Qihang Zhang

qihangz.work@gmail.com

Education

University of British Columbia — Vancouver, Canada
Ph.D. in Electrical and Computer Engineering — *September 2023-now*
- Supervisors: *Prof. Renjie Liao* and *Prof. Lele Wang*

Tsinghua University — Beijing, China
Bachelor of Engineering in Control (Department of Automation) — *August 2019-June 2023*

Research Experience

Explainable Driving Model | University of Illinois Urbana-Champaign — May 2022 – Nov 2022

Advisor:**Shenlong Wang** (Assistant Professor of UIUC Department of Computer Science)

- Designed a novel driving model which disentangles a teacher model's cost map into several ones through intervention and distillation
- Explained how various objects being perceived affect decision-making in designed model as car progresses on route.
- Evaluated model on CARLA leaderboard, proving the model improved performance compared to baseline.
- Planned to fine-tuned the model to make it learn what is the true causality recognized by human beings.
- Planned to apply our method on real-world data

Sample-Adaptive Offline Reinforcement Learning with Expert Guidance | Tsinghua — February 2022 – June 2022

Advisor:**Gao Huang** (Associate Professor of Department of Automation, Tsinghua University)

- Proposed a novel plug-in approach, Guided Offline RL (GORL), which can adaptively determine the relative importance of every sample and can be easily applied to most offline RL algorithms
- Designed a new guiding network with updating method as well as an approach of updating the policy of whole offline RL algorithm
- Analyzed the rationality of GORL's updating mechanism and proved the near-optimality of the guidance from GORL
- Implemented the proposed framework on various state-of-the-art methods such as TD3+BC, SAC+BC, CQL, and IQL and evaluated the performance on D4RL benchmark. The results show our framework has ***statistically significant performance improvement*** with ***limited additional computational cost***
- Conducted ablation study and discussed the advantage of the adaptive weights, how GORL is different from other related works, and the limitation of GORL
- Published on **TNNLS** as first co-author

Projects

Auto-Ultrasound | Tsinghua University — September 2022 – June 2023

Advisor:**Gao Huang** (Associate Professor of Department of Automation, Tsinghua University)

- Collected real operational data from professional doctors operating ultrasound equipment.
- Trained an agent whose input is real-time ultrasound image of the heart part and output is joint angle of robotic arm
- Took the angle as input and calculated control signals via PID
- Currently developing robot to automatically acquire echocardiographic images of specific diagnostic views of patients' hearts with little to no human intervention.

PCIC 2021: Causal Inference and Recommendation — June 2021 – August 2021

- Trained a model to estimate users' preference for a particular tag
- Solved the problem of sparse matrices using *Matrix Factorization*, helping speed up the model training and helped the model converge
- Eliminated the recommender system's popularity bias by using causal inference methods, which could improve the recommender system's performance on the test set: the AUC metric was improved by 0.15 compared to the baseline
- Led team to rank 8 out of 116 teams participating in the competition

Technical Skills

Programming Languages: Proficient in Python C, C++, Mastery of Verilog & MIPS
Additional Skills:Experienced in popular Machine Learning and Reinforcement Learning libraries such as Pytorch, OpenAI gym. Experienced in causal inference, computer vision, and reinforcement learning