Edward S. Hu

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Research Interests

Robotics, Reinforcement Learning, Imitation Learning, Deep Learning

Education

University of Pennsylvania Aug 2020 – Present
Ph.D. in Computer Science

University of Southern California
M.S. and B.S. in Computer Science Aug 2015 – May 2020
Robert Fulton Scholarship, Master's Best Research Award

Research and Experience

UPenn General Robotics, Automation, Sensing, and Perception Lab September 2020 – Present
Ph.D. Student, ***Professor Dinesh Jayaraman***

- Research on developing data-driven control methods for robotics that can adapt to novel objects, tasks, and environments. Topics include model based reinforcement learning, transfer learning, and manipulation.

USC Cognitive Learning for Vision and Robotics Lab May 2018 – Present
Undergraduate / Master's Research Assistant, ***Professor Joseph Lim***

- **Robot Learning Research**: Researched reinforcement learning and imitation learning techniques for learning locomotion and manipulation skills and published in 3 conferences (ICLR, CoRL, ICRA) as undergrad.
- **Furniture Simulator**: Developed a physics simulator to model furniture assembly to teach robots how to assemble furniture.

Intel May 2017 - Aug 2017
Machine Learning Intern, ***Dr. Helin Cao***

- **Applied Reinforcement Learning**: Automated thermal tuning process for laptops CPUs via machine learning using model-free and model-based reinforcement learning algorithms.

USC Wireless Devices and Systems Group May 2016 – Aug 2017
Research Assistant, ***Professor Andreas Molisch***

- **Viterbi Virtual Cache**: Developed data collection tools for study on user media caching. Implemented video player application for Android and server for storing user data.

Publications

ES Hu, K Huang, D Jayaraman, "Transferable Visual Control Policies through Robot-Awareness," in *International Conference on Learning Representation*, 2022.

Y Lee, **ES Hu**, JJ Lim, "IKEA Furniture Assembly Environment for Long-Horizon Complex Manipulation Tasks" in *International Conference on Robotics and Automation*, 2021.

Y Lee, **ES Hu**, Z Yang, JJ Lim, "To Follow or not to Follow: Selective Imitation Learning from Observations," in *Conference on Robot Learning*, 2019.

Y Lee, SH Sun, S Somasundaram, **ES Hu**, JJ Lim, "Composing Complex Skills by Learning Transition Policies" in *International Conference on Learning Representations*, 2019.

Professional Experience

Tesla May 2018 - Aug 2018

Software Engineering Intern

- **Model 3 Production Optimization with NLP**: Created NLP classification pipeline to triage and classify 200,000 Model 3 Production issues
- **Manufacturing Operating System (MOS)**: Fullstack implementation of mission-critical production dashboards on MOS using Angular, Go, and SQL

Flo Technologies May 2016 - Aug 2016

Software Engineering Intern

- **Mobile Development**: Developed IoT iPhone application that controls smart plumbing device. Used MQTT, Swift, and Firebase frameworks to connect smart devices with the iPhone.

Code The Change May 2015 - August 2020

Technical Lead

- **Coding for Social Good**: Student organization that builds software products for LA nonprofits on a yearly cycle. Developed applications for reducing recidivism, data visualization for LA county, and medication management.
- **Technical Leadership**: Plan software architecture, set up boilerplate, review pull requests, and pair program with junior developers.

Awards

MS Best Research Award *May 2020*

Robert Fulton Scholarship *May 2019*

Discovery Scholar (Undergraduate Research) Distinction *May 2019*

Best Writeup, Best Demo, CS599 Deep Learning Final Project *May 2018*

1st Place at HackForHealth, Medmind *Apr 2017*

Dropbox Challenge Winner, Stanford Treehacks *Feb 2016*

1000 Pitches Winner *Dec 2015*

Outreach and Nonprofit Work

Splash Academic Outreach May 2020

Lecturer

- **High School Outreach**: Developed and taught course **Neural Networks in Excel** to teach 40 highschoolers forward and backward propagation using only spreadsheets.

Girls Empowerment Day Dec 2019

USC Robotics Presenter

- **Virtual Reality Demo**: Implemented virtual reality controller augmented inverse kinematics controllers for simulated Baxter robot. Presented and demoed robot control to 70 local high school girls.

MedMind Aug 2018 - May 2019

Founder, Technical Lead

- **Medication Management**: React Native app that uses computer vision to streamline drug management for cancer patients. Worked with local nonprofit CancerBase and tested with cancer patients.

LA Data Dashboard Aug 2017 - May 2018

Technical Lead

- **Open Data Initiative**: Dashboard that displays real-time metrics such as emergency response time, jobs added per quarter, etc. for the public to use. Collaborated with the LA Mayor's department, and dashboard is used by the mayor.

Projects

Research Blog: Post tutorials, paper summaries, and articles on machine learning research. Viewed by over 10,000 readers from 11 countries. https://www.edwardshu.com

Deep Symphony: Generated classical music with neural networks for CS599 final project. Explored RNN, word2vec embeddings, seq2seq, WGAN, SeqGAN. Won 1st place in class of 250 graduate students in best demo and best writeup categories.

GPT-2 Slackbot: Chatbot that utilizes OpenAI's powerful GPT-2 language model to converse with users.

Classes and Skills

Classes: Multivariate Calculus, Linear Algebra, Probability/Statistics, Data Structures, Algorithms, Graphics, Videogame Programming, Operating Systems, Professional C++, Artificial Intelligence, Deep Learning (grad), Machine Learning (grad), Robotics (grad)

Languages / Skills: Python, Java, C++, Javascript, Pytorch, Tensorflow, Numpy, Node.js, React (Native), Swift, Android, SQL, Mongo