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Andreea Bobu

Research Interests

I study how *robots can learn more efficiently from human feedback* by detecting when their model of what the person wants is insufficient and improving it with the *right* type of human input.

Education

2017–present **PhD in Computer Science**, *University of California Berkeley*, CA, USA, CGPA: 4.0/4.0.
Advisor: Anca Dragan

2013–2017 **Bachelor of Science in Computer Science and Engineering**, *Massachusetts Institute of Technology (MIT)*, Cambridge, MA, USA, GPA: 5.0/5.0.
Advisors: Polina Golland, Stefanie Jegelka, Adrian Dalca

Awards and Recognitions

2021 **Apple PhD Scholars in Artificial Intelligence and Machine Learning Fellowship**
Two-year fellowship with an annual stipend of $45,000 for graduate students in AI/ML.

2021 **Best Paper Award Finalist at ACM/IEEE HRI**
For the paper "Feature Expansive Reward Learning: Rethinking Human Input".

2021 **Best Paper Award Honorable Mention at IEEE T-RO**
For the paper "Quantifying Hypothesis Space Misspecification in Learning From Human-Robot Demonstrations and Physical Corrections".

2020 **Best Paper Award Winner at ACM/IEEE HRI**
For the paper "LESS is More: Rethinking Probabilistic Models of Human Behavior".

2020 **Human-Robot Interaction (HRI) Pioneers**
Chosen to participate in HRI Pioneers, a highly selective workshop that seeks to foster creativity, communication, and collaboration across HRI.

2019 **Cadence Women in Technology Scholarship**
A $5,000 scholarship for women in EECS demonstrating leadership and a strong academic record.

2019 **IBM PhD Fellowship Finalist**
One of three students nominated by the EECS department at UC Berkeley.

2019 **Google PhD Fellowship Finalist**
One of four students nominated by the EECS department at UC Berkeley.

2018 **Microsoft Research Ada Lovelace Fellowship Finalist**
One of two students nominated by the EECS department at UC Berkeley.

2016 **Best Paper Award Winner at MICCAI Patch-MI**
For the paper "Patch-Based Discrete Registration of Clinical Brain Images".

2016 **Google Anita Borg Memorial Scholarship**
A $10,000 scholarship for women in EECS demonstrating leadership and a strong academic record.

2015–present **Member of Tau Beta Pi (TBP) National Honor Society for Engineering**
Honors society for engineering students with the strongest academic records at their university.

2015–present **Member of Eta Kappa Nu (HKN) National Honor Society for EECS**
Honors society for EECS students with the strongest academic records at their university.

Journal Articles

to appear **Inducing Structure in Reward Learning via Feature Learning**
Andreea Bobu, Marius Wiggert, Claire Tomlin, Anca D. Dragan.
The International Journal of Robotics Research (IJRR), 2022.

paper link **Quantifying Hypothesis Space Misspecification in Learning from Human-Robot Demonstrations and Physical Corrections**
Andreea Bobu, Andrea Bajcsy, Jaime F. Fisac, Sampada Deglurkar, Anca D. Dragan.
IEEE Transactions on Robotics (T-RO), 2019.
Best paper award honorable mention.

Conference Publications

preprint link **Learning Perceptual Concepts by Bootstrapping from Human Queries**
Andreea Bobu, Chris Paxton, Wei Yang, Balakumar Sundaralingam, Yu-Wei Chao, Maya Cakmak, Dieter Fox.
In submission to IEEE International Conference on Robotics and Automation (ICRA), 2022.

paper link **Dynamically Switching Human Prediction Models for Efficient Planning**
Arjun Sripathy*, **Andreea Bobu***, Daniel S. Brown, Anca D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.

paper link **Situational Confidence Assistance for Lifelong Shared Autonomy**
Matthew Zurek*, **Andreea Bobu***, Daniel S. Brown, Anca D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.
Also presented as an oral presentation at *Lifelong Learning and Personalization in Long-Term Human-Robot Interaction (HRI, 2021).*

paper link **Feature Expansive Reward Learning: Rethinking Human Input**
Andreea Bobu*, Marius Wiggert*, Claire Tomlin, Anca D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2021.
Best paper award finalist.
Also presented at *AI & Its Alternatives in Assistive & Collaborative Robotics: Decoding Intent (RSS, 2020)* and *Workshop on Human in the Loop Learning (ICML, 2020).*

paper link **LESS is More: Rethinking Probabilistic Models of Human Behavior**
Andreea Bobu*, Dexter Scobee*, Jaime F. Fisac, Shankar Sastry, Anca D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2020.
Best paper award winner.

paper link **Learning Under Misspecified Objective Spaces**
Andreea Bobu, Andrea Bajcsy, Jaime F. Fisac, Anca D. Dragan.
Conference on Robot Learning (CoRL), 2018.
Invited to special issue.

Workshop Publications

paper link **Detecting Hypothesis Space Misspecification in Robot Learning from Human Input**
Andreea Bobu, Anca D. Dragan.
Companion of the ACM/IEEE International Conference on Human-Robot Interaction, 2020.

paper link **Adapting to Continuously Shifting Domains**
Andreea Bobu, Eric Tzeng, Judy Hoffman, Trevor Darrell.
Workshop at the International Conference on Learning Representations (ICLR), 2018.

paper link **Patch-Based Discrete Registration of Clinical Brain Images**
Adrian V. Dalca, **Andreea Bobu**, Natalia S Rost, Polina Golland.
Patch-based Techniques in Medical Imaging (MICCAI Patch-MI), 2016.
Best paper award winner.

Experience

Summer 2021 **NVIDIA Corporation** *Seattle, WA*
Research Intern under Prof. Maya Cakmak and Dieter Fox
- Developed a method for learning perceptual concepts describing multi-object prepositional relationships from a small amount of human input.
- Demonstrated the utility of the learned concepts in motion planning tasks on a 7-DoF Franka Panda robot arm.
- Submitted a paper to the IEEE International Conference on Robotics and Automation (ICRA), 2022.

2016–2017 **MIT Computer Science and Artificial Intelligence Laboratory** *Cambridge, MA*
Undergraduate Researcher under Prof. Polina Golland and Stefanie Jegelka
- Utilized machine learning techniques (principal component analysis, Gaussian mixture models, and latent topic models) to construct 3D representations for leukoaraiosis, a small vessel brain disease.
- Predicted diseased areas in the brain by modeling white matter hyperintensity in 3D brain images.

Summer 2015 **Microsoft** *Cambridge, MA*
Software Development Intern
- Helped build a health-oriented food-tracking application for the Microsoft Band.
- Developed the entire back-end side of the cloud server used for the application.
- Implemented part of the user interface and helped create user studies (C#, node.js, Azure).

2015–2017 **MIT Computer Science and Artificial Intelligence Laboratory** *Cambridge, MA*
Undergraduate Researcher under Prof. Polina Golland and Dr. Adrian Dalca
- Utilized machine learning, inference, and image analysis techniques to create a patch-based discrete image registration algorithm for sparse 3D brain images in MATLAB.
- Released code that is applicable to a variety of image shapes, dimensions, and modalities. The open-source code can be found here.
- Published a paper in the MICCAI Patch-MI workshop 2016 that won **Best Paper Award**.

Summer 2014 **Bloomberg** *New York, NY*
Research and Development Intern (Software Development)
- Developed a unit-testing framework for a large-scale C++ system (Internal and Web Applications team).
- Winner of the B-Puzzled algorithmic competition – out of approximately 20 teams.

Spring 2014 **MIT Koch Institute for Integrative Cancer Research** *Cambridge, MA*
Undergraduate Researcher under Prof. Daniel Anderson
- Utilized Natural Language Processing tools to mine biomedical literature for drug and toxin biodistribution in the human body.
- Created an ontological tree of human organ subparts and worked on linking mined chemicals to the organ area where they are most prevalent.

Teaching

Spring 2021 **CS 287H: Algorithmic Human-Robot Interaction** *UC Berkeley*
Graduate Student Instructor
Created and graded weekly quizzes and hands-on programming homework assignments, brainstormed and provided feedback on project proposals, led some of the lectures, and guest lectured.

Fall 2019 **CS 188: Introduction to Artificial Intelligence** *UC Berkeley*
Graduate Student Instructor
Taught weekly one-hour discussion sections, held weekly office hours, designed homework and exams.

January 2016 **6.178: Introduction to Software Engineering in Java** *MIT*
Instructor and Lecturer
Co-organized and taught the course, held regular office hours, and designed and graded homework.

2015–2017 **6.046: Design and Analysis of Algorithms** *MIT*
Tutor
Tutored active students as part of Tau Beta Pi's Tutoring Committee.

Spring 2014 **6.01: Introduction to Electrical Engineering and Computer Science** *MIT*
Student Lab Assistant
Mentored my peers through completing the weekly lab assignments.

Invited Talks

Inducing Structure in Robot Learning via Human-Guided Representations

2021 **Aware-learning: How to Benefit from Priors** *CDC*

Feature Expansive Reward Learning: Rethinking Human Input

2021 **CMSC-33281: Topics in Human-Robot Interaction** *UChicago*

Learning Perceptual Concepts by Bootstrapping from Human Queries

2021 **AI Robotics Research Lab** *NVIDIA*

Robust Robot Learning via Human-Guided Intermediate Representations

2021 **Interactive Robotics Group** *MIT*

2021 **Human-AI Collaboration in Sequential Decision-Making** *ICML*

2021 **Internal Research Seminar** *Apple*

2021 **Human And Robot Partners (HARP) Lab Reading Group** *CMU*

2021 **CS287H: Algorithmic Foundations of Human-Robot Interaction** *UC Berkeley*

LESS is More: Rethinking Probabilistic Models of Human Behavior

2020 **Multi-Agent Reinforcement Learning Seminar** *UC Berkeley*

Learning Under Misspecified Objective Spaces

2020 **CS287H: Algorithmic Foundations of Human-Robot Interaction** *UC Berkeley*

2018 **Center for Human-Compatible Artificial Intelligence** *UC Berkeley*

Domain Adaptation for Fixed and Continuously Varying Domains

2018 **Berkeley Artificial Intelligence Research (BAIR) Seminar Series** *UC Berkeley*

Organized Workshops & Seminars

2022–present **Dream/CPAR Seminar** *UC Berkeley*

Lead Organizer

Weekly seminar hosting professors/professionals in robotics, control, human-centered autonomy.

June 2021 **Social Intelligence in Humans and Robots Workshop** *ICRA*

Co-Organizer

Brought together experts from cognitive science and developmental psychology to better understand human social intelligence, and experts from AI and robotics to discuss how to engineer socially intelligent artificial agents.

July 2020 **Advances and Challenges in Imitation Learning for Robotics Workshop** *R:SS*

Co-Organizer

Brought together AI and robotics experts to discuss the greatest challenges facing imitation learning for robotics.

2020–2021 **SemiAutonomous Vehicles Seminar** *UC Berkeley*

Co-Organizer

Weekly robotics and controls seminar for students and professors internal and external to Berkeley.

Research Mentorship

2021–present **Regina Wang (Undergraduate at University of California, Berkeley)**

Research on robot reward learning from multiple types of human input.

2021–present **David Zhang (Undergraduate at University of California, Berkeley)**

Research on a more efficient interface for learning rewards from human input.

2021–present **Yi Liu (Undergraduate at University of California, Berkeley)**

Research on learning rewards by first learning task-agnostic representations from human input.

2020–present **Arjun Sripathy (now Masters student at University of California, Berkeley)**

Research on meta-planning with a fleet of human models, and learning representations for expressive motions using human input.

2020–2021 **Matthew Zurek (now PhD student at the University of Wisconsin-Madison)**
Research on confidence-aware shared autonomy.

2018–2019 **Sampada Deglurkar (now PhD student at University of California, Berkeley)**
Research on confidence-aware learning from human input.

Outreach

Summer 2019 **Girls in Engineering Camp** *UC Berkeley*
Lecturer and Mentor
I co-organized one of the Self-Driving Cars workshops, where I got to teach the girls about sensing, planning, and control in autonomous driving, and work together on experimenting with an Evo robot.

August 2018 **AI4ALL** *UC Berkeley*
Teaching Assistant
I mentored a team of underrepresented high school students as they learned to train a deep reinforcement learning agent in MuJoCo.

2018–present **Berkeley Artificial Intelligence Research** *UC Berkeley*
Mentor
I have been meeting up regularly with underrepresented undergraduate students and mentoring them in research and career planning. I helped one student find a robotics summer internship, a research position in robotics lab, and a Master's position at UC Berkeley.

2018–2019 **Women in Computer Science and Engineering** *UC Berkeley*
Mentor
I mentored early-stage female PhD students in career planning and navigating life at UC Berkeley.

2016 **Women in Science and Engineering** *MIT*
Mentor
I mentored high school girls from the Greater Boston area during monthly sessions designed to introduce them to engineering at MIT.

2013–2015 **Educational Studies Program** *MIT*
Lecturer
I taught courses on "Water Security in Asia", "Introduction to Probability", and "Group Theory" to middle school students in the New England region.

Review Activities

2021-2022 IEEE Transactions on Robotics (T-RO)
2020 Nature: Machine Intelligence
2020-2022 ACM/IEEE International Conference on Human-Robot Interaction (HRI)
2021-2022 IEEE International Conference on Robotics and Automation (ICRA)
2021-2022 IEEE International Conference on Intelligent Robots and Systems (IROS)
2021 Robotics: Science and Systems (R:SS)
2021 Conference on Robot Learning (CoRL)
2021-2022 Companion of the ACM/IEEE International Conference on Human-Robot Interaction (HRI Pioneers)
2021 Companion of the Robotics: Science and Systems (RSS Pioneers)
2021 Cooperative AI at Conference on Neural Information Processing Systems (NeurIPS)
2019 Adaptive & Multitask Learning at International Conference on Machine Learning (ICML)