Xinyi Liu

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Education

University of Michigan *Ann Arbor, MI*
M.S. Electrical & Computer Engineering, Robotics *Aug 2021 – May 2023*
Coursework: Experimental Unmanned Aircraft, Linear Systems, Machine Learning, Information Theory

University of California, Berkeley *Berkeley, CA*
Exchange Student *(GPA: 3.96/4.00)* *Sep 2019 – May 2020*
Coursework: Artificial Intelligence, Experimental Control Design, Optimization Models in Engineering, 3D Vision

ShanghaiTech University *Shanghai, China*
B.E. Electrical Engineering *(Major GPA: 3.93/4.00 Rank: 3/66) Outstanding Graduates* *Sep 2017 – Aug 2021*

Publications

- J. Li, **X. Liu**, J. Li, B. Zhu, J. Jiao, M. Tomizuka, C. Tang, and W. Zhan "Guided Online Distillation: Promoting Safe Reinforcement Learning by Offline Demonstration" submitted to 2023 ICRA [arxiv] [website]
- D. Isele, P. Gupta, **X. Liu**, S. Bae "Gaussian Lane Keeping: A Robust Prediction Baseline" submitted to 2023 ICRA
- **(Best Paper)** S. Danforth, **X. Liu**, M. Ward, P. Holmes, and R. Vasudevan "Predicting Sagittal-Plane Swing Hip Kinematics in Response to Trips", RA-L and BioRob for the IEEE Robotics and Automation Letters, 2022 [DOI, video]

Research Experience

Safe Reinforcement Learning Fine-Tuning in Driving Scenarios *Berkeley, CA*
Research Assistant at Group of Masayoshi Tomizuka (MSC Lab) *June 2023 – Now*
- Developed a versatile driving simulation platform capable of replaying real-world datasets and facilitating online training.
- Specified problem setups such as state/observation/action spaces. Conducted offline training of a transformer model as baseline.
- Implemented an online distillation procedure within the driving simulator, resulting in the successful extraction of lightweight policies from the transformer model.
- Achieved approximately a 15% improvement in success rates for real-world traffic driving tasks as a result of these efforts.

Swing Hip Recovery Behavior Modeling and Safe Planning *Ann Arbor, MI*
Research Assistant at Group of Ram Vasudevan (ROAHM Lab) *Sep 2021 – Dec 2022*
- Planned and executed human subject experiments to develop a trip-recovery dataset, with the goal of analyzing the responses of prosthetic wearers following unexpected trips.
- Developed three distinct models to forecast hip trip-recovery behavior, including a multi-output Gaussian process regression (Bayesian) model, a NARX (neural network) model, and a pendulum dynamics model.
- Designed and implemented a scuff-free trip-recovery planner, and compared its performance to a clinically utilized nominal phase-based controller. Demonstrated empirical superiority of our planner in terms of trip-recovery performance.

Autonomous Mid-Air Docking of Drones *Berkeley, CA*
Research Assistant at Group of Mark Mueller (HiPeR Lab) *Nov 2019 – Oct 2020*
- Conducted thorough calibration and error analysis of the sensors (cameras and IMU units) in the onboard positioning system.
- Collaborated with a team to build simulation platform development, providing tests and extensions for real-world experiments.
- Implemented an onboard closed-loop control approach on simulated drones, enabling mid-air docking in simulation.

Work Experience

Honda Research Institute USA, Inc. *San Jose, CA*
Research Intern, Autonomous Driving & Interactive Decision Making *Sep 2022 – Apr 2023*
- Developed C++-based obstacle-avoidance planning module to identify and correct unsafe or infeasible trajectories generated by the behavior planner. Successfully decreased the collision rate in simulation from 30% to less than 3%.
- Designed and Implemented multiple standard trajectory prediction modules and integrated them into the ROS-Carla simulator.

Skills

Language | Python, C/C++, MATLAB, R, LaTeX
Software | ROS,ROS2, PyTorch, tensorflow, Unreal Engine, Numpy, Pandas, Gym

Project Experience

Event-Based Corner Detection and Tracking *Shanghai, China*
Graduate Thesis on Event Camera, State estimation *Mar 2021 – May 2021*
- Developed a novel strategy of corner feature extraction from the input of an event camera.
- Proposed a new loss function D2D with an exact solver for fitting the spatial-temporal manifold.
- Built C++ pipeline for corner detection and tracking to test the D2D loss function in simulation and real-world datasets.

Depth Estimation from a Single City-Scene Image *Berkeley, CA*
Course Project on Computer Vision, Depth Estimation *Mar 2020 – May 2020*
- Applied Manhattan assumption and vanishing point (VP) constraints to improve single-image depth estimation in city scenarios.
- Implemented our network architecture via Pytorch and line segment recognition via OpenCV.
- Demonstrated improved depth estimation performance by 5% on average and enhanced depth estimate on edges and corners.