Baiyu Peng

pby19@mails.tsinghua.edu.cn • +86 18810507500 • homepage https://baiyu6666.github.io/

EDUCATION

Tsinghua University **Beijing, China**

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

- **Course Highlight**: Machine Learning (4.0) | Optimal Control (4.0) | Vehicle Control Engineering (4.0)
- **Master's Thesis Project:** Model-based safe reinforcement learning for automated vehicles and robotics

Tsinghua University **Beijing, China**

Bachelor in Vehicle Engineering and Economics (Minor) 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
- **Course Highlight**: Calculus (4.0) | Linear Algebra (4.0) | Physics for Scientists and Engineers (4.0)
- **Bachelor's Thesis Project**: 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) improving RL learning efficiency by using the model of the vehicle/robots to optimize policy (2) adding safety constraints in RL to enable its application in real-world safety-critical situations. In addition to RL, 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 chance-constrained RL algorithms that learns a policy with a high probability of being safe. The proposed methods have less oscillations and conservatism than baselines, with a fast learning process.
- Conducted a real mobile robot navigation experiment. The trained robot was able to reach the destination without colliding with a randomly moving obstacle. (experiment video)
- Published and orally presented two conference papers as the first author, one of which won Student Best Paper Award Finalist.

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 method achieved safe distributed planning and controlling of 10 robots.
- Conducted extensive real-world experiments, where the two robots 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 update the stochastic model by collected data.
- 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.

End-to-end Autonomous Driving via Reinforcement Learning | Project Leader 11/2018-06/2019

Intelligent Driving Lab, Tsinghua University

- Developed an RL-based end-to-end driving method and verified it on a car simulator. The proposed method used a dual network with both camera image and motion information as the inputs to improve the performance.
- Drew saliency maps of the driving policy network via gradient-based ConvNet visualization technique.
- Published a journal paper as the first author.

Robust-Control-Based RL Driving Policy Transfer | Main participant 07/2018-09/2018

Mechanical Systems Control Lab, UC Berkeley

- Accomplished a car trajectory tracking simulation to verify the proposed RL method.
- Wrote and deployed the ROS code in the experimental car. Conducted a real autonomous driving experiment, where the RL controller trained in the simulator drove the real car robustly along a 300 m test road without getting out of road.

PUBLICATION

Conference Proceedings

- **Baiyu Peng**, Yao Mu, Jingliang Duan, et al. "Separated Proportional-Integral Lagrangian for Chance Constrained Reinforcement Learning." 32nd IEEE Intelligent Vehicle Symposium (IV), 2021. (**Student Best Paper Award Finalist,** (**Top 1%**, 3/220), [video])
- **Baiyu Peng**, Yao Mu, Yang Guan, et al. "Model-Based Actor-Critic with Chance Constraint for Stochastic System." 60th IEEE Conference on Decision and Control (CDC), 2021. (Accepted, [video])
- 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. (**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), 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 09/2018-present

Center for Student Studying and Development, Tsinghua University

- Organize regular workshops and give lectures to new students on the topics of academic and career planning. (9 workshops, 1 video, served more than 350 students)

Vice Minister of Publicity Department 09/2017-01/2018

The University Student Union, Tsinghua University

- Organize department members to make social media posts about the campus life and other useful information. (10 posts, 50000 reads)
- Publish and propagate the activity information by social media 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)