Xiaoshan Lin

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Education

University of Minnesota, Twin Cities   Sep. 2020 – Jun. 2025
Ph.D. Candidate in Aerospace Engineering and Mechanics   (Expected)

Shanghai Jiao Tong University   Sep. 2015 – Jun. 2019
Bachelor of Mechanical Engineering, Zhiyuan Honors Program in Engineering

Research Interest

Robotics, Reinforcement Learning, Multi-Robot Systems, Motion Planning, Formal Methods.

Skills

Programming Languages: C/C++, Python, MATLAB/Simulink

Specialized: Experience with **Reinforcement Learning**, **Real-Time Control** of Cable-Driven Robot Arm, Drones, and Mobile Robots, Model Predictive Control, Vision-based Control, Version Control (git)

Software: Stable Baselines, RoboSuite, ROS, Gazebo, Gym, PyTorch, TensorFlow, Gurobi, SolidWorks

Hardware: UR3 robot arm, Turtlebot 4 mobile robot, Crazyflie drone, Arduino, Mbed

Publications

- **Xiaoshan Lin**, Yasin Yazıcıoğlu, and Derya Aksaray. ""*Robust Planning for Persistent Surveillance with Energy-Constrained UAVs and Mobile Charging Stations*"", IEEE Robotics and Automation Letters, 2022.

- **Xiaoshan Lin***, Abbasali Koochakzadeh*, Yasin Yazıcıoğlu, and Derya Aksaray. "*Reinforcement Learning Under Probabilistic Spatio-Temporal Constraints with Time Windows*", 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

- **(In preparation for submission) Xiaoshan Lin**, Sadik Bera, Yasin Yazıcıoğlu, and Derya Aksaray. "*Adaptive Policy-Switching for Probabilistic Satisfaction of Temporal Logic Constraints in Reinforcement Learning*", 2025 IEEE International Conference on Robotics and Automation.

Research Experience

CORIES Lab, University of Minnesota   Sep. 2020 – Jun. 2024
Research Assistant | Advisors: Prof. Derya Aksaray and Prof. Yasin Yazicioglu

- **Thesis Topic:** Constrained Planning and Reinforcement Learning for Robotic Systems with Complex Specifications: Balancing Constraint Satisfaction and Performance under Uncertainty.

- Developed a robust motion planning algorithm for routing energy-constrained UAVs and mobile charging stations for environment monitoring, which is proven effective and robust against unknown obstacles (published in RA-L and presented at ICRA).

- Proposed an automata-theoretic algorithm to ensure the probabilistic satisfaction of temporal logic constraints during reinforcement learning (presented at IROS).

- Developed an adaptive approach for reinforcement learning with probabilistic satisfaction of temporal logic constraints under dynamics uncertainty (in preparation for ICRA).

- Working on multi-agent reinforcement learning with temporal logic constraints under dynamics uncertainty.

Internship Experience

Mitsubishi Electric Research Laboratories   Nov. 2023 – Apr. 2024
Research Intern (Full-time) | Host: Abraham Vinod

- Implemented onboard controllers to control Turtlebots for autonomous navigation.

- Developed algorithms for UAVs to autonomously land on wireless chargers.
- Developed coordination and collision avoidance algorithms for a UAV-UGV team to monitor the environment and classify interesting targets as quickly as possible.
- Implemented the algorithms in the Robot Operating System (ROS) with Python to validate the method with 4 Crazyflie drones (UAVs) and 2 Turtlebots (mobile charging stations).

Flexiv Robotics Ltd.   Sep. 2018 – Jul. 2019
Control Engineer Intern (Part-time)

- Implemented hand-eye calibration algorithms for robotic manipulators using Python and C++, tested on a UR3 robot arm.

GRASP Lab, University of Pennsylvania   Jun. 2018 – Sep. 2018
Research Intern (Full-time) | Host: Prof. Mark Yim

- Developed embedded codes for a smooth trajectory generator and real-time trajectory-tracking controller for a cable-driven manipulator, tested on the Spiral Zipper Manipulator built by ModLab at the University of Pennsylvania.
- Designed a circuit board integrating a microcontroller and sensors.

Projects

Assembly Path Planning for Robot-Arm Bolt Tightening in Gazebo Simulation

- Constructed a simulation environment in Gazebo for robot arms to perform bolt-tightening tasks.
- Implemented path planning algorithms to optimize the assembly process.
- Utilized ROS and Gazebo for simulation and control of robotic arms.

Vision-based Sensing for Crazyflie Drones with Low-Resolution Camera

- Contributed to developing a target recognition algorithm based on color detection using OpenCV.
- Developed embedded codes on a GAP8 and STM32 for communications between the drone and a desktop.

UAV-UGV Cooperative Localization

- Implemented an estimation algorithm based on Extended Kalman Filter (EKF) to cooperatively estimate the pose of a drone and a mobile robot, given noisy GPS measurements for the drone and noisy relative pose of the mobile robots to the drone.

Least-violating Multi-vehicle Routing with Temporal Logic Specifications

- Implemented a graph-based routing algorithm for a multi-vehicle system such that a pickup-and-delivery task specified as a Linear Temporal Logic constraint is minimally violated.

Review Experience

Reviewer for the following journals and conferences:
- IEEE Robotics and Automation Letters (RA-L)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- AAAI Conference on Artificial Intelligence (AAAI)

Teaching Experience

TA Instructor for Statics and Dynamics   Jan. 2023 – May 2023

- Led weekly discussion sections to teach undergraduate students how to solve problems, addressed students' questions, and graded homework and exams.
- Collected student feedback and reported to the course instructor.

TA Instructor for Aeromechanics Laboratory   Sep. 2022 – Dec. 2022

- Led weekly lab sections to teach undergraduate students wind tunnel experiments, solid mechanics experiments,

and flight control experiments. Held office hours and graded experiment reports.

Awards

Honorable Mention for NASA's Trash-to-Gas Ash Management Challenge	2022
John and Jane Dunning Copper Fellowship of the University of Minnesota	2021
Academic Excellence Scholarship of Shanghai Jiao Tong University	2016, 2017, 2018
Honors Scholarship of Zhiyuan Program in Engineering	2016, 2017