# Baiyu Peng

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## EDUCATION

**Tsinghua University (QS ranking:15)** **Beijing, China**

*Master in Vehicle Engineering* 08/2019- 07/2022 (Expected)

- **Master's Project:** Model-based safe reinforcement learning
- **Related Courses**: Machine Learning (4.0) | Optimal Control (4.0)

**Tsinghua University (QS ranking:15)** **Beijing, China**

*Bachelor in Vehicle Engineering* 08/2015- 07/2019

- **Academic**: GPA: 3.74/4.0, Ranking: 8/75
- **Awards**: National Scholarship, Top 1%, 2017 | Outstanding Graduates of Beijing, Top 5%, 2019 | Excellent Graduates of Tsinghua University, Top 10%, 2019 | Comprehensive Excellence Scholarship, Top 10%, 2018
- **Key Courses**: Calculus (4.0) | Linear Algebra (4.0) | Physics for Scientists and Engineers (4.0) | Fundamentals of Control Engineering (3.6)
- **Bachelor's thesis**: End-to-end autonomous driving though deep reinforcement learning (4.0)

## RESEARCH EXPERIENCE

My research interests and experiences mainly focus on reinforcement learning (RL) and its application on automated vehicles and robots. I especially pay attention to the safety of RL-based control method and aimed at providing existing RL with safety guarantee. Besides, I also have knowledge and experience on traditional control methods such as Model Predictive Control (MPC).

**Safe Reinforcement Learning | Project Leader** 04/2020-present

*Intelligent Driving Lab, Tsinghua University*

- Proposed two model-based safe RL algorithms that learn a policy with a high probability of being safe. The proposed methods reduced the oscillations and conservatism than baselines with a fast learning process.
- Accomplished a wheeled robot navigation experiment with the proposed algorithm. The robot reached the destination without colliding with a randomly moving obstacle. (Experiment video: https://youtu.be/oVDB2XqNoCU)
- Published and presented two conference papers as the first author (Presentation video: https://youtu.be/lsOE4nWvjoA) and won Finalist for Student Best Paper Award.

**Multi-Robot Distributed MPC Control | Project Leader** 10/2020-present

*Intelligent Driving Lab, Tsinghua University*

- Developed a distributed control scheme for warehouse mobile robots. The scheme consists of an A-star planner and a MPC controller with an integrated decision-making and control framework.
- Accomplished a multi-robot simulation, where the developed algorithm achieved safe distributed planning and controlling of 10 robots.
- Accomplished a real-world experiment with 2 robots in different scenarios and they reached their own destinations without colliding.

**Model-based Reinforcement Learning | Main participant** 10/2019-04/2020

*Intelligent Driving Lab, Tsinghua University*

- Derived the Bayesian estimator for estimating model uncertainty.
- Designed and accomplished a simulation to verify the optimality of the proposed method.
- Published a conference paper as the second author and won Student Best Paper Award.

**Robust-Control-Based RL Driving Policy Transfer | Main participant** 07/2018-09/2018
*Mechanical Systems Control Lab, UC Berkeley*

- Accomplished a trajectory tracking simulation to verify the proposed method.
- Wrote the project ROS (Robot Operation System) code and accomplished a driving experiment along a 300 m test road.

## PUBLICATION

### Conference Proceedings

- **Baiyu Peng**, Yao Mu, Jingliang Duan, et al. "Separated Proportional-Integral Lagrangian for Chance Constrained Reinforcement Learning." 2021th IEEE Intelligent Vehicle Symposium (IV) (2021). (Accepted, **Finalist for Student Best Paper Award,** (**Top 1%**, 3/220))
- **Baiyu Peng**, Yao Mu, Yang Guan, et al. "Model-Based Actor-Critic with Chance Constraint for Stochastic System." 2021th IEEE Conference on Decision and Control (CDC) (2021). (Accepted)
- Mu, Yao, **Baiyu Peng**, Ziqing Gu, et al. "Mixed Reinforcement Learning for Efficient Policy Optimization in Stochastic Environments." 20th International Conference on Control, Automation and Systems (ICCAS) (2020). (Published, **Student Best Paper Award,** (**Top 1%**, 5/500))

### Journal

- **Baiyu Peng**, Jingliang Duan, Jianyu Chen, et al. "Model-based Chance-Constrained Reinforcement Learning via Separated Proportional-Integral Lagrangian." IEEE Transactions on Neural Networks and Learning Systems (TNNLS, IF:10.45) (2021). (Under review)
- **Baiyu Peng**, Qi Sun, Shengbo Eben Li, et al. "End-to-End Autonomous Driving through Dueling Double Deep Q-Network." Automotive Innovation 4(3), 328–337 (2021) https://doi.org/10.1007/s42154-021-00151-3.

## DUTIES & ACTIVITIES

**Workshop Lecturer, Center for Student Studying and Development** 09/2018-present
*Tsinghua University*

- Organize regular workshops and give lectures to new students about the study and life on campus. (8 workshops, served about 300 students)

**Vice Minister of Publicity Department, the University Student Union** 09/2017-01/2018
*Tsinghua University*

- Organize department members to make social media posts about the campus life and information. (10 posts, 50000 reads)
- Be responsible for publishing and propagating the activity information for other departments of the University Student Union.

## SKILLS

**Programming:** Python, Pytorch, ROS, Matlab, C++.
**English:** TOEFL 102 (Reading 30 | Listening 28 | Speaking 21 | Writing 23)