Xilun Zhang

412-430-2841 | xilunz@andrew.cmu.edu | linkedin.com/in/xilunzhang

Education

Carnegie Mellon University Pittsburgh, PA

Master of Science in Mechanical Engineering - Research *Dec 2024*

- GPA 4.00/4.00 | CMU Safe AI Lab
- Current Projects : LLM for Curriculum Task Generation, Visual Sim-to-Real Transfer
- Courses: Introduction to Robot Learning(current); Machine Learning for Engineers(current); Self-driving Cars: Perception and Control; Trustworthy AI Autonomy; Introduction to Deep Learning

Simon Fraser University Vancouver, Canada

Bachelor of Applied Science in Mechatronic Systems Engineering with Co-op with Distinction *Dec 2022*

- Major GPA 3.85/4.33 | SFU Autonomous and Intelligent Systems Lab
- Selected Courses: Advanced Kinematics for Robotic Systems; Flight Dynamics and Control of UAVs; Modern Control System; Optimization; Sensors and Actuators; Power Electronics and Machinery
- Awards: SFU Vice-President Undergraduate Research Award (Summer 2021, Fall 2022)

Research Projects

Closing Sim-to-Real Gap via Differentiable Causal Discovery Apr 2023 – Aug 2023

Graduate Research Assistant @ CMU Safe AI Lab | PI: Prof.Ding Zhao *Pittsburgh, PA*

- Proposed an algorithm that learns a differentiable mapping from the environment parameters to the differences between simulated and real-world robot trajectories, which is governed by a simultaneously-learned causal graph.
- Reproduced paper results and Outperformed state-of-the-art Sim-to-real methods in trajectory alignments such as Gradient-based Methods (ExiNet), Sampling-based Methods (NPDR) and TuneNet
- Developed PPO/SAC training simulations/tasks from scratch using Mujoco and Robosuite; Improved causal discovery network structure and parameters
- Coded the algorithm's main framework including data collection, agent training, and causal model training
- Conducted extensive literature reviews in dynamical domain randomization, domain adaptation, sampling-based optimization methods, and gradient-based optimization methods

Developing Robust Control for Learning-based Quadrotor Stabilization Aug 2022 – Dec 2022

Undergraduate Research Assistant @ SFU Multi-Agent Robotic System Lab | PI: Prof.Mo Chen *Vancouver, Canada*

- Developed adversarial control framework using Hamilton-Jacobi Reachability Analysis in simulation against the quadrotor stability; Generated value function and optimal disturbance under different control settings
- Set up simulation/training environment to stabilize small-scale quadrotor under disturbance using Proximal Policy Optimization
- Wrote Gym wrapper for quadrotor training environment, optimized reward function design and implemented curriculum learning during adversarial training
- Conducted extensive literature review on robot learning, robust reinforcement learning, guided policy search and Sim2Real transfer for quadrotor low-level control

Designing Driverless Car Using Artificial Intelligence Jan 2022 – Aug 2022

Student Researcher @ SFU Autonomous and Intelligent Systems Lab | PI: Prof.Ahmad Rad *Vancouver, Canada*

- Led a team of five to achieve optimal results by managing multiple design requirements and moderated internal/external meetings; managed project documentation including proposals, functional/design specifications
- Designed high-level controllers and tested them in CARLA Simulator, including finite state machines, trajectory rollout algorithms, trapezoidal velocity profiles, motion prediction and circle-based collision checking
- Implemented transfer learning to PilotNet with a pre-trained network to cater specific testing environment
- Implemented Stanley and Pure Pursuit Controller for vehicle lateral control and PID for longitudinal control

Publication

1. What Went Wrong? Closing the Sim-to-Real Gap via Differentiable Causal Discovery
Peide Huang, **Xilun Zhang***, Ziang Cao*, Shiqi Liu*, Mengdi Xu, Wenhao Ding, Jonathan Francis, Bingqing Chen, Ding Zhao
2023 Conference on Robot Learning (CoRL 2023)

2. Continual Vision-based Reinforcement Learning with Group Symmetries
Shiqi Liu*, Mengdi Xu*, Peide Huang, **Xilun Zhang**, Yongkang Liu, Kentaro Oguchi, Ding Zhao
2023 Conference on Robot Learning (CoRL 2023) (oral, 6.6%)

Technical Skills

Engineering/software: SIMULINK, Pytorch, TensorFlow, StableBaselines3, CARLA, Sklearn, OpenCV, LTspice, LabVIEW, Proteus, SolidWorks, Soldering
Languages: Python, MATLAB, C++, Assembly