Dongjie Yu (余冬杰)

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Education

Tsinghua University Sep. 2020 – Present

Master of Science in Mechanical Engineering *Advisor: Prof. Shengbo Eben Li & Prof.Jianyu Chen*

Tsinghua University Sep. 2016 – Jul. 2020

Bachelor of Engineering in Vehicle Engineering *Advisor: Prof. Shengbo Eben Li*

- GPA:3.75/4, rank: 6/65, **top 10%**
- Awarded with the Excellent Graduate of Tsinghua University **(top 10%)**

Tsinghua University Sep. 2017 – Jul. 2020

Minor in Computer Application Technology

Research Interest

Reinforcement Learning (RL), Safe Learning Control, Autonomous Driving, Hamilton-Jacobi (HJ) Reachability Analysis, Optimal Control

Honors and Awards

Best Student Paper Award at the 2021 International Conference on Intelligent Vehicles 2021

Excellent Graduate of Tsinghua University **(top 10%)** 2020

Outstanding Graduation Project at School of Vehicle and Mobility **(top 20%)** 2020

Scholarship of Academic Excellence Award at Tsinghua University **(top 30%)** 2017, 2018

Scholarship of Freshmen at School of Vehicle and Mobility **(2/65)** 2016

Research and Project Experiences

(No special marks: leading projects, *co-leading projects, †projects member)

Reachability Constrained RL for Safety-critical Dynamical Systems (RCRL)* Nov. 2021 – Present

Postgraduate Student Researcher, Intelligent System and Robotics Lab, Institute of Interdisciplinary Information Science, Tsinghua University

- Characterized the largest forward-invariant state subspace in constrained RL problems and guided policy updates of RL with insights from HJ reachability analysis.
- Evaluated RCRL on 2D quadrotor tracking tasks and robots navigation tasks in simulation. RCRL converged to zero-violation policies with competitive performance. (Paper 3)

Interpretable and Computationally Efficient Driving Intelligence (IDC)† Jan. 2021 – Dec. 2021

Postgraduate Student Researcher, Intelligent Driving Lab, School of Vehicle and Mobility, Tsinghua University

- Designed a static path planner for general intersections, together with a velocity-choosing mechanism addressing switch among different traffic lights. All for interpretable and efficient decision and control at intersections. (Patent CN202110990214.8)
- Implemented an attention-based model as the decision-making neural networks backbone to deal with the dynamic number of surrounding traffic participants. (Paper 4 & 2)

Permutation Invariant State Representation for Autonomous Driving (ESC)† Jun. 2020 – Dec. 2020

Postgraduate Student Researcher, Intelligent Driving Lab, School of Vehicle and Mobility, Tsinghua University

- Proposed a permutation-invariant representation method (called ESC) to eliminate pre-defined input sorting rules in autonomous driving. Proved the injectivity and representation capability of ESC from theory and empirical experiments. Compared to the fixed-permutation method, ESC reduces the approximation error by 62.2%. (Paper 5 & 1)
- Adopted attention-based models to address the equally weighting in ESC, reducing constraint violation in an intersection simulation by 66.5%. (Applied in Project IDC)

Publications

Selected Journal and Conference Papers (* means equal contribution)

5. **[T-ITS'21]** Jingliang Duan*, Dongjie Yu*, Shengbo Eben Li, Wenxuan Wang, Yangang Ren, Ziyu Lin, Bo Cheng. "Fixed-Dimensional and Permutation Invariant State Representation of Autonomous Driving" (2021). In *IEEE Transactions on Intelligent Transportation Systems*. **(IF: 6.492, Q1 top)** [Paper]

4. **[ICoIV'21]** Jianhua Jiang, Yangang Ren, Yang Guan, Shengbo Eben Li, Yuming Yin, Dongejie Yu, Xiaoping Jin. "Integrated Decision and Control at Multi-Lane Intersections with Mixed Traffic Flow" (2021). in *International Conference on Intelligent Vehicles*. **(Best student paper award)** [Paper]

Selected Preprints (* means equal contribution)

3. Dongjie Yu*, Haitong Ma*, Shengbo Eben Li, Jianyu Chen. "Reachability Constrained Reinforcement Learning" (2022). In *International Conference on Machine Learning*. (**Accepted for short presentation**) [Paper] [Code_env] [Code_learning]

2. Yangang Ren, Jianhua Jiang, Dongjie Yu, Shengbo Eben Li, Jingliang Duan, Chen Chen, Keqiang Li. "Self-learned Intelligence for Integrated Decision and Control of Automated Vehicles at Signalized Intersections" (2021). In *IEEE Transactions on Intelligent Transportation Systems*. (under review) [Paper]

1. Jingliang Duan, Yangang Ren, Fawang Zhang, Yang Guan, Dongjie Yu, Shengbo Eben Li, Bo Cheng, Lin Zhao. "Encoding Distributional Soft Actor-Critic for Autonomous Driving in Multi-lane Scenarios" (2021). in *IEEE Transactions on Neural Networks and Learning Systems*. (under review) [Paper]

Book Chapter

1. Chapter 9.6.2 (**5 pages about the application of HJ Reachability in Constrained RL**) and Chapter 11.7 (**6 pages about common RL libraries and benchmarks**) in *Reinforcement Learning for Decision-making and Control* by Shengbo Eben Li. Springer, 2022. (to be published)

Extracurricular Activities

Technology Service Team of Work-Study Program at Tsinghua University Sep. 2020 – Jan. 2022
Core team member

- Offered help for teaching and administrative staff and students in terms of computers, including (re-)installing OS and software, desktop assembly, and software and hardware troubleshooting.
- Awarded with Excellent Team Member of the Month 3 times, Excellent Team Member of the Semester 2 times and **Outstanding Individual** of Work-Study Program of Tsinghua University in 2021 (top 10%).

Student Association of School of Vehicle and Mobility Feb. 2017 – May. 2018
Member of Sports Association

- Provided volunteering service including training organization, photographing and events publicity for student athletes.
- Won the first runner-up of Ma Yuehan Cup in 2018.

Skills

Programming Languages: Python, C/C++, MATLAB
Software and Platforms: Linux, TensorFlow, PyTorch, MATLAB & Simulink, Git
English: IELTS (8.0)
Hobbies: Football