

# DONGJIE YU (余冬杰)

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## EDUCATION

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**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

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

## HONORS AND AWARDS

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**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

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(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)

**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, Dongjie 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)

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**EXTRACURRICULAR ACTIVITIES**

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**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.

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**SKILLS**

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