

# 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**

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## EDUCATION

### Embry-Riddle Aeronautical University (ERAU)

*Ph.D. in Electrical Engineering and Computer Science*

Daytona Beach, Florida

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)

*B.Eng. in Telecommunication Engineering*

Tianjin, China

SEPT. 2012 – JULY 2015

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## WORKING EXPERIENCES

### Louisiana Tech University (LaTech)

*Tenure Track - Assistant Professor of Electrical Engineering*

Ruston, Louisiana

SEP. 2022 – PRESENT

- Teach courses in Control Theories and AI.
- Research fields include autonomous systems, robotics, and AI.

### Embry-Riddle Aeronautical University

*Visiting Assistant Professor of Electrical Engineering*

Daytona Beach, Florida

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.

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## 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  $100 \times 100$  m<sup>2</sup> 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.

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## **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.

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## 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.

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## 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;

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## 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

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## 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.

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## 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*