

XUESU XIAO

(Incoming) Assistant Professor, Department of Computer Science, George Mason University (Fall 2022)
Robotist, The Everyday Robot Project, X, The Moonshot Factory
Research Affiliate, Department of Computer Science, The University of Texas at Austin

xiao@cs.utexas.edu • +1(412)320-0572 • 1212 Baywood Ct, College Station, TX 77845
<https://www.cs.utexas.edu/~xiao/>

RESEARCH STATEMENT

I envision future after-disaster missions to be efficiently conducted by fully autonomous robots, which are (1) highly capable of reliably moving through challenging and most likely adversarial environments, and (2) highly intelligent so that involvement of human rescuers, both physically and intellectually, can be effectively minimized. Therefore, my research goal is to **develop highly capable and intelligent mobile robots that are robustly deployable in the real world with minimal human supervision**. As a roboticist with unique expertise evenly grounded in motion planning and machine learning, and vast experience working on real-world problems in the field with disaster responders, I build advanced robot platforms, develop complex sensing and actuation systems, design sophisticated motion planning algorithms, and set up standardized testbeds and metrics in order to create highly capable and intelligent robots to locomote on land, in air, and at sea.

PROFESSIONAL PREPARATION

- **Ph.D.** (Computer Science, 2019), **Texas A&M University**, College Station, TX
Dissertation: *Risk-aware Path and Motion Planning for a Tethered Aerial Visual Assistant in Unstructured or Confined Environments*
Thesis Committee: Robin R. Murphy (Chair), Dylan A. Shell, Thomas R. Iroger, Suman Chakravorty
- **Master of Science** (Mechanical Engineering, 2015), **Carnegie Mellon University**, Pittsburgh, PA
Advisor: William (Red) L. Whittaker
- **Bachelor of Engineering** (Mechatronics Engineering, Dual-Degree, 2013),
Tongji University, Shanghai, P.R. China
FH Aachen University of Applied Sciences, Aachen, North Rhine-Westphalia, Germany

APPOINTMENTS

Academia

- **George Mason University**, starting 08/2022
Assistant Professor, Department of Computer Science
- **University of Texas at Austin**, 06/2021-current
Research Affiliate, Learning Agents Research Group (LARG)
- **University of Texas at Austin**, 08/2019-05/2021
Postdoctoral Researcher, Learning Agents Research Group (LARG)
- **Texas A&M University**, 08/2015-08/2019
Graduate Research Assistant, Center for Robot-Assisted Search and Rescue (CRASAR)
- **Carnegie Mellon University**, 08/2014-05/2015
Graduate Research Assistant, Biorobotics Lab

- **Carnegie Mellon University**, 09/2013-11/2014
Graduate Research Assistant, Field Robotics Center

Industry

- **X, The Moonshot Factory**, 06/2021-current
Robotician, Mountain View, CA
- **Facebook Reality Labs**, 05/2018-08/2018
Research Intern, Sausalito, CA
- **Microsoft Research Labs**, 05/2017-08/2017
Research Intern, Redmond, WA
- **PHOENIX CONTACT GmbH & Co. KG**, 02/2013-06/2013
Intern & Bachelor Thesis Author, Blomberg, Germany
- **DELPHI China Technical Center**, 06/2012-08/2012
Advanced Intern, Shanghai, China
- **Siemens Industrial Automation Ltd., Shanghai**, 05/2011-09/2011
Assistant Engineer, Shanghai, China
- **Luther Attorneys Shanghai**, 07/2010-08/2010
Executive Assistant, Shanghai, China

PUBLICATIONS

Journal

- [1] Z. Wang, **X. Xiao**, G. Warnell, and P. Stone. APPLE: Adaptive Planner Parameter Learning from Evaluative Feedback. *IEEE Robotics and Automation Letters (RA-L)*, accepted, July 2021.
- [2] J. Dufek, **X. Xiao**, and R. Murphy. Best Viewpoints for External Robots or Sensors Assisting Other Robots. *IEEE Transactions on Human-Machine Systems (THMS)*, accepted, May 2021.
- [3] **X. Xiao**, J. Biswas, and P. Stone. Learning Inverse Kinodynamics for Accurate High-Speed Off-Road Navigation on Unstructured Terrain. *IEEE Robotics and Automation Letters (RA-L)*, Vol. 6, No. 3: 6054 - 6060, July 2021.
- [4] **X. Xiao**, B. Liu, G. Warnell, and P. Stone. Toward Agile Maneuvers in Highly Constrained Spaces: Learning from Hallucination. *IEEE Robotics and Automation Letters (RA-L)*, Vol. 6, No. 2: 1503 - 1510, February 2021.
- [5] B. Liu, **X. Xiao**, and P. Stone. A Lifelong Learning Approach to Mobile Robot Navigation. *IEEE Robotics and Automation Letters (RA-L)*, Vol. 6, No. 2: 1090 - 1096, February 2021.
- [6] **X. Xiao**, B. Liu, G. Warnell, J. Fink, and P. Stone. APPLD: Adaptive Planner Parameter Learning from Demonstration. *IEEE Robotics and Automation Letters (RA-L)*, Vol. 5, No. 3: 4541-4547, July 2020.
- [7] **X. Xiao**, J. Dufek, and R. Murphy. Robot Risk-Awareness by Formal Risk Reasoning and Planning. *IEEE Robotics and Automation Letters (RA-L)*, Vol. 5, No. 2: 2856-2863, April 2020.
- [8] K. Tiwari, **X. Xiao**, A. Malik, and N. Y. Chong. A Unified Framework for Operational Range Estimation of Mobile Robots Operating on a Single Discharge to Avoid Complete Immobilization. *Mechatronics*, 57: 173-187, December 2018.
- [9] **X. Xiao** and R. Murphy. A Review on Snake Robot Testbeds in Granular and Restricted Maneuverability Spaces. *Robotics and Autonomous Systems*, 110: 160-172, October 2018.

[10] **X. Xiao**, M. Wu, J. Li and H. Zhang. Design and Realization of an Automobile Running Platform with External Panorama Simulation. *Journal of Mechanical & Electrical Engineering*, Vol. 29, No. 5, May 2012.

Conference

[11] Z. Xu, **X. Xiao**, G. Warnell, and P. Stone. Machine Learning Methods for Local Motion Planning: A Study of End-to-End vs. Parameter Learning. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, October 2021.

[12] Z. Wang, **X. Xiao**, A. Nettekoven, K. Umasankar, A. Singh, S. Bommakanti, U. Topcu, and P. Stone. From Agile Ground to Aerial Navigation: Learning from Learned Hallucination. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, September 2021.

[13] B. Liu, **X. Xiao**, and P. Stone. Team Orienteering Coverage Planning with Uncertain Reward. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, September 2021.

[14] **X. Xiao**, B. Liu, and P. Stone. Agile Robot Navigation through Hallucinated Learning and Sober Deployment. *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021.

[15] Z. Wang, **X. Xiao**, B. Liu, G. Warnell, and P. Stone. APPLI: Adaptive Planner Parameter Learning from Interventions. *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021.

[16] Z. Xu, G. Dhamankar, A. Nair, **X. Xiao**, G. Warnell, B. Liu, Z. Wang, and P. Stone. APPLR: Adaptive Planner Parameter Learning from Reinforcement. *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021.

[17] D. Perille, A. Truong, **X. Xiao**, and P. Stone. Benchmarking Metric Ground Navigation. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 116-121, November, 2020.

[18] J. Hart, R. Mirsky, **X. Xiao**, S. Tejada, B. Mahajan, J. Goo, K. Baldauf, S. Owen, and P. Stone. Using Human-Inspired Signals to Disambiguate Navigational Intentions. *12th International Conference on Social Robotics (ICSR)*, pp. 320-331, November 2020.

[19] **X. Xiao**, J. Dufek, and R. Murphy. Benchmarking Tether-based UAV Motion Primitives. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 51-55, September 2019.

[20] **X. Xiao**, J. Dufek, and R. Murphy. Explicit Motion Risk Representation. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 278-283, September 2019.

[21] **X. Xiao**, J. Dufek, and R. Murphy. Autonomous Visual Assistance for Robot Operations Using a Tethered UAV. *12th Conference on Field and Service Robotics (FSR)*, pp. 15-29, August 2019.

[22] **X. Xiao**, J. Dufek, M. Suhail, and R. Murphy. Motion Planning for a UAV with a Straight or Kinked Tether. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 8486-8492, October 2018.

[23] K. Tiwari, **X. Xiao**, and N. Y. Chong. Estimating Achievable Range of Ground Robots Operating on Single Battery Discharge for Operational Efficacy Amelioration. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3991-3998, October 2018.

[24] **X. Xiao**, Y. Fan, J. Dufek, and R. Murphy. Indoor UAV Localization Using a Tether. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 1-6, September 2018, **Best Paper Finalist**.

[25] **X. Xiao** and S. Zarar. A Wearable System For Articulated Human Pose Tracking Under Uncertainty of Sensor Placement. *IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*,

pp. 1144-1150, August 2018.

- [26] **X. Xiao** and S. Zarar. Machine Learning for Placement-insensitive Inertial Motion Capture. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 6716-6721, May 2018.
- [27] **X. Xiao** and S. Zarar. Packet Loss Concealment with Recurrent Neural Networks for Wireless Inertial Pose Tracking. *IEEE International Conference on Wearable and Implantable Body Sensor Networks (BSN)*, pp. 25-29, March 2018.
- [28] **X. Xiao**, J. Dufek, and R. Murphy. Visual Servoing for Teleoperation using a Tethered UAV. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 147-152, October, 2017.
- [29] J. Dufek, **X. Xiao**, and R. Murphy. Visual Pose Stabilization of Tethered Small Unmanned Aerial System to Assist Drowning Victim Recovery. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 116-122, October, 2017.
- [30] **X. Xiao**, J. Dufek, T. Woodbury, and R. Murphy. UAV Assisted USV Visual Navigation for Marine Mass Casualty Incident Response. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 6105-6110, September 2017.
- [31] R. Murphy, J. Dufek, T. Sarmiento, G. Wilde, **X. Xiao**, R. Smith, S. Allred, A. Wright, J. Braun, L. Mullen, J. Adams, and J. Gingrich. Two Case Studies and Gaps Analysis of Flood Assessment for Emergency Management with Small Unmanned Aerial Systems. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pp. 54-61, October 2016.
- [32] **X. Xiao**, E. Cappelletti, W. Zhen, J. Dai, K. Sun, C. Gong, and H. Choset. Locomotive Reduction for Snake Robots. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3735-3740, May 2015.

Workshop / Extended Abstract

- [33] **X. Xiao**, B. Liu, G. Warnell, and P. Stone. Extended Abstract: Safe Learning from Hallucination for Navigation in the Wild. *AAAI Spring Symposium Series 2021 Machine Learning for Mobile Robot Navigation in the Wild*, March 2021.
- [34] **X. Xiao**, B. Liu, G. Warnell, Z. Wang, Z. Xu, G. Dhamankar, A. Nair, and P. Stone. Extended Abstract: Adaptive Planner Parameter Learning for Mobile Robot Navigation in the Wild. *AAAI Spring Symposium Series 2021 Machine Learning for Mobile Robot Navigation in the Wild*, March 2021.
- [35] B. Liu, **X. Xiao**, and P. Stone. Extended Abstract: Lifelong Learning for Resource-Constrained Robot Navigation in the Wild. *AAAI Spring Symposium Series 2021 Machine Learning for Mobile Robot Navigation in the Wild*, March 2021.
- [36] **X. Xiao**, B. Liu, and P. Stone. Motion Planners Learned from Geometric Hallucination. *Workshop "Bring Geometric Methods to Robot Learning, Optimization and Control", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, October 2020.
- [37] **X. Xiao**, H. Astley, J. Dai, W. Zhen, C. Gong, D. Goldman, and H. Choset. How Compound-Wave Control Alleviates Hyper-Redundant Control Complexity. *Workshop "Robotics-inspired Biology", IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

Preprint

- [38] **X. Xiao**, Y. Zhang, H. Li, H. Wang, and B. Li. Camera-IMU Extrinsic Calibration Quality Monitoring. *under review*, September 2021.

- [39] Z. Wang, **X. Xiao**, and P. Stone. Task-Independent Causal State Abstraction. *under review*, September 2021.
- [40] J. Park, **X. Xiao**, G. Warnell, H. Yedidsion, and P. Stone. Learning Perceptual Hallucination for Multi-Robot Navigation in Narrow Hallways. *under review*, September 2021.
- [41] Z. Xu, A. Nair, **X. Xiao**, and P. Stone. Improving Autonomous Navigation by Self-Supervised Environment Synthesis. *under review*, September 2021.
- [42] S. Ravi, S. Satewar, G. Wang, **X. Xiao**, Garrett Warnell, Joydeep Biswas, and Peter Stone. Visually Adaptive Geometric Navigation. *under review*, September 2021.
- [43] K. Sikand, S. Rabiee, A. Uccello, **X. Xiao**, G. Warnell, and J. Biswas. Visual Representation Learning for Preference-Aware Path Planning. *arXiv: 2109.08968 [cs.RO]*, September 2021.
- [44] R. Mirsky, **X. Xiao**, J. Hart, and P. Stone. Prevention and Resolution of Conflicts in Social Navigation - a Survey. *arXiv: 2106.12113 [cs.RO]*, June 2021.
- [45] **X. Xiao**, Z. Wang, Z. Xu, B. Liu, G. Warnell, G. Dhanmankar, A. Nair, and P. Stone. APPL: Adaptive Planner Parameter Learning. *arXiv: 2105.07620 [cs.RO]*, May 2021.
- [46] H. Karnan, G. Warnell, **X. Xiao**, and P. Stone. VOILA: Visual-Observation-Only Imitation Learning for Autonomous Navigation. *arXiv: 2105.09371 [cs.RO]*, March 2021.
- [47] **X. Xiao**, B. Liu, G. Warnell, and P. Stone. Motion Control for Mobile Robot Navigation Using Machine Learning: a Survey. *arXiv: 2011.13112 [cs.RO]*, November 2020.

Technical Report

- [48] **X. Xiao** and R. Whittaker. Energy Utilization and Energetic Estimation of Achievable Range for Wheeled Mobile Robots Operating on a Single Battery Discharge. *tech. report CMU-RI-TR-14-15, Robotics Institute, Carnegie Mellon University*, June, 2015.
- [49] R. Whittaker, U. Wong, H. Jones, S. Huber, C. Cunningham, W. Whittaker, S. Mcguire, **X. Xiao**, R. Shanor, A. Solorzano, T. Carlone, W. Tabib, C. Greve, L. Schneider, and N. Otten. Exploration of Planetary Skylights and Tunnels. *NASA Technical Report*, September, 2014.
- [50] **X. Xiao** and R. Whittaker. Energy considerations for wheeled mobile robots operating on a single battery discharge. *tech. report CMU-RI-TR-14-16, Robotics Institute, Carnegie Mellon University*, August, 2014.

Dissertation

- [51] **X. Xiao**. Risk-aware Path and Motion Planning for a Tethered Aerial Visual Assistant in Unstructured or Confined Environments. *Ph.D. Thesis, Texas A&M University*, December 2019.

Patent

- [52] **X. Xiao**. A Multifunctional Automobile Running Simulation System. *Chinese Patent, Application Number: 201120456535.1*.

- [53] **X. Xiao.** Bus Awning. *Chinese Patent*, Publication Number: CN101607541 A.
- [54] **X. Xiao.** An Automobile Braking System with instant Braking Condition Indication. *Chinese Patent*, Publication Number: CN202345519 U.
- [55] **X. Xiao.** Cold Water Collector for Water Heater. *Chinese Patent*, Publication Number: CN201177356 Y.
- [56] **X. Xiao.** Food Bag with a Storage Pocket. *Chinese Patent*, Publication Number: CN201086890 Y.

SELECTED PROJECTS

- **Inspection of City Infrastructure via Peripheral Perception**, 09/2020-current
Project Lead, Good Systems Grand Challenge funded project at University of Texas at Austin
- **Human-in-the-Loop Machine Learning for Adaptive Robot Navigation Behaviors**, 08/2019-current
Project Lead, Army Research Laboratory (ARL) Collaborative Research Alliance (CRA) funded Distributed and Collaborative Intelligent Systems and Technology (DCIST) project at University of Texas at Austin
- **NRI: A Collaborative Visual Assistant for Robot Operations in Unstructured or Confined Environments**, 09/2016-08/2019
Project Lead, Department of Energy funded NSF NRI project at Texas A&M University
- **NRI: Collaborative: Exploiting Granular Mechanics to Enable Robotic Locomotion**, 05/2016-08/2019
Main Participant, NSF NRI funded project at Texas A&M University
- **NSF RAPID: Using an Unmanned Aerial Vehicle and Increased Autonomy to Improve an Unmanned Marine Vehicle Lifeguard Assistant Robot**, 01/2016-08/2019
Project Lead, NSF funded project at Texas A&M University
- **NRI: Robotic Scouts: Augmenting Perception for Underground Rescue**, 10/2013-11/2014
Main Participant, NSF NRI funded project at Carnegie Mellon University

TEACHING

- **CS309 Autonomous Intelligent Robotics (FRI II)**
Co-Instructor, University of Texas at Austin, Fall 2020
- **CS309 Autonomous Intelligent Robotics (FRI I)**
Co-Instructor, University of Texas at Austin, Spring 2020
- **CSCE 121 Introduction to Program Design and Concepts**
Teaching Assistant, Texas A&M University, Spring 2016
- **CSCE 121 Introduction to Program Design and Concepts**
Teaching Assistant, Texas A&M University, Fall 2015
- **Robotics 778 Mechatronic Design**
Teaching Assistant, Carnegie Mellon University, Spring 2015

STUDENT MENTORSHIP

University of Texas at Austin

Haresh Karnan, Ph.D. student	12/2020-current
Zizhao Wang, Ph.D. student	08/2020-current
Zifan Xu, Ph.D. student	05/2020-current
Bo Liu, Ph.D. student	12/2019-current
Anirudh Nair, Undergraduate student	05/2020-current
Daniel Perille, Undergraduate student	05/2020-current
Ashwin Kudva, Undergraduate student	01/2021-06/2021
Gauraang Dhamankar, Undergraduate student	05/2020-05/2021
Abigail Truong, Undergraduate student	05/2020-03/2021
William Shi, Undergraduate student	08/2020-12/2020
Yuntong Qu, Undergraduate student	08/2020-12/2020

Texas A&M University

Jan Dufek, Ph.D. student	08/2019-08/2020
Mohamed Suhail, Master student	08/2017-05/2018
Rebecca Schofield, Undergraduate student	08/2017-05/2018

SERVICE

Chair

- AAAI Spring Symposium Series 2021 Machine Learning for Mobile Robot Navigation in the Wild
- IEEE ICRA 2021 Workshop Machine Learning for Motion Planning

Organizing Committee

- ACM/IEEE HRI 2021 Workshop Exploring Applications for Autonomous Non-Verbal Human-Robot Interactions

Associate Editor

- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)

Senior Program Committee

- International Joint Conferences on Artificial Intelligence (IJCAI)

Program Committee

- The AAAI Conference on Artificial Intelligence (AAAI)
- International Conference on Autonomous Agents and Multiagent Systems (AAMAS)
- IEEE ICRA 2020 Workshop Machine Learning in Planning and Control of Robot Motion

Reviewer Board

- MDPI Applied Sciences
- MDPI Sensors

Journal Reviewer

- IEEE Robotics and Automation Letters (RA-L)
- IEEE Robotics and Automation Magazine (RAM)
- IEEE Robotics and Autonomous Systems (RAS)
- IEEE Transactions on Automation Science and Engineering (T-ASE)
- IEEE Transactions on Mobile Computing (TMC)
- IEEE Access
- AI Access Foundation Journal of Artificial Intelligence Research (JAIR)
- MDPI Journal of Marine Science and Engineering (JMSE)
- Springer Machine Learning
- SAGE Measurement and Control (MAC)
- SCIENCE CHINA Information Sciences

Conference Reviewer

- Robotics: Science and Systems (RSS)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)
- IEEE International Symposium on Multi-Robot and Multi-Agent Systems (MRS)
- IEEE European Conference on Mobile Robots (ECMR)
- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)

PRESS COVERAGE

- US Army, **Soldiers could teach future robots how to outperform humans**, 08/12/2020
- Robotics Business Review, **How Robots and Drones are Changing Rescue Operations**, 11/27/2019
- Tech Briefs, **Drones and AI Improve 'EMILY' Lifesaver Robot for Large-Scale Water Rescues**, 06/30/2018
- NSF Science Nation, **Water rescue robot EMILY gets some help from the sky**, 02/26/2018
- WIRED, **Marsupial Robots Ain't Cuddly, But They Are Totally Brilliant**, 04/08/2017
- KBTX, **Search and rescue workers, drones, robots, gather in Grimes County for training**, 01/28/2017

HONORS

- 2018 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR), Best Paper Finalist (08/2018)
- 2018 IEEE International Conference on Wearable and Implantable Body Sensor Networks (BSN), Student Travel Award (03/2018)
- The Excellent Graduate of Shanghai (06/2013)
- DAAD Scholarship (German Ministry of Education) (09/2012)
- National Scholarship (Chinese Ministry of Education) (09/2012)
- Learning Scholarship of Tongji University (09/2012)
- The Excellent Student of Tongji University (09/2012)
- National Scholarship (Chinese Ministry of Education) (09/2011)
- Learning Scholarship of Tongji University of the School Year 2010-2011 (09/2011)
- The Excellent Student of the School Year 2010-2011 of Tongji University (09/2011)

- Ni-Li-Shi Scholarship (awarded to the best students) (09/2010)
- Learning Scholarship of Tongji University of the School Year 2009-2010 (09/2010)
- The Excellent Student of the School Year 2009-2010 of Tongji University (09/2010)

PERSONAL

Languages:

- Chinese (native)
- English (fluent)
- German (fluent)