Jinning Li

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Education

University of California, Berkeley **Berkeley, CA**
Ph.D. Candidate *08/2019 – 05/2024(Expected)*
- Academic advisor: Prof. Masayoshi Tomizuka | Major: Control; Minor: Robotics, Optimization | GPA: 3.95/4.0

Harbin Institute of Technology **Harbin, China**
B.Eng. in Automation *09/2015 – 07/2019*
- Academic advisor: Prof. Huijun Gao, and Prof. Weichao Sun | Major GPA: 4.0/4.0 | Ranking: 1/150

Publications

[1] **Jinning Li**, Chen Tang, Masayoshi Tomizuka and Wei Zhan, "Hierarchical Planning Through Goal-Conditioned Offline Reinforcement Learning," in *IEEE Robotics and Automation Letters*, 2022.

[2] **Jinning Li**, Chen Tang, Masayoshi Tomizuka and Wei Zhan. "Dealing with the Unknown: Pessimistic Offline Reinforcement Learning," in *2021 Conference on Robot Learning (CoRL)*, 2021.

[3] Jiachen Li, Hengbo Ma, Zhihao Zhang, **Jinning Li** and Masayoshi Tomizuka. "Spatio-Temporal Graph Dual-Attention Network for Multi-Agent Prediction and Tracking," in *IEEE Transactions on Intelligent Transportation Systems*, 2021.

[4] **Jinning Li**, Liting Sun, Jianyu Chen, Masayoshi Tomizuka and Wei Zhan. "A Safe Hierarchical Planning Framework for Complex Driving Scenarios based on Reinforcement Learning," in *2021 IEEE Conference on Robotics and Automation (ICRA)*, 2021.

[5] **Jinning Li**, Liting Sun, Wei Zhan and Masayoshi Tomizuka. "Interaction-aware behavior planning for autonomous vehicles validated with real traffic data," in *Dynamic Systems and Control Conference (DSCC)*. American Society of Mechanical Engineers, 2020.

[6] **Jinning Li**. "A novel integrated SVM for fault diagnosis using KPCA and GA," in *Journal of Physics: Conference Series*. IOP Publishing, 2019.

Academic Services

- **Co-chair** of Presentation Sessions at *2021 IEEE Conference on Robotics and Automation (ICRA)*
- **Graduate Student Instructor** of *UC Berkeley ME C232/EE C220A (Advanced Control Systems I)* Fall 2021
- **Academic Publication Reviewer** for CoRL, ICRA, IROS, IEEE RA-L, IEEE T-SMC:Systems, NeurIPS workshop

Work Experiences

Google LLC **Mountain View, CA**
Software Engineer Intern, Discover Ads Auction Team *05/2022 – 08/2022*
- Designed and built an offline reinforcement learning infrastructure under Tensorflow for discover ads auction
- Trained deep NNs to optimize auction long term values from real-world data to achieve better advertiser/user value trade-off
- Conducted A/B testing of the trained algorithm on production traffic and polished the models accordingly
- Drove weekly meetings with the host teams and the research teams with effective communication
- Documented the design and implementation details for future iterations by the team

Selected Research Experiences

Goal-Conditioned Offline Reinforcement Learning (RL) in Driving Scenarios **UC Berkeley**
Advisor: Prof. Masayoshi Tomizuka *08/2021 – 05/2022*
- Designed and built a goal-conditioned RL policy with Pytorch, which solved the infamous problem of RL policies for being too greedy by waiting for a higher reward in the later stage of each episode
- Applied Variational Auto-Encoder programmed via Pytorch to extract the distribution over image observations in the training dataset so that valid goals could be sampled directly
- Evaluated the framework in CARLA which communicates with the Pytorch model (policy) by an Open-AI Gym interface, and obtained 15% more score than standard RL policies in terms of cumulative reward

Pessimistic Offline Reinforcement Learning **UC Berkeley**
Advisor: Prof. Masayoshi Tomizuka *01/2021 – 08/2021*

- Developed a Pessimistic Offline Reinforcement Learning (PessORL) algorithm which forces the policy to avoid or recover from out-of-distribution states and actions that are never included in training datasets, by leveraging a conservative regularization term in the policy evaluation step to shape the value function
- Theoretically and empirically proved that PessORL learns a pessimistic value function that lower bounds the true value function, and moreover, is corresponding to a pessimistic Markov Decision Process
- Evaluated the PessORL algorithm on Mujoco and Adroit robotic manipulation benchmark tasks based on Python and Pytorch, and obtained around 10% more generalization ability than the state-of-the-art offline RL methods

Hierarchical Behavior Planning Based on Reinforcement Learning **UC Berkeley**
Advisor: Prof. Masayoshi Tomizuka *05/2020 – 01/2021*

- Designed a hierarchical structure for behavior planning, which consists of high-level reinforcement learning modules and low-level optimization-based control modules to ensure safety
- Built a simulator based on Open-AI Gym in Python that reproduces traffic scenes from real-world traffic datasets
- Tested the proposed method in the in-house simulator with real-world traffic conditions, and achieved a success rate of around 91% in various driving tasks, e.g., merging, overtaking, and unprotected turns.

Behavior Planning Under Uncertainty in Merging Scenarios **UC Berkeley**
Advisor: Prof. Masayoshi Tomizuka *08/2019 – 05/2020*

- Formulated a Partially Observed Markov Decision Process (POMDP) where the cooperativeness of other traffic participants is treated as an unobservable state
- Extracted human behavior patterns from real traffic data via maximum likelihood method programmed in Python, with a mean squared error of $0.046\ m/s^2$ of the predicted acceleration
- Accelerated solving POMDP by Monte-Carlo Tree Search, thus the ego agent operates in real-time (every 0.1s)
- Evaluated the algorithm in both simulations with 99.4% success rate and real traffic data with 95.0% success rate

Stabilization of A Three-axis Gimbal **Harbin Institute of Technology**
Advisor: Prof. Weichao Sun *10/2018 – 08/2019*

- Applied inertial measurement units and brushless DC electric motors to stabilize a three-axis gimbal
- Designed via Solidworks, assembled and stabilized the gimbal whose mechanical structure was built by 3D printing
- Programmed the control algorithm (PID) in C++ on an STM32 Arm Cortex MCU as the controller of the system, with a phase margin of 20° and a settling time of 0.8s

An Integrated Support Vector Machine for Fault Diagnosis **Harbin Institute of Technology**
Advisor: Prof. Huijun Gao *03/2018 – 10/2018*

- Designed a support vector machine (SVM) and programmed in Python to identify faults within industrial systems, using massive data from real manufacturers (Tennessee Eastman Process), with small margin of error
- Applied kernel principle components analysis to dramatically reduce the dimension of the feature space from 52 to 8
- Employed genetic algorithms to optimize SVM parameters to simplify the tedious hyperparameter tuning by hands
- Evaluated the algorithm on Tennessee Eastman Process with an average accuracy score of 96.0%

Skills

- Research: Deep Reinforcement Learning, Optimization, Machine Learning, Control
- Deep learning framework: Pytorch, Tensorflow
- Programming: Python, C/C++, MATLAB