In-class Tournament — 2019
- 2nd place, University of Toronto Engineering Kompetitions (UTEK), Programming Section — 2019

- 3rd place, University of Toronto Engineering Kompetitions (UTEK), Programming Section 2018
- Sullivan Memorial Scholarship - CAD $3,415 2017
- The Wallberg Undergraduate Scholarships - CAD $1,500 2017
- Engineering Science Research Opportunities Program - CAD $6,000 2017
- President's Entrance Scholarships - CAD $2000 2016
- 1st place, Engineering Science Matboard Bridge Design and Build Challenge 2016
- 2nd place, Engineering Science Pong AI vs. AI Competition 2016

## Skills

- **Programming Languages**: Python, C++, MATLAB, Javascript, HTML, Bash, LaTeX, Java, Verilog
- **Libraries**: PyTorch, ROS, Tensorflow, OpenCV, PCL, Pyro, Electron.js, Pandas, NumPy, SciPy, Jupyter
- **Tools**: Linux, Git, LLM/VLM, Gerrit, Docker, Slurm, Illustrator, OpenVINO

## Media Coverage

- Featured in Modern Machine Shop article on our Multi-arm Lego Assembly Testbed. 2024