Eley Ng

Updated July 12, 2023

CONTACT

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CORE COMPETENCIES

5+ years of experience in machine learning, generative models (VAE, GANs, diffusion), deep learning (Transformers, RNNs, CNNs), reinforcement learning, robotics, PyTorch, Python, behavior and trajectory prediction, sequence modeling, software development, and real-time human-machine systems. Proficient leadership, management, communication, teamwork, problem solving.

EDUCATION

Stanford University Stanford, CA
PhD in Mechanical Engineering (Robotics) Sept. 2019 – June 2023
Advisor: Monroe Kennedy III
Thesis Committee: Dorsa Sadigh, Mac Schwager

Stanford University Stanford, CA
MS in Mechanical Engineering Sept. 2017 – June 2019

University of Texas at Austin Austin, TX
BS in Mechanical Engineering, Top 5% of Class Aug. 2013 – May 2017

RELEVANT EXPERIENCE

Diffusion Co-Policy for Human-Robot Collaboration

- Developed a long-horizon robot policy using a Transformer-based diffusion network trained via imitation learning to predict and execute human and robot trajectories in a Model Predictive Control framework.
- Achieved 10-20 percent improvement in task success rate over state-of-art imitation learning and planning methods for human-robot collaborative table-carrying, in both simulation and real robot experiments.
- Demonstrated novel and compelling qualitative robot behaviors, such as shared task understanding, leadership, and human-like behavior on the task.
- Led, executed, and managed project to completion within 5 months, taking ownership of all stages including ideation, implementation (ROS and motion capture for mobile robots, simulation, model training/evaluation), experimentation, and technical communication.

Sampling Waypoint Predictions for a Cooperative Planner

- Developed a planner with learned sampling distributions for generating waypoint trajectories for a human-robot cooperative task.
- Designed and executed human-in-the-loop experiments and Turing Test user study that demonstrated 10-40 percent improvement in task success rate over non-learning methods, as well as statistical significance in perception of human-likeness of generated trajectories.

• Led team and demonstrated effective problem solving by strategically pivoting methods towards working solutions within 4 months.
• Communicated results in a technical paper published and presented at ICRA 2023, and shared open-sourced models and simulator code on github.

Learning Sampling Distributions for States and Joint Actions
• Developed a model-based reinforcement learning framework using learned models of long-horizon human-robot actions and task dynamics.
• Implemented various neural networks in PyTorch, including mixture density recurrent networks and other generative models, data processing methods, and the human data collection pipeline from training to evaluation.
• Communicated findings and failure cases in a workshop paper at RSS 2022.

PUBLICATIONS

[5] **Eley Ng**, Ziang Liu, and Monroe Kennedy III. Diffusion Co-Policy for Synergistic Human-Robot Collaborative Tasks. *arXiv preprint, arXiv:2305.12171.*

[4] **Eley Ng**, Ziang Liu, and Monroe Kennedy III. It Takes Two: Learning to Plan for Human-Robot Cooperative Carrying. *IEEE International Conference on Robotics and Automation (ICRA), 2023.*

[3] **Eley Ng**, Ziang Liu, and Monroe Kennedy III. Learning Action and State Sampling Distributions for Human-Robot Collaboration. *Workshop on Learning from Diverse, Offline Data, Robotics: Science and Systems (RSS), 2022.*

[2] George E. Gorospe Jr., Matthew J. Daigle, Shankar Sankararaman, Chetan S. Kulkarni, and **Eley Ng**. GPU accelerated prognostics. *Annual Conference of the PHM Society, 2017.*

[1] Shixuan Yang, **Eley Ng**, and Nanshu Lu. Indium Tin Oxide (ITO) serpentine ribbons on soft substrates stretched beyond 100%. *Extreme Mechanics Letters, 2015.*

SKILLS

Programming Python, MATLAB, C++, Linux (Bash), Javascript
Data Science NumPy, Matplotlib, SciPy
Learning PyTorch, PyTorch Lightning, AWS, CUDA Toolkit
Robots/Hardware ROS, Gym, MuJoCo, Locobot/Turtlebot, Motiv

AWARDS & GRANTS

Joel H. Ferziger Memorial Fellowship	2020-2023
Human-Centered AI (HAI) Seed Grant	2020
NSF Graduate Research Fellowship	2017
UT Austin Leadership Collaborative Award	2017
Undergraduate Research Fellowship	2014
SanDisk Engineering Scholarship	2013
2nd Place National Winner, Toshiba Science Competition	2012

WORK EXPERIENCE

NASA Ames, Mountain View, CA June - August 2017
Research internship with the Diagnostics and Prognostics Group in the Intelligent Systems Division under Christopher Teubert.

Intel Corporation, Hillsboro, OR June - August 2016
Internship in mechanical design with the New Technology Group.

Oregon State University, Corvallis, OR June - August 2015
Research Internship in soft robotic actuators under Yiğit Mengüç.

Sandia National Laboratories, Albuquerque, NM 2014 - 2015
Internship in computation and finite element analysis.

TEACHING

CS 339R (ME 326): Collaborative Robotics Winter 2022
Teaching Assistant, Stanford University.
This course focuses on how robots can be effective teammates with other robots and human partners, teaching concepts such as robot perception and control, teammate behavioral modeling, inter-agent communication, and team consensus. Course involves teaching through literature review, research proposals, and group project working with real robots (Interbotix LoCoBot) in ROS/Python/C++.
Average student rating: 4.25/5.00.

ENGR 15: Dynamics Fall 2021
Teaching Assistant, Stanford University.
This course teaches the application of Newton's Laws to solve 2-D and 3-D static and dynamic problems, particle and rigid body dynamics, freebody diagrams, and equations of motion, as well as dynamic simulations.
Average student rating: 4.33/5.00.

MENTORING

Ziang Liu (PhD CS, Cornell University), Bryn M. Hughes (BS CS, Stanford University), J.D. Kelly (BS EE, Stanford University), Ahad Rauf (ME PhD, Stanford University)

OUTREACH

Stanford Mechanical Engineering Women's Group 2020 – Present
Co-organize Women's Seminar Series (ENGR 311A) and social events with regular attendance of 30, initiated Dine with Professor events to open discourse between the graduate student community and women in STEM faculty.

Research Mentor, SURI Program 2019 - 2020
Mentored Stanford CS and EE undergraduate research students on two projects: 1) developing an American Sign Language detection and generator mobile app, and 2) online simulator for robotic task.

First Year ME PhD Mentorship Program 2019 - 2020
Mentored first year ME PhD student.

WME President, VP, Outreach Chair 2014 - 2017
Sought and secured $8,500 (1000% increase in funding, starting from a budget deficit) from corporate sponsors in 2016 as club president. Developed team projects (3D-printed prostheses), coordinated a series of speakers from industry and academia for weekly meetings, coordinated outreach events, and organized recruitment events in various leadership roles.

MEUAB Nominated Member 2016 - 2017
Selected by the department to serve on the UT Austin Mechanical Engineering Undergraduate Advisory Board to discuss and implement department and curriculum changes with faculty of Mechanical Engineering.