Yewei Huang, Ph.D.

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RESEARCH INTEREST

My main research interest is the challenges associated with **robot perception**, **navigation** and **decision-making** problems, particularly in the context of **multi-robot systems**. By deploying these algorithms in real-world environments with **limited communication bandwidth**, I aim to enable fully autonomous robots to support the long-term maintenance of the underwater infrastructures and effectively monitor the complex offshore hydrodynamic and environmental conditions.

I'm interested in marine robot, multi-robot systems, SLAM, exploration, inter-robot loop closure, object-based data association, factor graph optimization, distributed multi-robot SLAM, planning under uncertainty, Gaussian process motion planning, expectation-maximization, learning-based decision making, multi-sensor fusion.

EDUCATION

Doctor of Philosophy, Mechanical Engineering
Stevens Institute of Technology, NJ   08/2019 - 05/2025

Master of Science, Surveying Engineering
Tongji University, Shanghai, China   09/2016 - 03/2019

Bachelor of Science, Geographic Information System
Tongji University, Shanghai, China   09/2012 - 06/2016

POSITIONS

Post-doctoral Research Fellow, Dartmouth Reality and Robotics Lab
Dartmouth College, NH   07/2025 - present

Graduate Student Research Assistant, Robust Field Autonomy Laboratory
Stevens Institute of Technology, NJ   08/2019 - 05/2025

PROJECT 1 - DISTRIBUTED MULTI-ROBOT PERCEPTION AND NAVIGATION

Robust Field Autonomy Laboratory, Stevens Institute of Technology, NJ   Advisor: Dr. Brendan Englot

Distributed Multi-Robot LiDAR SLAM   Jan 2020 – Sep 2021
- First distributed multi-robot SLAM system using compact LiDAR descriptors for **efficient data communication**.
- A two-step global-and-local pose graph optimization algorithm for accuracy and scalability.
- Manuscript published in IEEE Robotics and Automation Letters.
- Funded by National Science Foundation (NSF).

Multi-Robot Autonomous Exploration   Jun 2023 - May 2024
- Multi-robot exploration while accounting for **localization uncertainty**.
- Reinforcement learning-based multi-robot exploration with Graph Neural Networks.
- Manuscript published in ICRA'24.

- Funded by Office of Naval Research (ONR).

[*Multi-Robot SLAM for Underwater Unmanned Vehicle (UUV)s*](#)   September 2024 - March 2025
- First to introduce distributed graph matching for underwater robot teams to enable **efficient data communication**.
- Inter-robot data association **outlier detection** algorithm specific for multi-robot sonar SLAM.
- Manuscript accepted by IROS'25.
- Funded by National Science Foundation (NSF) and Office of Naval Research (ONR).

PROJECT 2 - SYMBIOTIC DESIGN FOR CYBER PHYSICAL SYSTEMS CHALLENGE

Robust Field Autonomy Laboratory, Stevens Institute of Technology, NJ   Advisor: Dr. Brendan Englot

[*Gaussian Process Motion Planning for UUVs*](#)   Aug 2022 - May 2023
- First **3D Motion planning algorithm for underwater vehicle** near seafloor.
- Motion planning algorithm with **oceanic current** considered.
- Manuscript published in IEEE Robotics and Automation Letters.
- Funded by Defense Advanced Research Projects Agency (DARPA).

PROJECT 3 - WALK-THROUGH RENDERING FROM IMAGES OF VARYING ALTITUDE

Robust Field Autonomy Laboratory, Stevens Institute of Technology, NJ   Advisor: Dr. Brendan Englot

[*Structure From Motion(SFM) with Varying Altitude Images*](#)   Jan 2024 - Apr 2024
- First **geo-referenced** Structure-from-Motion pipeline using satellite images.
- Bundle Adjustment with geographical information encoded.
- Manuscript accepted by IROS'25.
- Funded by Intelligence Advanced Research Projects Activity.

PROJECT 4 - SUWAC SHARED UNDERSTANDING FOR WIDE-AREA HUMAN-ROBOT COLLABORATION

Vision and Robotics Laboratory, SRI International, NJ   Advisor: Dr. Han-Pang Chiu

Multi-robot Scene Graph SLAM   May 2024 - Aug 2024
- Distributed multi-robot SLAM with object matching for **efficient data communication**.
- Hierarchical scene graph for humans and robots to understand.
- Manuscript preparing for submission.
- Licenced to Avsr AI.

AWARDS AND HONORS

- Academic Year 2019-2020 Stevens Provost Doctoral Fellowship

- Academic Year 2024-2025 Stevens Excellence Doctoral Fellowship

- Maryland Robotics Center: Future Leaders in Robotics and AI of 2025

- Academic Year 2024-2025 Paul Kaplan Award for Distinguished Doctoral Work upon Graduation

PUBLICATIONS

1. **Y. Huang**, J. McConnell, X. Lin, and B. Englot "DRACo-SLAM2: Distributed Robust Acoustic Communication-efficient SLAM for Imaging Sonar Equipped Underwater Robot Teams with Object Graph Matching" *Submitted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, accepted, to appear, 2025.

2. Y. Li, **Y. Huang**, W. Gaozhang, and Y. Liu "Autonomous Exploration with Virtual Map using Unmanned Surface Vehicles" *Submitted to IEEE International Conference on Automation and Computing (ICAC)*, accepted, to appear, 2025.

3. Y. Li, **Y. Huang**, B. Gaudel, H. Jafarnejadsani, and B. Englot "CVD-SfM: A Cross-View Deep Front-end Structure-from-Motion System for Sparse Localization in Multi-Altitude Scenes" *Submitted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, accepted, to appear, 2025.

4. **Y. Huang**, X. Lin, and B. Englot "Multi-Robot Autonomous Exploration and Mapping Under Localization Uncertainty with Expectation-Maximization" *2024 IEEE International Conference on Robotics and Automation (ICRA)*, 7236–7242, 2024.

5. **Y. Huang**, X. Lin, M. Hernandez-Rocha, S. Narain, K. Pochiraju and B. Englot "Mission-oriented Gaussian Process Motion Planning for UUVs over Complex Seafloor Terrain and Current Flows" *IEEE Robotics and Automation Letters (RA-L)*,9(2):1780-1787, 2024.

6. X. Lin, P. Szenher, **Y. Huang**, and B. Englot "Distributional Reinforcement Learning Based Integrated Decision Making and Control for Autonomous Surface Vehicles" *IEEE Robotics and Automation Letters (RA-L)*, 2024.

7. X. Lin, **Y. Huang**, F. Chen, and B. Englot "Decentralized Multi-Robot Navigation for Autonomous Surface Vehicles with Distributional Reinforcement Learning *IEEE International Conference on Robotics and Automation (ICRA)*, 2024.

8. K. Doherty, A. Papalia, **Y. Huang**, D. Rosen, B. Englot, and J. Leonard "MAC: Maximizing Algebraic Connectivity for Graph Sparsification" *arXiv e-prints*, arXiv–2403, 2024.

9. " X. Lin, **Y. Huang**, D. Sun, T.-Y. Lin, B. Englot, R. M. Eustice, and M. Ghaffari "A Robust Keyframe-Based Visual SLAM for RGB-D Cameras in Challenging Scenarios" *IEEE Access*, 11, 97239–97249, 2023.

10. J. Wang, F. Chen, **Y. Huang**, J. McConnell, T. Shan, and B. Englot "Virtual maps for autonomous exploration of cluttered underwater environments" *IEEE Journal of Oceanic Engineering*, 47(4):916–935, 2022.

11. J. McConnell, **Y. Huang**, P. Szenher, I. Collado-Gonzalez and B. Englot "DRACo-SLAM: Distributed Robust Acoustic Communication-efficient SLAM for Imaging Sonar Equipped Underwater Robot Teams" *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 8457–8464, 2022.

12. F. Chen, P. Szenher, **Y. Huang**, J. Wang, T. Shan, B. Shi and B. Englot "Zero-shot reinforcement learning on graphs for autonomous exploration under uncertainty" *2021 IEEE International Conference on Robotics and Automation (ICRA)*, 5193–5199, 2021.

13. **Y. Huang**, T. Shan, F. Chen and B. Englot "DiSCo-SLAM: Distributed scan context-enabled multi-robot lidar slam with two-stage global-local graph optimization" *IEEE Robotics and Automation Letters (RA-L)*, 7(2):1150–1157, 2021.

14. F. Chen, J. Martin, **Y. Huang**, J. Wang, and B. Englot "Autonomous exploration under uncertainty via deep reinforcement learning on graphs" *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 6140–6147, 2020.

15. J. Zhao, **Y. Huang**, X. He, S. Zhang, C. Ye, T. Feng, and L. Xiong "Visual semantic landmark-based robust mapping and localization for autonomous indoor parking" *Sensors*, 19(1):161, 2019.

16. **Y. Huang**, J. Zhao, X. He, S. Zhang, and T. Feng "Vision-based semantic mapping and localization for autonomous indoor parking" *Proceedings of the IEEE Intelligent Vehicles Symposium (IV)*, 636–641, 2018.

17. **Y. Huang**, H. Wang, K. Zhan, J. Zhao, P. Gui, and T. Feng "Image-based localization for indoor environment using mobile phone" *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 40:211–215, 2015.

MENTORING

I have mentored the following undergraduate and master's students with my doctoral advisor, Prof. Brendan Englot:

- **Thomas Roff**. "Optimization of Utility Function Weights for Active Autonomous Exploration and Mapping With Multi-robot Systems" *Master's thesis*, Stevens Institute of Technology, 2024.
- **Sneha Banda**, **Jesse Knuckles**. "Modular Sensor Fusion Package for Localization" *Undergraduate Senior Design*, sponsored by Kearfott Guidance and Navigation, Stevens Institute of Technology, 2025.

I have mentored the following doctoral student in collaboration with Prof. Yuanchang Liu from UCL:

- **Ye Li**. "Autonomous Exploration with Virtual Map using Unmanned Surface Vehicles" *The 30th International Conference on Automation and Computing (ICAC)*, 2025.

REVIEWER

- IEEE Transactions on Robotics (T-RO).
- International Journal of Robotics Research (IJRR).
- IEEE Robotics and Automation Letters (RA-L).
- Journal of Field Robotics (JFR).
- Elsevier Applied Ocean Research.
- IEEE International Conference on Robotics and Automation (ICRA).
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

TALKS

- 03/28/2025, Maryland Robotics Center: Future Leaders in Robotics and AI Seminar
  Data Efficient Localization and Mapping for Distributed Multi-Robot Teams in the Field
- 07/11/2025, Invited talk (virtual), University College London
  Distributed Robust Acoustic Communication-efficient SLAM for Imaging Sonar Equipped Underwater Robot Teams with Object Graph Matching

SKILLS

C++, Python, ROS, reinforcement learning, computer vision, Matlab, LaTex, Git.