Lingxiao Wang

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Short Biography

- Research interests in **Autonomous Systems**, **Robotics**, and **Artificial Intelligence (AI)**
- Published 15 Peer-Review Papers in **AI** and **Robotics**
- 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 | Advisor: Dr. Shuo Pang
- GPA: 4.0/4.0

M.S. in Electrical and Computer Engineering Sept. 2015 – Dec. 2017

- Graduate with Distinction
- GPA: 4.0/4.0

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

- GPA: 3.5/4.0

Academic Appointments

Assistant Professor, Louisiana Tech University (LaTech) Ruston, LA
Dept. of Electrical Engineering Sep. 2022 – Present

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

Visiting Assistant Professor, ERAU Daytona Beach, FL
Dept. of Electrical Engineering and Computer Science Jan. 2022 – May 2022

- Taught senior design class and electrical engineering fundamental circuit classes.

Research Projects

AI-based Robotic Odor Source Localization
Researcher, LaTech Jan. 2018 – Present

- Designed navigation algorithms to direct mobile robots finding odor sources in unknown environments, incorporating various AI methods, including reinforcement learning, deep learning, fuzzy inference systems, and large language models;
- Implemented AI-based navigation algorithms on a ground mobile robot to search odor source locations in various airflow environments.
- Designed a vision and olfaction fused navigation algorithm that combines computer vision models and olfactory-based navigation algorithms to improve the navigation accuracy and efficiency.

Wildfire Early Detection with Unmanned Aerial Vehicles

Researcher, LaTech SEP 2022 – PRESENT

- Integrated Computer Vision and Robotic Olfaction to enable a robot (i.e., a drone) "see" and "smell" wildfire smokes to detect early wildfire locations.
- Collected real-world wildfire imagery data from a drone in multiple prescribed burns, collaborating with the ERAU Aerospace Engineering department and Tall Timber fire institution.
- Trained and Implemented various deep learning-based computer vision models, including YOLO, Mask R-CNN, etc., to autonomously detect smoke from drone imagines.

Chemical Plume Tracing with Autonomous Underwater Vehicles

Researcher, ERAU JAN 2018 – PRESENT

- Developed multiple chemical plume tracing algorithms for using on AUVs to locate hidden hydrothermal vents.
- Implemented the deep reinforcement learning method to combine the merits of multiple traditional chemical plume tracing algorithms.
- Designed a source mapping and path planning searching algorithm using POMDP and A-star algorithms.

Multi-agent Coordination with Reinforcement Learning Methods

Research Assistant, ERAU JAN. 2020 – MARCH 2021

- Coordinated five unmanned surface vehicles (USVs) to collaboratively search 20 mobile objects over the 100×100 m^2 ocean surface by designing a swarm-based coordination algorithm using reinforcement learning methods.
- Defined robot search behaviors by designing various types of reward functions to encourage search behaviors that detect mobile objects and avoid inter-vehicle collision.
- Implemented the proposed coordination algorithm in on-vehicle experiments and summarized the algorithm and experiment results in a manuscript.

Teaching Experience

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;
- Designed a lab course incorporating with the theory course, covering MATLAB control tool box and Arduino PID controller design;
- Received **4.0/4.0** in the teaching evaluation surveys of 2022 and 2023 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;
- Designed a series of small Python coding projects to teach student implement the learned AI techniques to solve real-world problems;
- 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 foundamental 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.

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.

Research Funds

Advancing Embodied AI for Enhanced Robotic Odor Source Localization

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

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

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;

Student 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

Professional Activities

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.

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