TIANYU SHI

Email: ty.shi@mail.utoronto.ca

Personal Website: https://shitianyu-hue.github.io/

Google scholar: https://scholar.google.ca/citations?user=DC0t9zwAAAAJ&hl=en

EDUCATION

University of Toronto *September 2021 - present*

- Ph.D. in Transportation Engineering
- Research topic: Deep reinforcement learning for intelligent transportation system decision making and control

McGill University *January 2020 - Sep 2021*

- Master of Engineering (MEng) Thesis Option, GPA:3.8/4.0
- Research topic: Deep reinforcement learning, Robotics, Intelligent transportation system

Beijing Institute of Technology *September 2015 - July 2019*

- Mechanical Engineering (BEng), Major GPA: 3.7/4.0, Overall Ranking: 1/66
- First Class Honors graduate

JOURNAL PUBLICATIONS

Tianyu Shi, Jiawei Wang, Yuankai Wu, Luis Miranda-Moreno, Lijun Sun. Efficient Connected and Automated Driving System with Multi-agent Graph Reinforcement Learning. *IEEE Transactions on Intelligent Transportation Systems (2021)* (under review).

Tianyu Shi, Franois-Xavier Devailly, Denis Larocque, Laurent Charlin. Improving the generalizability and robustness of large-scale traffic signal control. *IEEE Transactions on Intelligent Transportation Systems (2021)* (under review).

Ye Ma*, Tianyu Shi*, Wei Zhang, Yu Hao, Junbing Huang, Yinan Lin. A Comprehensive Evaluation of NEV Development in China, Japan, the United States and Germany based on the AHP-EW Model, *Journal of Cleaner Production, 2019 Mar 20;214:389-402.*.

CONFERENCE PROCEEDINGS

Tianyu Shi*, Dong Chen, Kaian Chen, Zhaojian Li . Offline Reinforcement Learning for Autonomous Driving with Safety and Exploration Enhancement. *Workshop on Machine Learning for Autonomous Driving, 2021 Conference on Neural Information Processing Systems (NeurIPS).*

Tianyu Shi*, Jiawei Wang*, Yuankai Wu, Luis Miranda-Moreno, Lijun Sun. Multi-agent Graph Reinforcement Learning for Connected Automated Driving. *Workshop on AI for Autonomous Driving , 2021 International Conference on Machine Learning (ICML).*

Tianyu Shi*, Chenyang Xi*, Yuankai Wu, Lijun Sun. Efficient Motion Planning for Automated Lane Change based on Imitation Learning and Mixed-Integer Optimization. *The 2020 IEEE International Conference on Intelligent Transportation(ITSC).*

Tianyu Shi*, Pin Wang*, Ching-Yao Chan. A Data Driven Method of Optimizing Feedforward Compensator for Autonomous Driving Vehicle,*The 2019 IEEE Intelligent Vehicles Symposium (IV).*

Tianyu Shi*, Pin Wang*, Ching-Yao Chan. Driving Decision and Control for Automated Lane Change based on Deep Reinforcement learning,*The 2019 IEEE International Conference on Intelligent Transportation (ITSC).*

Yang Li, Jianqiang Wang, Tianyu Shi, Xiao-Yun Lu, Qing Xu, Keqiang Li. Pedestrian Trajectory Prediction at Un-Signalized Intersection Using Probabilistic Reasoning and Sequence Learning, *The 2019 IEEE International Conference on Intelligent Transportation(ITSC).*

WORKING PAPERS

Tianyu Shi, Yifei Ai, Baher Abdulhai. Bilateral Deep Reinforcement Learning Approach for Better-than-human Car Following Model.

ACADEMIC EXPERIENCE

Toronto ITS Centre, University of Toronto September 2021 - present
PhD Student, supervised by Prof.Baher Abdulhai

- ***Reinforcement learning for Mixed-autonomy Driving***
- Investigate the effect of bilateral car following models to stabilize mixed traffic as well as improve travel efficiency at the same time.

Smart Transportation Group, McGill University January 2020 - September 2021
Master Student, supervised by Prof.Lijun Sun

- ***Multi-agent Graph Reinforcement Learning for Automated Driving***
- Develop the graph attention networks in the navigation setting of multi-agent reinforcement learning for mixed-autonomy cooperation.
- Introduce Dynamic relational index based on both velocity and position information to capture attention features among surrounding agents.
- Improve the traffic flow efficiency and mitigate congestion. Present our paper in ICML 2020.

Berkeley Deep Drive, UC Berkeley July 2018 - September 2018
Research Assistant , supervised by Dr.Ching-Yao Chan & Dr. Pin Wang

- ***Research on Decision-making and Control System based Deep Reinforcement Learning (Project Link)***
- Designed two similar Deep Q learning frameworks with quadratic approximator for deciding how to select a comfortable gap and follow the preceding vehicle.
- Proposed a novel hierarchical deep reinforcement learning for decision making and control of lane change situations.
- Explored and optimized planning and control module based on customized reference trajectory and pure pursuit controller.

Tsinghua University July 2019 - September 2019
Research Assistant at State Key Lab of automotive Safety and Energy

- ***Research on Pedestrian Trajectory Prediction***
- Participated in designing a new hybrid model DBN-Seq2Seq for pedestrian trajectory prediction through an adaptively online weighing algorithm, which adjusts the weights of Seq2Seq and DBN models by estimating the stopping probability and their prediction errors at previous steps.
- Employed data-augmentation techniques to enlarge the original dataset for learning-based approaches.

INTERNSHIP EXPERIENCE

Mila - Quebec AI Institute, Montreal August 2020 - September 2021
Research Intern, supervised by Prof.Laurent Charlin & Prof.Denis Larocque

- ***Research on improving robustness of Reinforcement learning for traffic signal control given missing data***

· Measure the impact of faulty or noisy data on the policy learned by graph neural network based reinforcement learning.
· Improve decision making robustness given missing data based on imputation method and distributional reinforcement learning approach.

HONORS & AWARDS

2021 Graduate Merit-Based Entrance Scholarship(**five recipients in Uoft Civmin**) *Sep 2021*
2020 IVADO Excellence Scholarship(**five Recipients of McGill**) *April 2020*
Graduate Excellence Fellowship (GEF)(**funding new graduate of McGill**) *Jan 2020*
MIIT Scholarship for Scientific Innovation (**ten undergrad winners in BIT**) *January 2019*
First Prize of the CASC Scholarship (**one winner in our department of BIT**) *October 2018*
First Prize of the Fast Gear Scholarship(**one winner in our major of BIT**) *November 2017*
North Industry Scholarship for All-round Development(**ten winners in BIT**) *December 2016*
SWAT Scholarship(**ten winners in our department of BIT**) *Fall 2018*
Grand Prize of Academic Competition of BIT (**top 1%**) *May 2017*
Second Prize of National Undergraduate Mathematical Modeling Contest(**top 10%**) *December 2016*
Second Prize of Undergrad Physical Experiment Competition of Beijing (**top 10%**) *November 2016*

TALKS AND PRESENTATIONS

Distributional reinforcement learning for improving robustness and generalizability of large scale traffic signal control, at UofT ITS Innovation Lab, UT Austin. *April 2021*
Efficient Connected and Automated Driving System with Multi-agent graph Reinforcement Learning, at TRB Annual Meeting, CMU Safe AI Lab , UCLA Mobility Lab. *Jan 2021*
Data Driven motion planning for Autonomous Driving at The 2020 IEEE International Conference on Intelligent Transportation (ITSC). *Oct 2020*

PROFESSIONAL SERVICES

Reviewer

- IEEE Transactions on Intelligent Transportation Systems
- Transportation Research Part C: Emerging Technologies
- TRB Annual Meeting - Transportation Research Board
- IEEE International Conference on Intelligent Transportation Systems
- IEEE Intelligent Vehicles Symposium

Teaching Assistant

- Teaching Assistant for CSC2702H Technical Entrepreneurship at UofT
- Teaching Assistant for CIV 100 Mechanics at UofT
- Teaching Assistant for COMP 551 Applied Machine Learning at McGill

DATA ANALYTICS SKILLS

Programming Languages	Python, C/C++, MATLAB
Python Packages	Pandas, Matplotlib, Numpy, Scipy, Pytorch, Tensorflow
Software & Tools	LaTeX, Excel, SPSS, R, Photoshop , PROE , SolidWorks , CAD