Shuijing Liu

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Education

University of Illinois at Urbana Champaign 2018 – Exp. May 2023
Doctor of Philosophy in Electrical Engineering (CGPA: 3.91/4.0)
Research interests: Learning-based robotics, human-robot interaction, machine learning, reinforcement learning.

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

Industry Experience

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

Research Projects

Unsupervised Driver Trait Inference for Autonomous Navigation 2021
- Proposed a variational autoencoder + RNN network to learn a representation of driving styles from vehicle trajectories with no supervisions or labels using PyTorch.
- Used the learnt driving style representation to control a vehicle to navigate through an uncontrolled T-intersection with RL. The success rate increased over 10% compared with previous works.

Wayfinding Assistance Robot for People with Visual Impairments 2020 – Present
- Use bag-of-word model to map blind people's vocal instructions to desired destinations in indoor spaces.
- Use SLAM and ROS Navigation Stack to plan paths that guide blind people to various destinations.

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 with PyTorch, success rate increased by ~20%.
- Transferred the navigation policy from OpenAI Gym simulator to a real TurtleBot 2i.

Audio Instruction Following Robot 2021 – Present
- Built a representation that associates images and corresponding sound commands with contrastive loss.
- Used the representation to generate RL reward functions to train the instruction following robot.

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. [arXiv] [Video]
- **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]
- **Decentralized Structural-RNN for Robot Crowd Navigation with Deep Reinforcement Learning**
  S. Liu*, P. Chang*, W. Liang, N. Chakraborty, and K. Driggs-Campbell.
  In IEEE International Conference on Robotics and Automation (ICRA), 2021. [Paper] [Website] [Code] [Video]
- **Robot Sound Interpretation: Learning Visual-Audio Representations for Voice-Controlled Robots**
  P. Chang, **S. Liu**, and K. Driggs-Campbell. [arXiv]
- **Combining Model-Based Controllers and Generative Adversarial Imitation Learning for Traffic Simulation**
  H. Chen, T. Ji, **S. Liu,** and K. Driggs-Campbell.
  In IEEE Intelligent Transportation Systems Conference (ITSC), 2022.
- **Robot Sound Interpretation: Combining Sight and Sound in Learning-Based Control**
  P. Chang, **S. Liu,** H. Chen, and K. Driggs-Campbell.
  In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020. [Paper] [Website] [Video]

Skills

Programming: Python, C++/C, ROS, Matlab, HTML, MySQL, PHP.
Software: PyTorch, Keras, Tensorflow, NumPy, SciPy, PyBullet, OpenAI Gym.
Others: OpenCV, Unity 3D, Quartus, good written and oral communication skills.