Cherie Ho

Stanford Postdoc | Building In-the-Wild Flexible and Self-Improving Robots

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Summary

I build flexible and self-improving robots that operate reliably in messy, real-world environments. My research focuses on how robots can build flexible memory for long-horizon tasks, be steered by different types of goals, reason about uncertainty and consequences, and continually self-improve through their own experience. I enjoy working across diverse robotic platforms, including multi-drone systems, high-speed offroad driving, urban wheelchairs, and now mobile manipulators in unstructured indoor and outdoor environments.

Education

Carnegie Mellon University *2018 - 2025*

Ph.D. in Robotics (Advisor: Prof. Sebastian Scherer)

Thesis: Flexible Perception for High-Performance Robot Navigation

Harvey Mudd College *2013 - 2017*

B.S. in Engineering, Concentration: International Relations

Advisor: Prof. Christopher Clark

Research Experience

Postdoctoral Researcher, IPRL Lab, Stanford University *July 2025 -*

Flexible and Self-Improving Mobile Manipulators *Stanford, CA*

- Advisor: Prof. Jeannette Bohg
- Developing flexible and self-improving mobile manipulators, with an emphasis on deployability in unstructured indoor and outdoor environments. Research spanning robot memory, steerable Vision-Language-Action models (VLA)s, agentic robot planning for long-horizon tasks, and continual learning.

Ph.D. Student, AIR Lab, Carnegie Mellon University *Fall 2018 - May 2025*

Flexible Perception for High-Performance Robot Navigation *Pittsburgh, PA*

- Advisor: Prof. Sebastian Scherer
- Researched computer vision and learning algorithms to increase sensing horizon and deployment envelope for multiple applications: offroad driving, search-and-rescue, and wheelchair navigation.
- Researched generalizable, uncertainty-aware perception for autonomous wheelchairs using LLM and Foundation Models (Funded by Japan AIST). [Link]
- Researched ways to communicate robotics capabilities to the public and policymakers (Collab. with OECD).
- Led a team of 8 to develop perception systems for high-speed off-road driving (Funded by DARPA). [Link]
- Led a team of 4 to build a multi-drone planner for 3D actor reconstruction. Collaborated with three labs from CMU and UMN to build an autonomous outdoor MoCap for dense reconstruction (Funded by NSF). [Video]

Research Intern, Autonomous Systems Research Group, Microsoft AI *Summer 2021*

Pretraining for Robot Safety *Redmond, WA (remote)*

- Mentors: Dr. Shuang Ma and Dr. Ashish Kapoor
- Developed a pretraining pipeline for safe vision-based navigation.

Undergraduate Researcher, LAIR Lab, Harvey Mudd College *Spring 2014 - Spring 2017*

Shark Aggregation Tracking with Underwater Robots *Claremont, CA*

- Advisor: Prof. Christopher Clark
- Designed a decentralized, multi-robot controller to track shark aggregations in Catalina Island, CA. [Link]

Publications

Under Review

1. **MessyMem: Learning-from-Doing Memory for Mobile Manipulation**
   Anuva Banwasi, William Muckelroy III, Priya Sundaresan, Linfeng Zhao, Jeannette Bohg, **Cherie Ho**
   Under Review, 2026

2. **MessyNav: Zero-Shot Navigation via Manipulation in Messy Environments**
   Kenneth Llontop, **Cherie Ho**, Dylan Zhou, Anuva Banwasi, Carlota Pares-Morlans, Priya Sundaresan, Jeannette Bohg
   Under Review, 2026

3. **Robot-Powered Data Flywheels: Deploying Robots in the Wild for Continual Data Collection and Foundation Model Adaptation**
   Jennifer Grannen, Michelle Pan, Kenneth Llontop, **Cherie Ho**, Mark Zolotas, Jeannette Bohg, Dorsa Sadigh
   Under Review, 2026
   [Website] [PDF]
4. **VLM^2: Vision-Language Memory for Spatial Reasoning**
   Zuntao Liu, Yi Du, Taimeng Fu, Shaoshu Su, **Cherie Ho**, Chen Wang
   Under Review, 2025
   [Website] [PDF]
5. **Deep Bayesian Future Fusion for Self-Supervised, High-Resolution, Off-Road Mapping**
   Shubhra Aich, Wenshan Wang, Parv Maheshwari, Matthew Sivaprakasam, Samuel Triest, **Cherie Ho**, Jason M Gregory, John G Rogers III, Sebastian Scherer
   Under Review, 2024
   [PDF]

Peer-reviewed Conferences

6. **MapExRL: Human-Inspired Indoor Exploration with Predicted Environment Context and Reinforcement Learning**
   Narek Harutyunyan, Brady Moon, Seungchan Kim, **Cherie Ho**, Adam Hung, Sebastian Scherer
   IEEE International Conference on Advanced Robotics (ICAR), 2025
   [Website] [PDF]
7. **PIPE Planner: Pathwise Information Gain with Map Predictions for Indoor Robot Exploration**
   Seungjae Baek, Brady Moon, Seungchan Kim, Muqing Cao, **Cherie Ho**, Sebastian Scherer, Jeong Hwan Jeon
   IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025
   [Website] [PDF] [Code]
8. **RayFronts: Open-Set Semantic Ray Frontiers for Online Scene Understanding and Exploration**
   Omar Alama, Avigyan Bhattacharya, Haoyang He, Seungchan Kim, Yuheng Qiu, Wenshan Wang, **Cherie Ho**, Nikhil Keetha, Sebastian Scherer
   IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025
   [Website] [PDF] [Code]

9. **MapEx: Indoor Structure Exploration with Probabilistic Information Gain from Global Map Predictions**
   Cherie Ho*, Seungchan Kim*, Brady Moon, Aditya Parandekar, Narek Harutyunyan, Chen Wang, Katia Sycara, Graeme Best, Sebastian Scherer
   IEEE International Conference on Robotics and Automation (ICRA), 2025
   [PDF] [Website]
10. **SALON: Self-supervised Adaptive Learning for Off-road Navigation**
    Matthew Sivaprakasam, Samuel Triest, **Cherie Ho**, Shubhra Aich, Jeric Lew, Isaiah Adu, Wenshan Wang, and Sebastian Scherer
    IEEE International Conference on Robotics and Automation (ICRA), 2025
    [PDF] [Website]
11. **Map It Anywhere: Empowering BEV Map Prediction using Large-scale Public Datasets**
    Cherie Ho*, Jiaye Zou*, Omar Alama*, Sai Mitheran Jagadesh Kumar, Benjamin Chiang, Taneesh Gupta, Chen Wang, Nikhil Keetha, Katia Sycara, Sebastian Scherer
    Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track, 2024
    [PDF] [Website]
12. **Learning-on-the-Drive: Self-supervised Adaptation of Visual Offroad Traversability Models**
    Cherie Ho*, Eric Chen*, Mukhtar Maulimov, Chen Wang, Sebastian Scherer
    International Conference on Intelligent Robots and Systems (IROS), 2024
    [PDF][Video]
13. **3D Human Reconstruction in the Wild with Collaborative Aerial Cameras**
    Cherie Ho, Andrew Jong, Harry Freeman, Rohan Rao, Rogerio Bonatti, Sebastian Scherer
    International Conference on Intelligent Robots and Systems (IROS), 2021
    [PDF] [Video]
14. **Towards a Robust Aerial Cinematography Platform: Localizing and Tracking Moving Targets in Unstructured Environments**
    Rogerio Bonatti, **Cherie Ho**, Wenshan Wang, Sanjiban Choudhury, Sebastian Scherer
    International Conference on Intelligent Robots and Systems (IROS), 2019
    [PDF] [Video]
15. **Predicting Coordinated Group Movements of Sharks with Limited Observations using Autonomous Underwater Vehicles (AUVs)**
    Cherie Ho, Kimberly Joly, Andrew P. Nosal, Christopher G. Lowe, Christopher M. Clark
    Association for Computing Machinery Symposium on Applied Computing (SAC), 2017
    [PDF]

Journals

16. **Autonomous Aerial Cinematography Among Unstructured Environments With Learned Artistic Decision-Making**
    Rogerio Bonatti, Wenshan Wang, **Cherie Ho**, Aayush Ahuja, Mirko Gschwindt, Efe Camci, Erdal Kayacan, Sanjiban Choudhury, Sebastian Scherer
    Journal of Field Robotics (JFR), 2019
    [PDF] [Video]

Workshops and Tech Reports

17. **Adaptive Safety Margin Estimation for Safe Real-Time Replanning under Time-Varying Disturbance**
    Cherie Ho, Jay Patrikar, Rogerio Bonatti, Sebastian Scherer
    Arxiv, 2020. Also presented at RSS Robust Autonomy Workshop 2020.
    [PDF] [Video]

18. **Provably Safe in the Wild: Control Barrier Functions on a Vision-Based Quadrotor in an Outdoor Environment**
Cherie Ho*, Katherine Shih*, Jaskaran Singh Grover, Changliu Liu, Sebastian Scherer
RSS Robust Autonomy Workshop, 2020
[PDF] [Video]
19. **Autonomous Aerial Cinematography Among Unstructured Environments With Learned Artistic Decision-Making**
Rogerio Bonatti, Wenshan Wang, **Cherie Ho**, Aayush Ahuja, Mirko Gschwindt, Efe Camci, Erdal Kayacan, Sanjiban Choudhury, Sebastian Scherer
IROS Vision-based Drones Workshop, 2019
(Best Paper Finalist)
[PDF]
20. **Learning Reactive Flight Control Policies: From LIDAR Measurements to Actions**
Sam Zeng, Vaibhav Viswanathan, **Cherie Ho**, Sebastian Scherer
NeurIPS Imitation Learning and its Challenges in Robotics Workshop, 2018
(Spotlight Talk)

Honors & Awards

Croucher Postdoctoral Fellowship *2025-2027*
RSS Pioneers for Rising Stars in Robotics (1 out of 33, 15% Acceptance Rate) *2025*
Croucher Scholarship for Doctoral Study (Two-Year Full Scholarship, $180K) *2019-2021*
Microsoft Research PhD Fellowship Nomination, 1 out of 3 at CMU RI *2020*
Best Paper Finalist, IROS Vision-based Drones Workshop *2019*
Harvey Mudd Startup Incubator Inaugural Class ($120K for 6% Equity) *2017*
Harvey Mudd Excellence in Engineering Award for Entrepreneurship *2017*
University of Southern California Wrigley Institute Summer Fellowship *2016*

Industry Experience

Zenith Robotics *Spring 2017 - Summer 2018*
Co-Founder and CTO *San Francisco, CA*
- Part of the inaugural class of HMCINQ, a Harvey Mudd startup incubator (Awarded $120K for 6% equity).
- Developed machine learning algorithms and Robot Systems for sports analytics.

Google *Summer 2015*
Engineering Practicum Intern *Mountain View, CA*
- Developed an internal tool for Google Analytics for trend monitoring and anomaly detection in BigTable usage.

Teaching Experience

Lectures:

Bringing Robots into the Wild: Harnessing, Building, and Adapting Foundation Models, Guest Lecture for JHU: Introduction to Robot Learning *2026*
Visual SLAM, Guest Lecture for CMU 16-833: Robot Localization and Mapping *2021*
Deconstructing Robots, Outreach: Creative Tech Nights for Girls [Video] *2021*
Ensuring Safety in the Real World, Air Lab Summer School [Video][Code] *2020*

Course TA / Mentors:

Teaching Assistant, CMU 16-720: Computer Vision *2021*
Teaching Assistant, CMU 16-833: Robot Localization and Mapping *2020*
AI/Robotics Mentor, Chinese International School Tech Summer School *2017*
Head Tutor and Grader, HMC E84: Electronic and Magnetic Circuits/Devices *2017*
Lab Proctor, HMC E80: Experimental Engineering *2017*
Lab Proctor, HMC E79: Introduction to Engineering Systems and Signals *2016*
Tutor, HMC CS60: Principles of Computer Science *2015*
Tutor, HMC CS5: Introduction to Computer Science *2015*
Machine Shop Proctor, HMC E4: Introduction to Engineering Design *2014*

Academic and Professional Talks

Stanford Interactive Perception and Robot Learning Lab, Invited Talk *2025*
Stanford Vision and Learning Lab, Invited Talk *2025*
Voxel 51 "Best of NeurIPS" Series, Invited Talk *2025*
Princeton IROM Lab, Invited Talk *2025*
IROS 2024, Contributed Talk *2024*
Perception for High-Speed Offroad Driving, Thesis Proposal *2022*
CMU R-PAD Lab, Invited Talk *2022*
Third Wave Automation, Invited Talk *2021*
IROS 2021, Contributed Talk *2021*
Apple, Invited Talk *2021*
Lehigh University, Invited Talk *2021*
NSF Multidrone Symposium, Invited Short Talk *2020*
University of Illinois at Urbana-Champaign, Invited Short Talk *2020*
RSS 2020 Workshop on Robust Autonomy, Contributed Talk *2020*
Chinese International School Hong Kong, Invited Talk *2018*

Mentoring

Research Mentoring:

Dylan Zhou (Master's), Current Student *2026-*
Jiaye Zou (Undergrad @ CMU, Masters @ Stanford), Current Student *2025-*
Will Muckelroy III (Undergrad), Current Summer Intern *2026-*
Anuva Banwasi (Undergrad), Current Student *2026-*
Kenneth Llontop (Undergrad), Current Student *2026-*
Yifei Liu (Master's), Now: Field AI *2025*
Ben Chiang (Master's), Now: Software Engineer at Apple *2025*
Haoyang He (Master's), Now: Field AI *2025*
Charlotte Wang (Undergrad), Currently at CMU *2025*
Nathan Litzinger (Master's), Now: Robotics Engineer at Near Earth Autonomy *2025*
Nithya Sampath (Undergrad), Now: Software Engineer at Microsoft *2024*
Bangjie Xue (Master's), Now: Software Engineer at Apple *2024*
Omar Alama (Master's), Now: EE PhD at CMU *2024*
Sai Mitheran (Master's), Now: ML at Latent AI *2024*
Eric Chen (Undergrad), Now: CS Master's at Stanford *2023*
Rupanjali Kukal (Master's), Now: Data Scientist at Microsoft *2023*
Rohan Rao (Master's), Now: ML Engineer at NVIDIA *2021*

Harry Freeman (Master's), Now: Robotics PhD at CMU *2021*
Andrew Jong (Master's), Now: Robotics PhD at CMU *2021*

Master's Capstone Project Mentoring:

Autonomous Urban Wheelchair, ChaoI Tuan, Chiawen Liao, Haoyang He, Sonic Kuo, Thomas Chan *2024-2025*

CMU Masters Thesis / PhD Qualifier Committees:

Nikhil Keetha (PhD), High-fidelity Reconstruction with Gaussian Splatting *2024*
Aditya Rauniyar (Masters), Planning for 3D and 4D Reconstruction *2024*
Conner Pulling (Masters), Stereo Vision and Tactical Reinforcement Learning *2024*
Emily Kim (PhD), 3D Human Pose Estimation *2023*
Dominic Guri (PhD), Force-Torque Sensors for Agriculture *2023*
Seungchan Kim (PhD), Incorporating Interestingness for Object Detection *2023*
Sam Triest (PhD), Learning for Offroad Driving *2023*
Tushar Kusnur (Masters), Multi-robot Viewpoint Planning *2023*
Saumya Saxena (PhD), Graph Neural Networks for Manipulator Control *2022*
Ruohai Ge (Masters), Indoor Localization with 360° Images *2022*
Sourish Ghosh (Masters), Detect-and-Avoid for Aircrafts *2022*
Jay Patrikar (PhD), Socially-aware Motion Planning for Aircrafts *2021*

Service and Outreach

Interdisciplinary Activities:

Organizer, RSS Workshop in Robot Evaluation for the Real World [Link] *2025*
Bringing together experts from academia, public policy, and industry, this workshop aims to critically examine how we evaluate robotic systems to reflect the complexities of real-world operation across diverse domains.

Organizer, CMU Workshop on Assessment of Robotics Capabilities *2024*
In collaboration with OECD, hosted an interactive workshops for robotics students to debate and formulate a framework for evaluating robotics progress. Results are in preparation as a chapter in an upcoming OECD whitepaper.

Organizer, Special Meeting on Assessing Robotics Capabilities [Link] *2023*
In collaboration with OECD, hosted a meeting with robotics leaders to discuss proposed measures of robotics capabilities for policy makers

Committees and Outreach:

Creator, Meta-Resources on Graduate School and Research [Link] *2020-*
Organizer, ICRA 2024 Workshop on Resilient Off-road Autonomy [Link] *2024*
Climate Committee, CMU Robotics Institute *2022-2023*
Action committee for systemic issues in RI. Led efforts to better align advisor-advisee expectations. Contributed to webinars on grad school admissions.
Robotics PhD Admissions Committee, CMU Robotics Institute *2020-2022*
Session Co-Leader, CMU Creative Tech Nights for Girls [Video] *2021*
STEM outreach program targeting middle-school female students
Mentor, Society of Women Engineers *2016-2017*

Conference and Journal Reviewing:

ICRA, IROS, RSS, RA-L, AURO, NeurIPS, ISER, CHI, JFR, SSRR