Shuijing Liu

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Research Interest

Human-Robot Interaction, Reinforcement Learning, Artificial Intelligence

Education

University of Illinois at Urbana Champaign 2018 – 2020
Doctor of Philosophy in Electrical Engineering (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)

Publications

Preprints

- **S. Liu*,** P. Chang*, W. Liang†, N. Chakraborty†, and K. Driggs-Campbell, "*Decentralized Structural-RNN for Robot Crowd Navigation with Deep Reinforcement Learning*", in submission for IEEE International Conference on Robotics and Automation (ICRA), 2020. (arXiv preprint: https://arxiv.org/abs/2011.04820)

Conference Publications

- P. Chang, **S. Liu,** H. Chen, and K. Driggs-Campbell, "*Robot Sound Interpretation: Combining Sight and Sound in Learning-Based Control*", in IEEE International Conference on Intelligent Robots and Systems (IROS), 2020. (arXiv preprint: https://arxiv.org/abs/1909.09172)
- A. Pattanaik, **S. Liu*,** Z. Tang*, G. Bommannan, and G. Chowdhary, "*Robust Deep Reinforcement Learning with Adversarial Attacks*", In 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2018. (extended abstract)

Undergraduate Thesis

- **S. Liu,** A. Parameswaran, and J. Peng, "*Prostate Cancer Diagnosis by Deep Learning*". In Illinois Digital Environment for Access to Learning and Scholarship (IDEALS), May 2018.

Research Projects

Decentralized Structural-RNN for Robot Crowd Navigation 2019 – 2020
Advisor: Prof. Katherine Driggs-Campbell

- Propose a novel Decentralized Structural-RNN network that enables robot to perform spatial and temporal reasoning in crowd navigation
- Train the network by model-free reinforcement learning without supervised learning
- Results outperform baselines in challenging test settings, and transfer the learned policy to real world

Robot Sound Interpretation: Combining Sight and Sound in Learning-Based Control Summer 2019
Advisor: Prof. Katherine Driggs-Campbell

- Designed and conducted empirical experiments to show that our proposed deep neural network enables robots to interpret sound commands for decision making, in simulation and real world.

Robust Deep Reinforcement Learning with Adversarial Attacks 2017 – 2018
Advisors: Prof. Girish Chowdhary and Anay Pattanaik

- Implemented novel adversarial attacks on deep RL algorithms including DDQN and DDPG

- Implemented robust RL algorithm that leveraged the adversarial attacks, achieved good performance compared with state-of-art deep RL algorithms

Cancer Diagnosis with Deep Learning 2017 – 2018

Advisors: Prof. Aditya Parameswaran and Prof. Jian Peng

- Proposed ResNet binary classifiers to detect cancer biopsy images in US Biomax prostate cancer dataset, achieved 80% testing accuracy
- Proposed ensemble methods that boosted the performance of our classifiers to near 100%

Teaching Experience

Graduate Teaching Assistant

- ECE 598: Human Centered Robotics Fall 2020
- ECE 470: Introduction to Robotics Fall 2019 – Spring 2020
- ECE120: Introduction to Computing **(Head TA)** Fall 2018 – Spring 2019

Undergraduate Course Assistant

- ECE110: Introduce to Electronics Fall 2016 – Spring 2018

Selected Courses

Robotics

- **Introduction to Robotics:** Forward and inverse kinematics, robot dynamics, path planning
- **Probabilistic Robotics:** State estimation & filtering, localization, mapping, SLAM, MDP, POMDP

Reinforcement Learning

- **Sergey Levine's Deep RL (self-learned):** Imitation learning, model-based RL, exploration, transfer learning, RL algorithms
- **David Silver's RL (self-learned):** MDP, dynamic programming, model-free prediction & control, value function approximation
- **Statistical Reinforcement Learning:** Theoretical RL, sample complexity analyses

Machine Learning & Computer Vision

- **Fei-Fei Li's CNN for Visual Recognition (self-learned):** Design & training of CNN
- **Computer Vision:** Low-level vision, grouping and fitting, geometric vision, recognition
- **Machine Learning:** Regression, classification, optimization, neural networks, unsupervised learning
- **NLP:** RNN, POS tagging, parsing, machine translation, semantics
- **AI:** search, Bayes nets, HMM

Theory:

- **Control System Theory & Design:** Stability, controllability & observability, stabilization, optimal control
- **Optimization:** Convex optimization, gradient methods, KKT conditions, duality

Honors and Awards

- **Lauren Kelley Memorial Scholarship** 2017 – 2018
- **Professor N. Narayana Rao Scholarship** awarded to the top 10% of the junior class for scholastic excellence and distinguished meaningful service to the department and campus community, 2016.
- **Oakley Scholarship** awarded to outstanding sophomores in ECE department who have been active in outside activities, 2015.
- **Dean's List** honored full-time students whose GPA ranks in the top 20% of their college, 2014 – 2016.

Skills

Programming: Python, C++/C, MySQL, PHP, HTML

Packages: PyTorch, Tensorflow, Keras

Software: Matlab, Latex, Adobe Photoshop, Adobe Illustrator, Adobe After Effects

References

- Prof. Katherine Driggs-Campbell, Electrical and Computer Engineering, UIUC.
  krdc@illinois.edu
- Prof. Girish Chowdhary, Agricultural and Biological Engineering, UIUC.
  girishc@illinois.edu
- Prof. Aditya Parameswaran, Electrical Engineering and Computer Science, UC Berkeley.
  adityagp@berkeley.edu
- Prof. Jian Peng, Computer Science, UIUC.
  jianpeng@illinois.edu