Amal Nanavati

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Research Interests

Human-Robot Interaction; Physically Assistive Robots; Human Modeling; User-Centered Design; Robot Learning

Education

Sep 2019 - Present
University of Washington | Seattle, USA
PhD Student, Computer Science and Engineering
Advisers: Dr. Siddhartha Srinivasa, Dr. Maya Cakmak

Sep 2018 - July 2019
Kyoto University | Kyoto, Japan
Fulbright Fellow
Advisers: Dr. Takayuki Kanda, Dr. Dražen Brščić

Aug 2014 - May 2018
Carnegie Mellon University | Pittsburgh, USA
Bachelor of Science (BS) Computer Science
Additional Major: Global Studies | University Honors
Advisers: Dr. Aaron Steinfeld, Dr. Bernardine Dias

Selected Coursework:
- **CSE 599W** Reinforcement Learning
- **CSE 599I** Interactive Learning
- **CSE 599M** Robustness in ML
- **10-812** Never-Ending Learning
- **10-701** Introduction to ML
- **15-451** Algorithm Design and Analysis
- **15-440** Distributed Systems
- **HCDE 548B** Critical Tech Practice
- **CSE 599P** Computer Ethics

Publications

Full Papers

P.9 Ethan K. Gordon*, **Amal Nanavati***, Ramya Challa, Bernie Hao Zhu, Taylor A. Kessler Faulkner, and Siddhartha S. Srinivasa. **Towards General Single-Utensil Food Acquisition with Human-Informed Actions**. *Conference on robot learning (CoRL23)*.

P.8 **Amal Nanavati***, Patrícia Alves-Oliveira*, Tyler Schrenk, Ethan K. Gordon, Maya Cakmak, and Siddhartha S. Srinivasa. **Design principles for robot-assisted feeding in social contexts**. *Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI23)*.
- **Best Design Paper Award**

P.7 **Amal Nanavati**, Nick Walker, Lee Taber, Christoforos Mavrogiannis, Leila Takayama, Maya Cakmak, and Siddhartha S. Srinivasa. **Not All Who Wander Are Lost: A Localization-Free System for In-The-Wild Mobile Robot Deployments**. *Proceedings of the 2022 ACM/IEEE International Conference on Human-Robot Interaction (HRI22)*.

P.6 Michael Murray, Nick Walker, **Amal Nanavati**, Patrícia Alves-Oliveira, N. Filippov, Allison Sauppe, Bilge Mutlu, and Maya Cakmak. **Learning backchanneling behaviors for a social robot via data augmentation from human-human conversations**. *Conference on robot learning (CoRL22)*.

P.5 **Amal Nanavati**, Christoforos Mavrogiannis, Kevin Weatherwax, Leila Takayama, Maya Cakmak, and Siddhartha S. Srinivasa. **Modeling Human Helpfulness with Individual and Contextual Factors for Robot Planning**. *Proceedings of Robotics: Science and Systems 2021 (RSS21)*.

P.4 **Amal Nanavati**, Malcolm Doering, Dražen Brščić, and Takayuki Kanda. **Autonomously Learning One-To-Many Interaction Logic from Human-Human Interaction Data**. *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction (HRI20)*.

P.3 **Amal Nanavati**, Aileen Owens, and Mark Stehlik. **Pythons and Martians and Finches, Oh My! Lessons Learned from a Mandatory 8th Grade Python Class**. *Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE20)*.

P.2 **Amal Nanavati**, Xiang Zhi Tan, Joe Connolly, and Aaron Steinfeld. **Follow The Robot: Modeling Coupled Human-Robot Dyads During Navigation**. *Proceedings of the 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS19)*.

P.1 **Amal Nanavati**, M. Bernardine Dias, and Aaron Steinfeld. **Speak Up: A Multi-Year Deployment of Games to Motivate Speech Therapy in India**. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI18)*.

Short Papers

S.2 **Amal Nanavati**, Patrícia Alves-Oliveira, Tyler Schrenk, Ethan K. Gordon, Maya Cakmak, and Siddhartha S. Srinivasa. **Unintended Failures of Robot-Assisted Feeding in Social Contexts**. *Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI23)*. (Video, presented at HRI23)

S.1 **Amal Nanavati**, Xiang Zhi Tan, and Aaron Steinfeld. 2018. **Coupled Indoor Navigation for People Who Are Blind**. *Companion of the 2018 ACM/IEEE International Conference on Human-Robot Interaction (HRI18)*.

Selected Research Experiences

July 2021 - present
Robot-Assisted Feeding for People with Motor Impairments | Seattle, WA
- System design and implementation for a robot arm that helps feed people with motor impairments.
- Focusing on developing smooth human-robot interactions with the system, including non-threatening motions, a customizable bite transfer, and human-in-the-loop techniques to improve system robustness.
- Developed models of how humans acquire food in order develop bite acquisition primitives for the robot.

Sep 2019 - July 2021
Robots Asking Humans for Help: Models and Frameworks | Seattle, WA
- Developed a model of human help-giving behavior, which enabled a robot to perform 1.5x better than state-of-the-art approaches by effectively asking for help.
- Implemented help-seeking behavior on a mobile robot, which enabled error-free navigation for 32 hours.

Sep 2018 - July 2019
Learning Multiparty Interaction Logic from Human Data | Kyoto, Japan
- Designed & implemented an attention-based deep neural network that takes in multimodal data on customer actions and outputs how a robot shopkeeper should respond.
- The network outperformed state-of-the-art approaches by up to 30% in terms of social appropriateness.

Aug 2016 - Aug 2018
Assistive Robots for Blind Travelers | Pittsburgh, PA
- Developed, user tested, and implemented interaction modalities and autonomous navigation skills for a mobile robot to guide blind users.
- Designed a planner that simulates how users follow robots, bringing users 1.8x closer to their goal than a planner that only accounted for the robot.

Selected Industry Experiences

Jan 2023 - Apr 2023
User Experience Research Intern | Zipline
- Investigated user perceptions of droid motion during drone delivery. Worked with the planning and controls teams to integrate research insights into their algorithms.
- Extended a simulation environment to generate realistic drone delivery videos.
- Prototyped and evaluated multiple ways for workers to scan packages before loading them into the droid.

May 2016 - Aug 2016
Software Engineering Intern | Thumbtack
- Designed & implemented a Go service to send push notifications to Thumbtack's mobile apps, as well as data analytics for that service.
- Performed concurrent database migrations for millions of items between SQL, DynamoDB, and S3.

Selected Teaching Experiences

Jun 2022 - Aug 2022
Instructor, CSE 416 Introduction to Machine Learning | Seattle, WA
- Taught 80+ undergraduate and graduate students machine learning (ML), including deep learning, regression, matrix factorization, and social considerations in ML. Instructor Evaluation: **4.7/5.0**.
- Managed a team of 5 TAs to prepare and teach sections, respond to student questions, and grade.

April 2016 - Aug 2018
Teknowledge | Co-founder, President
- Taught afterschool computer science (CS) at under-resourced public schools and community centers.
- Developed intro Python (6^{th} - 11^{th} grade) and inquiry-based machine learning curricula (10^{th} - 12^{th} grade).
- Advised teachers and admin as they developed a mandatory 8th grade Python class based on our curriculum.
- Managed communications, interactions, training for 25 mentors, 130+ students, and 7 community partners.

Selected Course Projects

Spring 2020	*CSE599W Reinforcement Learning* (Project Write-up) ▪ Developed a taxonomy of the different types of human-help queries a robot can make. ▪ Created an OpenAI Gym environment to simulate a mobile robot asking users for help. ▪ Demonstrated that reinforcement learning (Trust Region Policy Optimization) learnt the tradeoffs between different human help queries (e.g., remote vs. in-person help, queries with different human costs, etc.).
Spring 2018	*10-812 Architectures for Never-Ending Learning* (Project Write-up) ▪ Investigated whether imitation learning (IL) can improve lifelong multi-agent reinforcement learning. ▪ Developed IL agents that track other agents' skills and learn by observing the most skilled agents. ▪ Demonstrated that learning by imitation combined with one's own experience improves learning speed.
Fall 2017	*16-831 Statistical Techniques in Robotics* (Project Write-up) ▪ Used reinforcement learning (DDPG—Deep Deterministic Policy Gradient) to teach a simulated quadrotor to follow a sequence of waypoints. ▪ Improved the system with expert demonstrations using Max-Margin Inverse Reinforcement Learning and DDPG from Demonstration.

Honors and Awards

2023	HRI23 Outstanding Reviewer	2018 - 2019	Fulbright Fellowship (Japan)
2021 -	NSF GRFP Fellow	Fall 2017	Phi Beta Kappa
2019 - 2020	Faithful Steward Endowed Fellowship	Spring 2018	K&L Gates Prize

Research Mentorship

- **Haya Bolotski**, Autumn 2022- (High School, Holy Names Academy '24)
- **Atharva Kashyap**, Spring 2022- (Undergraduate, University of Washington '24)
- **Raida Karim**, Autumn 2022-Aummer 2023 (Post-Bachelors, University of Washington '22)
- **Mridula Venkatesan**, Summer-Winter 2020 (Undergraduate, University of Washington '23)
- **Nikita Filippov**, Spring-Summer 2020 (Undergraduate, University of Washington '20)
- **Joe Connolly**, Summer 2018 (Undergraduate, Yale University '21)

Skills

Advanced:	ROS, Python, C/C++, LaTeX
Intermediate:	PyTorch, TensorFlow, ReactJS, Flask, R, Java, Go, AWS
Basic:	Matlab, JavaScript, Objective-C, Mathematica