MO XU

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EDUCATION

University of Michigan -Ann Arbor MI, United States
Master in EECS track Data Science & Machine Learning - GPA:3.7 Sept 2022 – Dec 2023
Concentrations: Machine Learning, Computer Vision, Robotics

Dalian University of Technology Dalian, China
BEng in Electrical Engineering - GPA:3.5 Sept 2018 – June 2022
Concentrations: Control Engineering, Intelligent Algorithm, Embedded System

RESEARCH INTERESTS

Research Areas: Human-robot Interaction, Social Navigation, Assistant Robot
Human Behavior Extraction: Human Pose Estimation, Affective Computing
Behavioral Feature Utilization: Scene Understanding, Multimodality
Robot Control: Model Predictive Control, Reinforcement Learning

RESEARCH EXPERIENCES

Research Assistant @ University of Michigan
Fluent Robotics lab, supervised by Prof. Christoforos Mavrogiannis Sep 2023 – Present

- Developed a real-time social navigation system and research platform from scratch.
- Modified the ROS on Stretch from Hello Robot to collect data.
- Established real-time perceptron algorithm to detect and track 2D human positions and skeletal keypoints via an RGB-D camera based on YOLOv8.
- Developed a Kalman Filter variant to estimate 3D features with point clouds depth information.
- Implemented Human Scene Transformer to forecast pedestrian trajectories in complex scenes.
- Employed topological model predictive control to avoid collision with pedestrians.
- Planned improvements with a scene understanding model for enhanced effectiveness and efficiency .

Research Assistant @ Westlake University
I4FSI Lab, supervised by Prof. Dixia Fan Apr 2023 – Aug 2023

- Developed an amphibious quadruped robot with 12 degrees of freedom.
- Designed thrust and buoyancy modules for robot underwater adaption.
- Established research platform on Raspberry Pi 4B with socket, servos, and IMU interfaces.
- Built an underwater inverse-kinematic model and an empirical thrust LSTM model.
- Implemented PPO-clipped algorithm and customized Gym.Env for trajectories control.
- Designed a long-term underwater experiment for reinforcement learning training.

Research Assistant @ Dalian University of Technology
Undergraduate Thesis, supervised by Prof. Wei Lu Apr 2022 – Jun 2022

- Developed bearing fault detection algorithm for industrial troubleshooting.
- Utilized wavelet package composition to denoise then extracted fuzzy information granulation.
- Implemented a CNN based on an auto-encoder structure to classify bearing errors.

SELECTED PROJECTS

Kalman Filter vs. Particle Filter in Pybullet
Algorithmic Robotics Course Aug 2023 - Dec 2023

- Implementation: A*, RRT, PCA, RANSAC, ICP, KF.
- Established a customized PR2 robot simulation environment with landmarks in Pybullet.
- Implemented Kalman Filter and Particle Filter to localize the PR2 robot position.
- Compared the performance of Kalman Filter and Particle Filter with various parameters.

Lidar and Visual SLAM Loosely-Coupled Fusion
Mobile Robotics Course Jan 2023 - Apr 2023

- Implementation: GTSAM, CSM, EKF, UKF.
- Utilized ORB-SLAM3 to calculate 3D robot pose from RGB images as visual SLAM.
- Utilized LITAMIN2 to calculate 3D robot pose from point clouds as LiDAR SLAM.
- Set LiDAR SLAM inference as the prior of ORB-SLAM3 to combine them.

Music Popularity Predicting Transformer Based on Extracted Instrumental Features
Machine Learning Course Jan 2023 - Apr 2023

- Implementation: Linear/Logistic Regression, Naive Bayes, PCA, ICA, SVM, CNN, RNN, Vanilla.
- Developed an auto script to search and download 45000+ songs from YouTube with multi threads.
- Extracted Mel-spectrograms to extract music features through Librosa.
- Implemented Transformer and ResNet to classify the popularity of songs by their spectrograms.
- Compared the performance of Transformer and ResNet; found a low correlation between popularity and music spectrograms.

Experimental Design of Auto Vehicle Algorithm Bias in Trolley Problems
Ethics for AI and Robotics Course Jan 2023 - April 2023

- Designed an experiment and survey to obtain people's preferences on variants of trolley problems.
- Proposed an algorithm bias strategy to balance regional difference of preferences.

Network Proxy Server Management System
Independent Project Oct 2022

- Established a management system of proxy servers across the world, which supported users to create, update, utilize and delete the proxy nodes, based on AWS EC2.
- Supported multiple proxy protocols for security, including Vmess and Trojan.
- Disguised proxy connections as normal http to avoid unexpected supervision.

INTERNSHIP

ABB Engineering (Shanghai) Ltd.
Intern, Electronics Department June 2021 – Aug 2021

- Involved in the BigCherry project for high voltage power of robots.
- Utilized closed loop PID to control the voltage in C language.
- Detected insulation performance and leakage current; analyzed the leakage current error.
- Established a SQL database to organize thousands of electronic components.

TEACHING

EECS 501 Probability & Random Processes, University of Michigan
Grader Jan 2023 - Apr 2023

LEADERSHIP & ACTIVITIES

Michigan Student AI Lab, University of Michigan
Student Organization Member Sep 2023 – Dec 2023

4th National Intelligent Fluid Mechanics Seminar, Westlake University
Supporting Organizer May 2023

Magic Association, Dalian University of Technology
Association Vice President Jun 2020 – Jun 2021