

## Mengxue Hou

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RESEARCH INTERESTS	Nonlinear filtering, learning and optimal control, underwater vehicle, human robot interaction
EDUCATION	<b>Georgia Institute of Technology</b> , Atlanta, GA, USA  Ph.D., Electrical and Computer Engineering     Aug. 2016 - Apr. 2022 (expected) Minor, Mathematics <i>Thesis:</i> A Mori-Zwanzig formalism based belief abstraction approach for symbolic task and motion planning <i>Advisor:</i> Prof. Fumin Zhang  <b>Shanghai Jiao Tong University</b> , Shanghai, China  B.S., Electrical Engineering (Power Systems)     Sept 2012 - June 2016
HONORS AND AWARDS	1 Best student paper/poster award, MTS/IEEE OCEANS' 19, Marseille, France, June. 2019 (flagship conference in ocean engineering). Paper/poster title: Partitioning ocean flow field for underwater vehicle path planning 2 Chiang Chen overseas graduate fellowship from Chiang Chen Industrial Charity Foundation, Hong Kong, China, 2015. (1 of 10 awardees in China) 3 Meritorious Winner, Mathematical Contest in Modeling, the Consortium for Mathematics and its Application, USA, 2015. (Top 10% among all participants worldwide)
PUBLICATIONS	<b>Journal publications</b> 1 <b>Mengxue Hou</b> , 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 <i>Frontiers in Robotics and AI</i> , 8, 2021. DOI: <a href="https://doi.org/10.3389/frobt.2021.575267">10.3389/frobt.2021.575267</a> 2 <b>Mengxue Hou</b> , Qiuyang Tao, and Fumin Zhang, "Human Pointing Motion during Interaction with an Autonomous Blimp," in <i>International Journal of Social Robotics</i> , under review. 3 Haoyan Zhai, <b>Mengxue Hou</b> , Fumin Zhang, and Haomin Zhou, "Method of Evolving Junction on Optimal Path Planning in Flow Fields," in <i>Autonomous Robots</i> , under review. arXiv: <a href="https://arxiv.org/abs/1904.11554">1904.11554</a> 4 Meriam Ouerghi, Sean Maxon, <b>Mengxue Hou</b> , and Fumin Zhang, "Improved Trajectory Tracing of Underwater Vehicles for Flow Field Mapping," in <i>International Journal of Intelligent Robotics and Applications</i> , 1-17, Jul. 2021, pp. 1-17. DOI: <a href="https://doi.org/10.1007/s41315-021-00189-w">10.1007/s41315-021-00189-w</a> 5 <b>Mengxue Hou</b> , Enlu Zhou, and Fumin Zhang, "Mori-Zwanzig Formalism based Belief Abstraction for Symbolic Motion Planning," in preparation for submission to <i>Automatica</i> . 6 Sravya Kondrakunta, Venkatsampath R. Gogineni, Michael Cox, Demetris Coleman, Xiabao Tan, Tony Lin, <b>Mengxue Hou</b> , 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 *Advances in Cognitive Systems*, in press.

#### Conference proceedings

- 1 **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](https://doi.org/10.1109/ICRA48506.2021.9561121)
- 2 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](https://doi.org/10.1109/ICARCV50220.2020.9305371).
- 3 Tony X. Lin, **Mengxue Hou**, Catherine R. Edwards, Michael Cox, 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](https://doi.org/10.1109/IEEECONF38699.2020.9389201).
- 4 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](https://doi.org/10.1145/3366486.3366522)
- 5 **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](https://doi.org/10.1109/OCEANSE.2019.8867327) (best student paper/poster award)
- 6 **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](https://doi.org/10.1109/CCTA.2019.8920528)
- 7 **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](https://doi.org/10.1109/OCEANS.2018.8604585)
- 8 **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](https://doi.org/10.1109/OCEANSKOBE.2018.8559348)
- 9 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](https://doi.org/10.1109/ICARCV.2018.8581376)
- 10 **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](https://doi.org/10.1109/ASCC.2015.7244440)
- 11 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](https://doi.org/10.1109/ChiCC.2015.7260108)

Georgia Tech Systems Research Laboratory,  
 Electrical and Computer Engineering, Georgia Institute of Technology  
 Supervisor: Prof. [Fumin Zhang](#)

- 1 Developed a novel reduced-order modeling approach of ocean flow field that can facilitate computationally efficient path planning of underwater vehicles. This work has won **the best student paper/poster award in MTS/IEEE OCEANS' 19 conference**.
- 2 Developed a novel branch-and-bound depth first search method for underwater vehicle path planning problems in the reduced-order ocean flow field model, as an instance of a mixed integer optimization problem. The algorithm is complete, and solves the planning problem with low computation cost.
- 3 Proposed a belief abstraction algorithm for Partially Observable Markov Decision Process (POMDP). We developed a novel memory-constrained partition method for belief abstraction. Based on the Mori-Zwanzig formalism, a Neural Network is used to model the reduced-order belief dynamic. We proved that by leveraging the Neural Network, the algorithm achieves time-uniform model reduction error bound.
- 4 Established the first model describing human behavior when interacting with a flying autonomous blimp through pointing motion. Video of this work can be found at <https://youtu.be/4JavPa0VKio>.

TEACHING  
EXPERIENCE

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

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

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

SERVICE

- Student organizer of the 14th International Conference on Underwater Networks & systems (WUWNet 2019).
- Reviewer for IEEE Transactions on Automatic Control, 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, Conference on Control Technology and Applications (CCTA).