Zhengxu Yu

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Research Overview

My research focuses on developing generative decision-making AIs capable of independently solving real-world problems, particularly temporal-spatial problems in urban scenarios. Two unique challenges arise in this context:

1. **Lack of Decision-Making Data and Generalization**: To address this, I build a Digital Twin simulator with generative models to generate training data for unseen scenarios.

2. **Model Transferability Across Tasks**: I propose generative decision-making models, including LLM-based RL models, that require minimal fine-tuning for task transferability.

My work demonstrates how the integration of simulators and decision-making models can solve various real-world urban problems, from multi-agent control to hierarchical planning. Currently, I am enhancing these models by integrating the planning and reasoning capabilities of Large Language Models (LLMs) with RLs for complex urban applications.

Research Interests: Machine Learning, Reinforcement Learning, Decision Making, Generative Models.

Education

•**Ph.D.** in Computer Science and Technology 2017/09-2021/03
Zhejiang University, China Advisors: Prof. Deng Cai, Prof Xiaofei, He
Research Area: Reinforcement Learning, Graph Neural Networks, Stable Learning
Thesis: Stable Learning for Non-I.I.D Data and its Application in Traffic Domain

•**M.S.c** in Information System 2015/09-2016/12
Surrey University, UK Advisors: Prof. H Lilian Tang
Research Area: Convolutional Neural Networks, Deep Learning based Data Mining methods
Thesis: CNN-based Mycobacterium Cells Segmentation for Time-lapse Images

•**B.S.** in Communication Engineering 2011/09-2015/06
Jilin University, China

Experience

•Alibaba Cloud, Alibaba Group Hangzhou, China
Senior Algorithm Engineer 2023/10-present

- **Leading the R&D team for the Decision Making Agent Project**
- **Developing Decision Making Models within urban scenarios**
- **Exploring the frontiers of reinforcement learning especially LLM-based RLs**
- **Supervising Engineers and Research Interns**

•DAMO Academy, Alibaba Group Hangzhou, China
Senior Algorithm Engineer 2021/04-2023/11

- **Leading the R&D team for the Digital Twin Project**
- **Developing the Camera Perception and Simulation System of Digital Twin Project**
- **Exploring the frontiers of reinforcement learning, digital twin, and data mining**
- **Developing the Crowd Monitoring System**
- **Leading the Accident Risk Personnel Forecast Project**
- **Supervising Engineers and Research Interns**

•DAMO Academy, Alibaba Group Hangzhou, China
Research Intern 2018/01-2021/04

- **Exploring the frontiers of reinforcement learning and graph neural networks**
- **Developing the Urban Traffic Prediction System**
- **Developing the Signal Control System**

Achievements

•**Outstanding Intern** Alibaba Group *2018-2019, 2021*

•**Outstanding Postgraduate Student** Zhejiang University *2019-2020*

Publications

P1 Xin Guo*, **Zhengxu Yu*** (*Co-first author), Pengfei Wang, Zhongming Jin, Jianqiang Huang, Deng Cai, Xiaofei He, and Xian-Sheng Hua. "Urban Traffic Light Control via Active Multi-agent Communication and Supply-Demand Modeling," in IEEE Transactions on Knowledge and Data Engineering (2023), doi: 10.1109/TKDE.2021.3130258.

P2 Xiang, Chao, Zhongming Jin, **Zhengxu Yu**, Xian-Sheng Hua, Yao Hu, Wei Qian, Kaili Zhu, Deng Cai, and Xiaofei He. "Optimizing traffic efficiency via a reinforcement learning approach based on time allocation." International Journal of Machine Learning and Cybernetics 14, no. 10 (2023): 3381-3391.

P3 **Zhengxu Yu**, Zhongming Jin, Long Wei, Jianqiang Huang, Deng Cai, Xiaofei He, Xian-Sheng Hua. "Progressive Transfer Learning." IEEE Trans. Image Processing (TIP), vol. 31, pp. 1340-1348, 2022, doi: 10.1109/TIP.2022.3141258.

P4 Peng, Liang, Fei Liu, **Zhengxu Yu**, Senbo Yan, Dan Deng, Zheng Yang, Haifeng Liu, and Deng Cai. "Lidar point cloud guided monocular 3d object detection." ECCV 2022.

P5 **Zhengxu Yu***, Yilun Zhao* (*Co-first author), Bin Hong, Zhongming Jin, Jianqiang Huang, Deng Cai, Xian-Sheng Hua. "Apparel-invariant Feature Learning for Person Re-identification." IEEE Transactions on Multimedia, doi: 10.1109/TMM.2021.3119133.

P6 Wang, Wenxiao, **Zhengxu Yu**, Cong Fu, Deng Cai, and Xiaofei He. "COP: customized correlation-based Filter level pruning method for deep CNN compression." Neurocomputing 464 (2021): 533-545.

P7 **Zhengxu Yu**, Shuxian Liang, Long Wei, Zhongming Jin, Jianqiang Huang, Deng Cai, Xiaofei He, Xian-Sheng Hua. "MaCAR: Urban Traffic Light Control via Active Multi-agent Communication and Action Rectification." IJCAI-PRICAI'2020 (Acceptance Rate: 12.3% (592/4717)).

P8 Liang Xie, Chao Xiang, **Zhengxu Yu**, Guodong Xu, Zheng Yang, Deng Cai, Xiaofei He. "PI-RCNN: An Efficient Multi-sensor 3D Object Detector with Point-based Attentive Cont-conv Fusion Module." AAAI'2020 (Acceptance rate: 16.2% (1150/7095)).

P9 Long Wei, Zhenyong Wei, Zhongming Jin, **Zhengxu Yu**, Jianqiang Huang, Deng Cai, Xiaofei He, Xian-Sheng Hua. "SIF: Self-Inspirited Feature Learning for Person Re-Identification." IEEE Trans. Image Processing (TIP) 29: 4942-4951 (2020).

P10 **Zhengxu Yu**, Zhongming Jin, Long Wei, Jishun Guo, Jianqiang Huang, Deng Cai, Xiaofei He, Xian-Sheng Hua. "Progressive Transfer Learning for Person Re-identification." IJCAI'2019 (Acceptance rate: 17.9% (850/4752)).

P11 Long Wei*, **Zhengxu Yu*** (*Co-first author), Zhongming Jin, Liang Xie, Jianqiang Huang, Deng Cai, Xiaofei He, Xian-Sheng Hua. "Dual Graph for Traffic Forecasting." IEEE ACCESS (2019).

P12 **Zhengxu Yu**, Pengfei Wang, Junkai Xu, Liang Xie, Zhongming Jin, Jianqiang Huang, Xiaofei He, Deng Cai, Xian-Sheng Hua. "Stable Learning via Causality-based Feature Rectification." arXiv preprint arXiv:2007.15241.