Baiyu Peng

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EDUCATION

Tsinghua University   **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) | Vehicle Control Engineering (4.0)

Tsinghua University   **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)
- **Bachelor's thesis**: End-to-end autonomous driving though deep reinforcement learning (4.0)

RESEARCH EXPERIENCE

My research interests and experiences mainly include reinforcement learning (RL) and its application in automated vehicles and robots. I especially pay attention to 1. using the prior model of the vehicle/robots to improve the RL learning efficiency 2. adding safety constraints in RL to enable its application in safety-critical fields. Besides, I also have knowledge and experience in 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 Control | Project Leader   10/2020-present
Intelligent Driving Lab, Tsinghua University

- Developed a distributed control scheme for warehouse mobile robots, which consists of an A-star global planner and a MPC local controller in 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, where 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 to estimate model uncertainty.
- Designed and accomplished an aircraft system 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 vehicle trajectory tracking simulation to verify the proposed RL method.
- Wrote and deployed the ROS (Robot Operation System) code in the experimental car. Accomplished an autonomous driving experiment, where the RL controller drove the car safely 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)