Ruiqi Zhang

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EDUCATION

B.Eng. in Automobile Engineering, Tongji University, Shanghai, China   Sep.2018 - Present
Overall GPA: 88.4/100, Major GPA: 91.5/100, 2 times of University Scholarship (10%)
Core courses: Python Programming (100), Mechanics of Materials (100), Probability Theory (100), Big Data & AI (95), Mechanical Design (95), CAD Mechanical Drawing (95), MATLAB Programming (95)

RESEARCH EXPERIENCE

Passive Robotic Lower Limb with Reinforcement Learning | Assistant   Jan.2021 – May.2021
Advisor: Zhijun Li, professor @ EE, USTC, IEEE Fellow
   In this project, we proposed an automatic robotic prosthesis framework, which is adaptive to different real-world situations with deep reinforcement learning. Our active prosthesis can cooperate with the movement of other joints of the disabled to realize walking on the different terrains like plane, upstairs, downstairs and slopes.

Model-free Autonomous Racing Framework with Residual DRL | Leader   Jun.2021 –Oct.2021
Advisor: Guang Chen, professor @ EECS, Tongji University
   We develop an efficient residual policy learning algorithm with modified artificial potential field for autonomous racing. We propose a novel complementary property of MAPF and model-free DRL and illustrate robustness, generalization ability, real-time performance, and lap time on 5 tracks of F1Tenth competition. Experimental results show our method outperforms the state-of-the-art method Dreamer and reaches the comparable level of professional human players.
Paper (1st author) is submitted to: *IEEE Robotics and Automation Letters (RA-L)*

Graph-based Policy Optimization for Decentralized Multi-Agent Navigation | Leader   Nov.2021 –Feb.2022
Advisor: Guang Chen, professor @ EECS, Tongji University
   In this paper, we extend our previous research to multi-agent navigation task. We propose a decentralized reinforcement learning method via graph convolutional network. Our method utilizes the permutation-invariant property in multi-agent system to enhance the representation and generalization ability of actor-critic network. Experimental results show our method is much safer than centralized MARL baselines and constrained barrier function-based methods and can be generalized to arbitrary number of agents.
Paper (1st author) is submitted to: *IEEE Transactions on Intelligent Transportation Systems (T-ITS)*

High-Throughput Parallel Reinforcement Learning Framework | Assistant   Aug.2021-Dec.2021
Advisor: Guang Chen, professor @ EECS, Tongji University
   Classical RL frameworks like RLlib, rlpyt and ACME require high-performance CPU to sampling. In this paper, we propose a high-throughput RL framework Spreeze, which utilizes parallel GPUs to update actor-critic networks independently and achieve the asynchronous sampling through the lock mechanism and queue. On the five RL benchmarks, our method significantly outperforms previous RL frameworks.
Paper (3rd author) is submitted to: *2022 International Joint Conference on Artificial Intelligence (IJCAI-2022)*

EXTRACURRICULAR ACTIVITIES

The Formula Student Team at Tongji | Chassis-Steering Group   Dec.2019 – Present
   I am responsible for assembly and adjustment of chassis system and participated in the design of steering system in 2020. We participated in 4 international races and won the title of FS China 2019, the 3rd of FS Japan 2019 and the 3rd of FS China 2020.

Obstacle Detection System for Formula Student Racing | Project Leader   Mar.2020 –Mar.2021
 Advisor: Liguang Li, professor and dean @ School of Automobile, Tongji University
   We design a low-cost cone detection system for Formula and improve SOTA models with increased frame rate and higher accuracy by optimizing the network structure and training hyperparameters. Furthermore, we established a large-scale dataset by collecting over 3000 pictures from dynamic racing and labeled hundreds of static pictures.

SKILLS

- Research Experiences in Reinforcement Learning & Computer Vision
- Programming Languages and Tools: Python, PyTorch, Tensorflow, PyBullet, MATLAB
- Engineering Software: Unigraphics NX, AutoCAD, Catia