Lingxiao Wang

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SHORT BIOGRAPHY

- Research interests in **Autonomous Systems**, **Robotics**, and **Artificial Intelligence (AI)**
- Published 17 Peer-Review Papers in **AI** and **Robotics**
- **7** years teaching experience as instructor in EE & CS related courses
- Current: Assistant Professor of Electrical Engineering at **Louisiana Tech University**

EDUCATION

Embry-Riddle Aeronautical University (ERAU)   Daytona Beach, FL
Ph.D. in Electrical Engineering and Computer Science   Jan 2018 – Dec. 2021
- Dissertation: Robotic Olfactory-based Navigation with Mobile Robots

M.S. in Electrical and Computer Engineering   Sept. 2015 – Dec. 2017
- Graduate with Distinction

Civil Aviation University of China (CAUC)   Tianjin, China
B.Eng. in Telecommunication Engineering   Sept. 2012 – July 2015

WORKING EXPERIENCES

Louisiana Tech University (LaTech)   Ruston, LA
Tenure Track - Assistant Professor of Electrical Engineering   Sep. 2022 – Present
- Teach courses in Control Theories and AI.
- Research fields include autonomous systems, robotics, and AI.

Embry-Riddle Aeronautical University   Daytona Beach, FL
Visiting Assistant Professor of Electrical Engineering   Jan. 2022 – May 2022
- Taught senior design class and electrical engineering fundamental circuit classes.

Graduate Teaching Assistant   Sept. 2018 – Dec. 2021
- Taught electrical circuits classes and labs.

RESEARCH

Embodied AI in Robotic Odor Source Localization
Researcher, LaTech   Jan. 2018 – Present
- *Developed novel navigation algorithms* for mobile robots to locate odor sources in unknown environments, integrating advanced *AI methods* such as reinforcement learning, deep learning, and fuzzy inference systems.
- *Trained Deep Neural Networks (DNNs)* to replicate traditional odor search algorithms and successfully implemented them in *on-vehicle tests*.
- *Integrated robotic vision and olfaction,* leveraging semantic information from both visual and olfactory observations using Large Language Models (LLMs) to significantly enhance search performance.

Wildfire Early Detection with Uncrewed Aircraft Systems (UASs)

Principal Investigator, LaTech   March 2022 – Present

- *Developed a multi-rotor UAS* equipped with a camera and smoke detector to gather visual and olfactory observations for wildfire detection.
- *Adapted the YOLOv7 deep learning-based object detector* to automatically identify wildfire smoke and flames from visual data.
- *Conducted preliminary experiments* in controlled burns to collect real-world wildfire smoke images and gas concentration data for simulation and navigation algorithm development.

Plume Tracing with Autonomous Underwater Vehicles (AUVs)

Researcher, ERAU & LaTech   Dec. 2016 – Present

- *Developed novel navigation algorithms* to guide AUVs in tracing chemical plumes and locating hydrothermal vents in unknown underwater environments.
- *Integrated sensor fusion techniques,* combining chemical concentration data with vehicle dynamics to optimize AUV movement and improve plume tracking accuracy.
- *Designed and implemented real-time decision-making strategies* that enable AUVs to adapt their trajectories based on chemical plume cues and environmental uncertainties.

Multi-agent Coordination with Reinforcement Learning

Research Assistant, ERAU   Jan. 2020 – March 2021

- *Designed a swarm-based coordination algorithm* using reinforcement learning to enable five unmanned surface vehicles (USVs) to collaboratively search for 20 mobile objects over a 100×100 m² ocean surface.
- *Defined robot search behaviors* by developing reward functions that encourage efficient detection of mobile objects while avoiding inter-vehicle collisions.
- *Summarized the algorithm design and experimental results* in a manuscript, showcasing the practical applications and performance of the system.

TEACHING

Assistant Professor of Electrical Engineering   LaTech

ELEN 471: Automatic Control Systems   Sep. 2022 – Present

- Taught control theories, including control system modeling, control system analysis, PID controller, root locus controller, and digital controller;
- Received **4.0/4.0** in the teaching evaluation surveys of 2022 and 2023 academic years.

ELEN 472: Digital Control Systems   Sept. 2022 – Present

- Taught digital control theories, including z-transform, digital control system modeling, discrete-time root locus, and optimal controls;
- Received **4.0/4.0** in the teaching evaluation surveys of 2022 academic years.

ELEN 451/CSC 557: Hands-on AI and Robotics   Sept. 2023 – Present

- Developed a new course related to AI and robotic technologies, covering deep learning, image processing, large language models, reinforcement learning, and robotics;
- Received **4.0/4.0** in the teaching evaluation survey of 2023 academic year.

Visiting Assistant Professor   ERAU

CS 450/EE 450: Senior Design   Jan. 2022 – May 2022

- Instructed 50 students from electrical engineering, computer engineering, and computer science in Senior Design projects, assisted students in code programs, algorithm design, and hardware troubleshooting.
- Taught Electrical Circuits classes and labs, covering topics in fundamental circuit calculations and designs;
- Received averaged **3.8/4.0** score in teaching evaluation survey of 2021 academic year.

PUBLICATIONS (Google Scholar)

Peer-Reviewed Journal Articles:

1. **Wang Lingxiao**, Pang Shuo, Li Jinlong, *"Olfactory-Based Navigation via Model-Based Reinforcement Learning and Fuzzy Inference Methods,"* IEEE Transactions on Fuzzy Systems (**impact factor: 11.9**), 2020.

2. **Wang Lingxiao** and Pang Shuo, *"Robotic Odor Source Localization via Behavior-based Navigation and Fuzzy Inference Methods,"* Robotics and Autonomous Systems (**impact factor: 4.3**), 2021.

3. Miao Runlong, **Wang Lingxiao**, Pang Shuo, *"Coordination of Distributed Unmanned Surface Vehicles via Model-Based Reinforcement Learning Methods,"* Applied Ocean Research (**impact factor: 4.3**), 2022.

4. **Wang Lingxiao** and Pang Shuo, *"Autonomous Underwater Vehicle Based Chemical Plume Tracing via Deep Reinforcement Learning Methods,"* Journal of Marine Science and Engineering, 2023.

5. Hassan Sunzid, **Wang Lingxiao**, and Khan Raqib Mahmud. *"Robotic Odor Source Localization via Vision and Olfaction Fusion Navigation Algorithm."* Sensors (**impact factor: 3.4**), 2024.

6. Hassan Sunzid, **Wang Lingxiao**, and Khan Raqib Mahmud. *"Integrating Vision and Olfaction via Multi-Modal LLM for Robotic Odor Source Localization."* Sensors (**impact factor: 3.4**), 2024.

7. Khan Raqib Mahmud, Wang Lingxiao, Hassan Sunzid, and Zheng Zhang. *"A Knowledge-Driven Framework for Robotic Odor Source Localization using Large Language Models."* Robotics and Autonomous Systems (**impact factor: 4.3**), under review, 2024.

Peer-Reviewed Conference Articles:

1. **Wang Lingxiao** and Pang Shuo, *"AUV Navigation based on Inertial Navigation and Acoustic Positioning Systems,"* OCEANS 2018 MTS/IEEE Charleston. IEEE, 2018.

2. **Wang Lingxiao** and Pang Shuo, *"Chemical Plume Tracing using an AUV based on POMDP Source Mapping and A-star Path Planning,"* OCEANS 2019 MTS/IEEE Seattle. IEEE, 2019.

3. **Wang Lingxiao** and Pang Shuo, *"An Implementation of the Adaptive Neuro-Fuzzy Inference System (ANFIS) for Odor Source Localization,"* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020.

4. **Wang Lingxiao**, Pang Shuo, and Xu Guangyu, *"3-Dimensional Hydrothermal Vent Localization Based on Chemical Plume Tracing,"* OCEANS 2020 MTS/IEEE San Diego. IEEE, 2020.

5. **Wang Lingxiao**, Pang Shuo, and Li Jinlong, *"Learn to Trace Odors: Autonomous Odor Source Localization via Deep Learning Methods,"* IEEE International Conference on Machine Learning and Applications (ICMLA), 2021.

6. **Wang Lingxiao**, Yin Ziyu, and Pang Shuo, *"Learn to Trace Odors: Robotic Odor Source Localization via Deep Learning Methods with Real-world Experiments,"* IEEE SoutheastCon, 2023

7. **Wang Lingxiao**, Pang Shuo, Noyela Mantasha, Adkins Kevin, Sun Lulu, and El-Sayed Marwa, *"Vision and Olfactory-based Wildfire Monitoring with Uncrewed Aircraft Systems,"* IEEE International Conference on Ubiquitous Robots (UR), 2023

8. **Wang Lingxiao** and Pang Shuo, *"Robotic Odor Source Localization via End-to-End Recurrent Deep Reinforcement Learning.,"* IEEE International Conference on Robotic Computing (IRC), 2023.

9. Hassan Sunzid, **Wang Lingxiao**, and Khan Raqib Mahmud. *"Multi-Modal Robotic Platform Development for Odor Source Localization."* IEEE International Conference on Robotic Computing (IRC), 2023.

10. Mahmud Khan Raqib, **Wang Lingxiao**, Liu Xiyuan, Li Jiahao, and Hassan Sunzid, *"Deep Learning-based Wildfire Smoke Detection using Uncrewed Aircraft System Imagery,"* IEEE International Conference on Ubiquitous Robots, 2024.

GRANTS

Advancing Embodied AI for Enhanced Robotic Odor Source Localization

PI, Louisiana Board of Regent, July 2024 - July 2027, $108,000

- Developing a new navigation algorithm to control a mobile robot in finding odor source locations using embodied AI;
- Focusing on integrating Computer vision and Robotic Olfaction to improve the search efficiency and effectiveness;

Deep Learning-based Aerosol and Ocean Parameter Retrieval from Polarimeter and Lidar Data

PI, LaSPACE Research Enhancement Award, Aug. 2024 - Aug. 2025, $70,000

- Developing new deep learning-based methods to predict aerosol and ocean parameters from NASA Lidar and Polarimeter satellites;
- Collaborating with NASA environmental scientists to collect training data, design deep learning models, and evaluate model performance;

Predicting New Thermoset Shape Memory Polymers via Transformers and Graphic Neural Networks

PI, LAMDA Seed Grants, Aug. 2024 - Aug. 2025, $40,000

- Designing Transformers and Graphic Neural Networks to predict physical properties of new thermoset shape memory polymers;
- Advising two undergraduate students in designing and training deep learning models;

ADVISING

Undergraduate/Graduate Students:

- *Hoang My Le*, B.S. in Electrical Engineering;
- *Hannah McPherson*, B.S. in Electrical Engineering;
- *Luke Roger*, 2022 B.S. in Electrical Engineering, Now working at **NASA**;
- *Cheston Sturdivant*, M.S. in Electrical Engineering;
- *Alexander Isiani*, M.S. in Computer Science.

Ph.D. Advising:

- *Khan Mahmud*, Ph.D. in Computational Analysis and Modeling
- *Sunzid Hassan*, Ph.D. in Computational Analysis and Modeling

SERVICES

Manuscript Reviewer:

- International Conference on Robotics and Automation (ICRA 2022, 2023, 2024)
- IEEE International Conference on Machine Learning and Applications (ICMLA 2021)
- International Conference on Ubiquitous Robot (UR 2021)
- Expert Systems with Applications
- SICE Journal of Control, Measurement, and System Integration

Member of

- IEEE, IEEE Robotics and Automation Society, IEEE Computational Intelligence Society
- ERAU Robotics and Autonomous Systems Laboratory.

HONORS AND AWARDS

Outstanding Doctoral Student Award   APRIL, 2021
Department of Electrical Engineering and Computer Science, ERAU

Sportsmanship Award   JULY, 2017
20th Annual International RoboSub Competition, San Diego, CA

Outstanding Master Student Award   APRIL, 2017
Department of Electrical Engineering and Computer Science, ERAU