Philip (Yizhou) Huang

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Education

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

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

University of Toronto — Toronto, Canada
MSc. 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**, 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]

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", (Under Review) *ICRA 2025* [preprint] [blog] [video]

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

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

5. 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]

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

Professional Experience

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

- Developing and implementing efficient multi-robot task assignment and motion planning algorithms in C++ for automated assembly systems
- Leading development of an end-to-end robotic Lego assembly system utilizing dual Yaskawa GP4 industrial robots; integrating automated sequence planning, stability analysis, task allocation, motion generation, and real-time monitoring

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 demo in ROS featuring a **Crazyflie** nano-quadcopter autonomously navigating between 2-4 sunflowers for artificially pollinating sunflowers. [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 PRISM Workshop — Spring 2022
  Preparation for Research through Immersion, Skills, and Mentorship (University of Toronto)
- **Reviewer** for International Workshop on the Algorithmic Foundations of Robotics, *WAFR 2024* — 2023
- **Reviewer** for IEEE International Conference on Robotics and Automation, *ICRA 2024* — 2023

- **Reviewer** for IEEE/RSJ International Conference on Intelligent Robots and Systems, *IROS 2023* 2023
- **Reviewer** for IEEE International Conference on Robotics and Automation, *ICRA 2023* 2022
- **Reviewer** for IEEE/RSJ International Conference on Intelligent Robots and Systems, *IROS 2022* 2022
- **Reviewer** for Workshop on Meta Learning, *NeurIPS 2020* 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; PyTorch code **(>280 stars)** is available on GitHub

Scholarships and Awards

- 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, Gerrit, Docker, Slurm, Illustrator, OpenVINO