Mengxue Hou

Contact Information

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Research Interests

Robotics, Autonomy, AI, Machine Learning, Control Theory

Appointments

University of Notre Dame, South Bend, IN, USA — Jul. 2023 - present

Tenure-track Assistant Professor, Electrical Engineering

Purdue University, West Lafayette, IN — Aug. 2022 - Jul. 2023

Lillian Gilbreth Postdoctoral Fellow, College of Engineering
Advisors: Prof. Shaoshuai Mou, Prof. Shreyas Sundaram

Education

Georgia Institute of Technology, Atlanta, GA, USA — Aug. 2016 - Jul. 2022

Ph.D., Electrical and Computer Engineering

Minor, Mathematics

Thesis: Mori-Zwanzig formalism based reduced-order modeling for decision-making in marine autonomy

Advisor: Prof. Fumin Zhang

Shanghai Jiao Tong University, Shanghai, China — Sept 2012 - June 2016

B.S., Electrical Engineering

Honors and Awards

1 2023 CPS Rising Star, University of Virginia, April 2023

2 Lillian Gilbreth postdoctoral fellowship, Purdue University, August 2022.

3 Best student paper/poster award, MTS/IEEE OCEANS' 19, Marseille, France, June 2019 (flagship conference in ocean engineering).

4 Chiang Chen overseas graduate fellowship from Chiang Chen Industrial Charity Foundation, Hong Kong, China, 2015. (1 of 10 awardees in China)

Publications

Journal publications

J11 Jiankuo Cui, **Mengxue Hou**, Zheng Peng, Ying Wang, Jun-Hong Cui, "Hamiltonian based AUV navigation using adaptive finite-time trajectory tracking control," in *Ocean Engineering*, 320, 120329, 2025.

J10 **Mengxue Hou**, Enlu Zhou and Fumin Zhang, "Mori-Zwanzig Approach for Belief Abstraction with Application to Belief Space Planning," in *Autonomous Robots*, 49, no. 1: 1-23, 2025. DOI: 10.1007/s10514-024-10185-1.

J9 Yingke Li, **Mengxue Hou**, Enlu Zhou and Fumin Zhang, "Dynamic Event-triggered Integrated Task and Motion Planning for Process-aware Source Seeking," in *Autonomous Robots*, 48, no. 8: 1-20, 2024. DOI: 10.1007/s10514-024-10177-1

J8 Meriam Ouerghi, **Mengxue Hou** and Fumin Zhang, "Laplacian Regularized Motion Tomography for Underwater Vehicle Flow Mapping with Sporadic Localization Measurements", in *Autonomous Robots*, 48 (10), 2024. DOI: 10.1007/s10514-024-10165-5.

J7 Zunyao Yang, **Mengxue Hou**, Zhongsheng Hou and Shangtai Jin, "Disturbance Observer Dynamic Linearization-Based Model-Free Adaptive Control for Discrete-Time Nonlinear Systems," in *IEEE Transactions on Cybernetics*, 1-14, 2024. DOI: 10.1109/TCYB.2024.3431290.

J6 Zixiang Mao, **Mengxue Hou** and Zhongsheng Hou, "Model-free adaptive bipartite consensus control for unknown heterogeneous nonlinear MASs with different input delays," in *International Journal of Systems Science*, 1-16, 2024. DOI: 10.1080/00207721.2024.2367076.

J5 Xueming Zhang, **Mengxue Hou** and Zhongsheng Hou, "Data-Driven High-Order Point-to-Point ILC With Higher Computational Efficiency," in *IEEE Transactions on Automation Science and Engineering*, pp. 1-16, 2024. DOI: 10.1109/TASE.2023.3321038

J4 **Mengxue Hou**, Qiuyang Tao and Fumin Zhang, "Human Pointing Motion during Interaction with an Autonomous Blimp," in *Scientific Reports*, 12, 11402, 2022. DOI: 10.1038/s41598-022-15016-w

J3 Haoyan Zhai, **Mengxue Hou**, Fumin Zhang and Haomin Zhou, "Method of Evolving Junction on Optimal Path Planning in Flow Fields," in *Autonomous Robots*, 1-19, 2022. DOI: 10.1007/s10514-022-10058-5

J2 **Mengxue Hou**, Sungjin Cho, Haomin Zhou, Catherine R. Edwards and Fumin Zhang,"Bounded Cost Path Planning for Underwater Vehicles Assisted by a Time-invariant Partitioned Flow Field Model," in *Frontiers in Robotics and AI*, 8, 2021. DOI: 10.3389/frobt.2021.575267

J1 Meriam Ouerghi, Sean Maxon, **Mengxue Hou** and Fumin Zhang, "Improved Trajectory Tracing of Underwater Vehicles for Flow Field Mapping," in *International Journal of Intelligent Robotics and Applications*, 1-17, Jul. 2021, pp. 1-17. DOI: 10.1007/s41315-021-00189-w

Conference proceedings (* denotes PhD advisee)

C23 Zongyao Liu*, Ruochu Yang and **Mengxue Hou**, "An Active Perception Strategy for Underwater Vehicle Navigation", in *2025 OCEAN'S Great Lakes*, accepted.

C22 Yu Zhou* and **Mengxue Hou**, "Uncertainty-aware 3D Gaussian Splatting (3DGS) Underwater Robotic Perception", in *2025 OCEAN'S Great Lakes*, accepted.

C21 Likai Pei, Yu Zhou*, Xingtian Wang, Xueji Zhao, Wanxin Huang, Boyang Cheng, Halid Mulaosmanovic, Stefan Duenkel, Dominik Kleimaier, Sven Beyer, Kai Ni, **Mengxue Hou**, Michael Niemier and Ningyuan Cao, "Towards Uncertainty-aware Robotic Perception via Mixed-signal BNN Engine Leveraging Probabilistic Quantum Tunneling", in *2025 Design Automation Conference*, in press.

C20 Ruoshi Liu, Huy Ha, **Mengxue Hou**, Shuran Song and Carl Vondrick,"Self-Improving Autonomous Underwater Manipulation", in *2025 IEEE International Conference on Robotics and Automation (ICRA)*, in press.

C19 Yu Zhou*, Ruochu Yang and **Mengxue Hou**, "Flow Field Estimation in Underwater Vehicle Navigation using Sporadic Image Observations", in *22nd International Conference on Ubiquitous Robots*, College Station, TX, USA, Jun. 2025, pp. 579-584, DOI: 10.1109/UR65550.2025.11078124

C18 Xiaoran Zha* and **Mengxue Hou**, "A Mori–Zwanzig Formalism based Estimation Approach for Dynamic Obstacle Avoidance", in *22nd International Conference on Ubiquitous Robots*, College Station, TX, USA, Jun. 2025, pp. 464-469, DOI: 10.1109/UR65550.2025.11078068.

C17 Ruochu Yang, **Mengxue Hou**, Chad Lembke, Catherine R. Edwards and Fumin Zhang, "Real-time Autonomous Glider Navigation Software", in *Proc. of MTS/IEEE OCEANS' 23*, Limerick, UK, Jun. 2023, pp. 1-4, DOI: 10.1109/OCEANSLimerick52467.2023.10244627.

C16 Shaojun Ma, **Mengxue Hou**, Xiaojing Ye, and Haomin Zhou, "High-dimensional Optimal Density Control with Wasserstein Metric Matching", in *2023 62nd Conference on Decision and Control (CDC)*, Singapore, Singapore, Dec. 2023, pp. 6813 - 6818, DOI: 10.1109/CDC49753.2023.10384042.

C15 **Mengxue Hou**, Yingke Li, Fumin Zhang, Shreyas Sundaram and Shaoshuai Mou, "An Interleaved Algorithm for Integration of Robotic Task and Motion Planning", in *2023 American Control Conference (ACC)*, San Diego, CA, USA, Jun. 2023, pp. 539-544, DOI: 10.23919/ACC55779.2023.10156651.

C14 Yingke Li, **Mengxue Hou**, Enlu Zhou and Fumin Zhang, "Dynamic Event-triggered Integrated Task and Motion Planning for Process-aware Source Seeking," in *2023 American Control Conference (ACC)*, San Diego, CA, USA, Jun. 2023, pp. 527-532, DOI: 10.23919/ACC55779.2023.10156291.

C13 Ruochu Yang, **Mengxue Hou**, Chad Lembke, Catherine R. Edwards and Fumin Zhang, "Anomaly Detection of Underwater Gliders Verified by Deployment Data", in *2023 IEEE Underwater Technology (UT)*, Tokyo, Japan, Mar. 2023, pp. 1-10, DOI: 10.1109/UT49729.2023.10103445

C12 **Mengxue Hou**, Tony X. Lin, Haomin Zhou, Wei Zhang, Catherine R. Edwards and Fumin Zhang, "Belief Space Partitioning for Symbolic Motion Planning, " in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, Jun. 2021, pp. 8245-8251. DOI: 10.1109/ICRA48506.2021.9561121

C11 Sravya Kondrakunta, Venkatsampath R. Gogineni, Michael Cox, Demetris Coleman, Xiabao Tan, Tony Lin, **Mengxue Hou**, Fumin Zhang, Frank McQuarrie, and Catherine R. Edwards, "The Rational Selection of Goal Operations and the Integration of Search Strategies with Goal-driven Marine Autonomy," in *Proceedings of the Ninth Annual Conference on Advances in Cognitive Systems*, 2021.

C10 Qiuyang Tao, **Mengxue Hou** and Fumin Zhang, "Modeling and Identification of Coupled Translational and Rotational Motion of Underactuated Indoor Miniature Autonomous Blimps," in *2020 16th International Conference on Control, Automation, Robotics and Vision (ICARCV)*, Dec. 2020, pp. 339-344. DOI: 10.1109/ICARCV50220.2020.9305371

C9 Tony X. Lin, **Mengxue Hou**, Catherine R. Edwards, Michael Cox and Fumin Zhang, "Bounded Cost HTN Planning for Marine Autonomy," in *Global Oceans 2020: Singapore – U.S. Gulf Coast*, Oct. 2020, pp. 1-6. DOI: 10.1109/IEEECONF38699.2020.9389201

C8 Ziqiao Zhang, **Mengxue Hou**, Fumin Zhang, and Catherine R. Edwards, "An LSTM based Kalman Filter for Spatio-temporal Ocean Currents Assimilation," in *Proc. of ACM International Conference on Underwater Networks and Systems*, Atlanta, US, Oct. 2019, pp. 1-7. DOI: 10.1145/3366486.3366522

C7 **Mengxue Hou**, Haoyan Zhai, Haomin Zhou and Fumin Zhang, "Partitioning Ocean Flow Field for Underwater Vehicle Path Planning," in *Proc. of MTS/IEEE OCEANS' 19*, Marseille, France, Jun. 2019, pp. 1-8. DOI: 10.1109/OCEANSE.2019.8867327 **(best student paper/poster award)**

C6 **Mengxue Hou**, Qiuyang Tao, Paul Varnell and Fumin Zhang, "Modeling Pointing Tasks in Human-Blimp Interactions," in *Proc. of the 3rd IEEE Conference on Control Technology and Applications (CCTA)*, Hong Kong, China, Aug. 2019, pp. 73-78. DOI: 10.1109/CCTA.2019.8920528

C5 **Mengxue Hou**, Shijie Liu, Fumin Zhang and Catherine R. Edwards, "Path Tracking Error Analysis for Underwater Glider Navigation in a Spatially and Temporally Varying Flow Field", in *Proc. of MTS/IEEE OCEANS' 18*, Charleston, US, Oct. 2018, pp. 1-6. DOI: 10.1109/OCEANS.2018.8604585

C4 **Mengxue Hou**, Shijie Liu, Fumin Zhang and Catherine R. Edwards, "A Combined Path Planning and Path Following Method for Underwater Glider Navigation in a Strong, Dynamic Flow Field", in *Proc. of MTS/IEEE OCEANS' 18*, Kobe, Japan, May. 2018, pp. 1-8. DOI: 10.1109/OCEANSKOBE.2018.8559348

C3 Qiuyang Tao, Jaeseok Cha, **Mengxue Hou** and Fumin Zhang, "Parameter Identification

of Blimp Dynamics through Swinging Motion", in *Proc. of International Conference on Control, Automation, Robotics and Vision (ICRAV)*, Singapore, Nov. 2018, pp. 1186-1191. DOI: 10.1109/ICARCV.2018.8581376

C2 **Mengxue Hou** and Shangtai Jin, "Simulation Comparison among Three Data-Driven Control Methods for the Planar Manipulator", in *Proc. of 10th Asian Control Conference (ASCC)*, Sabah, Malaysia, May. 2015, pp. 1-6. DOI: 10.1109/ASCC.2015.7244440

C1 Shangtai Jin and **Mengxue Hou**, "An Improved Full-Form-Dynamic-Linearization based MFAC for a Class of Nonlinear Systems", in *Proc. of 34th Chinese Control Conference(CCC)*, Hangzhou, China, Jul. 2015, pp. 3045-3050. DOI: 10.1109/ChiCC.2015.7260108

Presentations

Invited Seminar Presentations

- "Assured Abstraction for Hierarchical Robotic Planning", University of Kentucky Department of Mechanical Engineering, Oct. 25, 2024
- "Mori-Zwanzig Formalism based Abstraction for Robotic Planning", Cleveland State University, Sept. 30, 2024

Invited Workshop and Conference Presentations

- "Assured Neuro-Symbolic Learning for Robotic Task and Motion Planning", Workshop on "Optimizing Across Scales: Multi-Fidelity, Multi-Modality, and Multi-Objective Approaches for Complex Systems", in American Control Conference (ACC), Denver, CO, Jun 2025.
- "High fidelity Neuro-Symbolic Model Learning for Robotic Planning", 2025 Midwest ML Symposium, University of Chicago, Chicago, IL, Jun, 2025.

Grant

Uncertainty Tolerant Controls

- Sponsor: Office of Electricity
- Institutions: Oak Ridge National Lab, Pacific Northwest National Laboratory, Sandia National Laboratories, University of Notre Dame (subcontract)
- Role: Principal Investigator
- Total Award (Hou's share): $12,994.00
- Project date: Jan. 1 2025 - Dec. 31 2025

Teaching Experience

Course Instructor, EE 67074 — Fall 2023, 2024
AI Planning: from Graph Search to Reinforcement Learning,
Electrical Engineering, University of Notre Dame

Course Instructor, EE 20221 — Spring 2024, 2025
Signal and Information Systems,
Electrical Engineering, University of Notre Dame

Course Instructor, Vertically Integrated Projects (VIP), — Fall 2018 - Spring 2019
Electrical and Computer Engineering, Georgia Tech

Course Instructor, Summer Undergraduate Research in Engineering/Sciences (S.U.R.E.), — Summer 2019
Electrical and Computer Engineering, Georgia Tech

Teaching Assistant, Introduction to Signal Processing, — Fall 2016 - Summer 2017
Electrical and Computer Engineering, Georgia Tech

Service

- Editor for Journal of Intelligent & Robotic Systems (JINT)
- Associate Editor, 2025 American Control Conference (ACC)
- Publication chair, 2025 IFAC Conference on Networked Systems (NecSys)

- EDAS chair, 2024 International Conference on Underwater Networks & systems (WUWNet)
- Reviewer for IEEE Transactions on Automatic Control, IEEE Transaction on Cybernetics, IEEE Transaction on Robotics, IEEE Journal of Oceanic Engineering, IEEE Transactions on Control of Network Systems, Autonomous Robots, and IEEE Robotics and Automation Letters.
- Reviewer for International Conference on Underwater Networks & systems (WUWNet), MTS/IEEE OCEANS, International Conference on Robotics and Automation (ICRA), International Conference on Intelligent Robots and Systems (IROS), Conference on Control Technology and Applications (CCTA), American Control Conference (ACC) and Conference on Decision and Control (CDC).