



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 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.
- P2 **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.
- P3 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.
- P4 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* (2021), doi: 10.1109/TKDE.2021.3130258.
- 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-Inspired 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*.