Chenning Yu

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Research Interest

Robotics and Motion Planning; Graph Neural Networks; Multi-Agent Planning; Machine Learning

Education

University of California, San Diego

- Ph.D. in Computer Science, Advisor: Prof. Sicun Gao — *Sept. 2021 - Jun. 2024 (Expected)*

University of California, San Diego

- M.S. in Computer Science — *Sept. 2019 - Jun. 2021*

Publication

4. **[ICRA 23]** Chenning Yu*, Qingbiao Li*, Sicun Gao, Amanda Prorok. "Accelerating Multi-Agent Planning Using Graph Transformers with Bounded Suboptimality." *IEEE International Conference on Robotics and Automation*, 2023.
3. **[NeurIPS 22]** Ruipeng Zhang, Chenning Yu, Jingkai Chen, Chuchu Fan, Sicun Gao. "Learning-based Motion Planning in Dynamic Environments Using GNNs and Temporal Encoding." *The Conference on Neural Information Processing Systems*, 2022.
2. **[CoRL 22]** Chenning Yu, Hongzhan Yu, Sicun Gao. "Learning Control Admissibility Models with Graph Neural Networks for Multi-Agent Navigation." *The Conference on Robot Learning*, 2022.
1. **[NeurIPS 21]** Chenning Yu, Sicun Gao. "Reducing Collision Checking for Sampling-Based Motion Planning Using Graph Neural Networks." *The Conference on Neural Information Processing Systems*, 2021.

Academic Experience

Reliable Autonomous Systems Lab, MIT — *Jun. 2022 - Oct. 2022*

Designing Generalizable Reinforcement Learning Agents with Highly Safe Performances — *Advisor: Prof. Chuchu Fan*

- Designed a set-theoretic formulation of RL policies to guarantee the forward invariance for safety-critical constraints.
- Generalized the RL agents to out-of-distribution tasks using the compositionality, and attaining highly safe performances.
- Tested the approach in a safety-critical MuJoCo robot environment with a performance of over 90% per-state safeness.

Prorok Lab, University of Cambridge — *Jun. 2022 - Sept. 2022*

Accelerating Multi-Agent Planning using Graph Transformers and Contrastive Learning — *Advisor: Prof. Amanda Prorok*

- Incorporated the Graph Transformers into a provably near-optimal planning framework for computation acceleration.
- Analyzed the approach in continuous clustered environments up to 30 agents, which are infeasible for traditional planners.
- Increased the success rates of the multi-agent planners by over 25% on average, with near-optimal performances.

Automation Algorithms Group, UC San Diego — *Feb. 2020 - Present*

Accelerating Motion Planning using Graph Neural Networks and Imitation Learning — *Advisor: Prof. Sicun Gao*

- Applied Graph Neural Networks to motion planning tasks, which enables faster planning with success rate guarantees.
- Evaluated the method with PyBullet robot arms from 2 to 14 degrees of freedom. The result has a 99% success rate and requires only 17% of the collision checking queries compared to the state-of-the-art learning-based planner.
- Extended the proposed method to dynamic environments and accelerated the total planning time by up to 95%.

Technical skills

Programming	Python, Bash, MATLAB
Development & Tools	PyTorch, JAX, TensorFlow, PyBullet, Jupyter Notebook, ROS, Raspberry Pi, Linux, Git

Invited Talks

Accelerating Multi-Agent Planning using Graph Transformers with Bounded Suboptimality

- REALM Lab at MIT — *Sept. 2022*

Learning to Reduce Collision Checking in Sampling-Based Motion Planning

- REALM Lab at MIT, — *Jul. 2022*
- Safe Autonomous Systems Lab at UC San Diego — *Mar. 2022*
- Automation Algorithms Group at UC San Diego — *Sept. 2021*