Shuijing Liu, Ph.D.

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Education

University of Illinois at Urbana Champaign 2018 – Exp. May 2024
Doctor of Philosophy in machine learning and Robotics (CGPA: 3.91/4.0)

University of Illinois at Urbana Champaign 2014 – 2018
Bachelor of Science in Computer Engineering, minor in Art and Design (CGPA: 3.86/4.0)

Skills

Programming: Python, C++/C, ROS, Matlab.
Software: PyTorch, Keras, Tensorflow, NumPy, SciPy, OpenAI Gym, Git, Docker, AWS.
Simulators: PyBullet, Unity 3D, AI2-THOR, Issac Gym, Drake.

Industry Experience

Research Scientist Internship, Bosch Center for Artificial Intelligence July 2023 – October 2023
Developed adversarial attacks and improved the robustness of autonomous vehicle planners with NuPlan and Metadrive.

Applied Scientist Internship, Robotics & AI, Amazon May 2022 – August 2022
Developed a deep Q-learning pipeline to grasp packages using a robot manipulator with a Drake simulator.

Research Projects

Robot Crowd Navigation 2019 – Present
- Proposed a graph neural network model for robot navigation in crowded environment with humans.
- Incorporated pedestrian trajectory prediction into the observation and reward function of RL navigation.
- Used PPO to train the GNN navigation policy with PyTorch, success rate increased by ~20%.
- Transferred the navigation policy from OpenAI Gym simulator to a real TurtleBot 2i. Developed a human detection and tracking system with YOLO and DeepSORT.

Unsupervised Driver Style Inference for Autonomous Navigation 2021
- Proposed a recurrent variational autoencoder network to learn a representation of driving styles from vehicle trajectories with no supervisions or labels using PyTorch.
- Used the driving style representation to navigate a car through an uncontrolled T-intersection with RL and PyGame.

Conversation and Visual-Language Grounding for Robot Assistive Navigation 2020 – Present
- Finetuned a CLIP model to map people's language instructions to desired destinations in indoor spaces.
- Design a system that can parse users' intents and hold conversations with users during navigation with Rasa.
- Use SLAM and ROS Navigation Stack to plan paths that guide blind people to their desired destinations.

Visual-Audio Representation as Intrinsic RL Reward for Instruction Following Robot 2021 – Present
- Built a multi-modal representation that associates images and sound commands with contrastive loss.
- Used the representation to generate RL reward for instruction following robots in navigation and manipulation.
- Developed a data-efficient and intuitive finetuning algorithm to reduce domain gaps after robot deployment.

Robot Stowing with Dynamic Modelling and Behavior Primitives 2022 – Present
- Proposed a model-based imitation learning framework to stow objects from minimal demonstrations.
- Created a robot stowing benchmark in simulation and real world as a long-horizon manipulation task.

Selected Publications

- **Intention Aware Robot Crowd Navigation with Attention-Based Interaction Graph**
  S. Liu, P. Chang, Z. Huang, N. Chakraborty, W. Liang, J. Geng, and K. Driggs-Campbell.
  In IEEE International Conference on Robotics and Automation (ICRA), 2023. [arXiv] [Website] [Video] [Code]
- **Learning to Navigate Intersections with Unsupervised Driver Trait Inference**
  S. Liu, P. Chang, H. Chen, N. Chakraborty, and K. Driggs-Campbell.
  In IEEE International Conference on Robotics and Automation (ICRA), 2022. [arXiv] [Website] [Video] [Code]
- **DRAGON: A Dialogue-Based Robot for Assistive Navigation with Visual Language Grounding**
  S. Liu, A. Hasan, K. Hong, R. Wang, P. Chang, Z. Mizrachi, J. Lin, D. L. McPherson, W. A. Rogers, and K. Driggs-Campbell.
  In submission to Robotics and Automation Letters, 2024. [arXiv] [Website] [Video]