Huaiyuan Rao

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Education

Georgia Institute of Technology 2022-Now
*Master of Science in Electrical and Computer Engineering (GPA: **4.00** / 4.00)* *Atlanta, Georgia*

East China Jiaotong University 2018-2022
*Bachelor of Science in Automation (GPA: **89.6** / 100)* *Nanchang, Jiangxi*

Professional Experience

Georgia Institute of Technology Jan 2024 – May 2023
Research Intern, Advisor: Prof. Kyriakos G. Vamvoudakis *Atlanta, Georgia*

- Leverage RRT^X for global path planning and replanning to produce waypoints for agent.
- Develop **RL-CBF-RRT^X**, using a critic-only value network to online learn a reasonably larger portion of the actual safe set with user predefined rewards and generate safe controller for navigating in an unknown environment.

Chinese University of Hong Kong (Shenzhen), Robotics & AI Lab May 2023 – Dec 2023
Research Intern, Advisor: Prof. Zhenglong Sun *Shenzhen, Guangdong*

- Construct dynamic model of continuum manipulator systems from collected data using Koopman operator.
- Develop **RL-LQR**, a LQR controller combined with a RL tunner implementing on continuum manipulator under input constraints and train DDPG agent to get the best weight matrix and implemented controller on real robot system.

East China Jiaotong University, Intelligent Driving Team May 2020 – June 2022
Captain & Founder, Advisor: Yun Yang *Nanchang, Jiangxi*

- Develop the Fuzzy Adaptive IMM (FAIMM) target tracking algorithm for vehicle detection on the AWR1843-BOOST (Texas Instruments) platform, designed to operate in harsh environments. This system will provide drivers with real-time updates on the distance and angle to the car ahead.
- Create a user interface with QT5 and deploy it on a display system powered by Linux.

Publications

- **Huaiyuan Rao**, Kyriakos G. Vamvoudakis. RL-CBF-RRT^X: Online Learning-Based Safe Critical Motion Planning in Unknown Environments. *(in progress), 2024*
- Qian Gao, Guanglin Ji, Minyi Sun, Yin Xiao, **Huaiyuan Rao**, Zhenglong Sun. Dynamic Hysteresis Compensation for Tendon-Sheath Mechanism in Flexible Surgical Robots without Distal Perception. *IEEE Transactions on Robotics (under review), 2024*

Selected Course Projects

Machine learning techniques on predicting chaotic orbits | *Course Project, Georgia Tech* March 2024 - May 2024

- Evaluate three machine learning models (Linear Regression with polynomial features, FNN, LSTM) to learn and predict the dynamics of a double pendulum.

Chaotic image encryption algorithm | *Graduation Design, ECJTU* Dec 2021 - June 2022

- Develop **CMT-ICSM**, an image encryption algorithm that integrates a novel Sine-Henon high dimensional map (ICSM) with the chaotic magic transform (CMT).

Selected Awards and Honors

China National Scholarship 2021
Finalist Prize, COMAP's Mathematical Contest in Modeling (Top 1%, more than 20000 teams at that time) 2022
1st class Academic Scholarship (3 years) 2021
Excellent Graduation Design Award 2022
Second Prize, National Undergraduate Electronics Design Contest (Jiangxi) 2020

Technical Skills

Program: C, C++, Python, MATLAB

Tools: ROS2 and Gazebo, Linux, Git, OpenCV, STM32, LATEX