Andreea Bobu

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Research Interests

I develop autonomous agents that learn to do tasks for, with, and around humans. My goal is to ensure that these agents align with people, whether expert designers or novice end users. My work looks at: 1) getting the right data to supervise the training of the robot, whether directly from people or via priors; 2) enabling agents and humans to efficiently and interactively arrive at shared task representations for reliable interaction; 3) quantifying and addressing misalignment caused by different human modeling choices. I ground my work in experiments and user studies with AI systems like assistive robot arms or LLM agents, and draw upon methods from deep learning, mathematical human modeling, inverse reinforcement learning, and Bayesian inference.

Professional Positions

2024–present **Boeing Assistant Professor**
Massachusetts Institute of Technology, Department of Aeronautics and Astronautics

2023–2024 **Research Scientist**
The AI Institute

Summer 2021 **Research Intern**
NVIDIA Research, Robotics Group

Education

2017–2023 **University of California, Berkeley**
Ph.D. in Electrical Engineering and Computer Sciences
Advisor: Anca Dragan
Thesis: Aligning Robot Representations with Humans

2013–2017 **Massachusetts Institute of Technology**
B.S. in Computer Science and Engineering, Minor in Mathematics
Advisors: Adrian Dalca, Polina Golland, Stefanie Jegelka

Awards and Honors

2023 **Emerging Research Award at the Intl. Symposium on Mathematics of Neuroscience**
For the talk on "Aligning Robot and Human Representations".

2022 **Rising Stars Academic Career Workshop in EECS**
Chosen to participate in an intensive workshop for historically marginalized graduate students and postdocs who are interested in pursuing academic careers in EE, CS, and AI and decision-making.

2022 **Robotics: Science and Systems (RSS) Pioneers**
Selected for workshop bringing together top early career researchers in robotics.

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 a highly selective workshop seeking to foster creativity, communication, and collaboration across Human-Robot Interaction.

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

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.

Teaching

Fall 2024 **16.410/16.413: Principles of Autonomy and Decision Making** *MIT*
Instructor

Spring 2021 **CS 287H: Algorithmic Human-Robot Interaction** *UC Berkeley*
Graduate Student Instructor

Fall 2019 **CS 188: Introduction to Artificial Intelligence** *UC Berkeley*
Graduate Student Instructor

January 2016 **6.178: Introduction to Software Engineering in Java** *MIT*
Instructor and Lecturer

2015–2017 **6.046: Design and Analysis of Algorithms** *MIT*
Tutor

Spring 2014 **6.01: Introduction to Electrical Engineering and Computer Science** *MIT*
Student Lab Assistant

Advising & Mentoring

Current Ph.D. Students
Minyoung Hwang

Past M.S. Students
Regina Wang (→ M.S. at Stanford), Yi Liu (→ ML Research Engineer at Scale AI), Arjun Sripathy (→ Senior ML Scientist at Tesla Autopilot)

Past Undergraduate Students
David Zhang (→ Codepoint Fellow), Matthew Zurek (→ Ph.D. at UW-Madison), Sampada Deglurkar (→ Ph.D. at UC Berkeley)

Ph.D. Committees
Sean Ye (Georgia Tech), Alex Forsey-Smerek (MIT)

Outreach

Summer 2024 **RoboLaunch** *CMU*
Speaker
I gave a talk at the CMU RI RoboLaunch Speaker Series, an outreach program for promoting robotics & AI research and education.

Summer 2019 **Girls in Engineering Camp** *UC Berkeley*
Lecturer and Mentor
I co-organized a Self-Driving Cars workshop, teaching the girls about sensing, planning, and control in autonomous driving, and 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.

2018–2022 **Berkeley Artificial Intelligence Research** *UC Berkeley*
Mentor
I mentored underrepresented undergraduate students in research and career planning.

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.

Professional Activities

Conference Area Chair

2024 CoRL: Conference on Robot Learning
2023 ICLR: International Conference on Learning Representations

Workshops & Seminars Co-organized

2024 Workshop on Task Specification for General-Purpose Intelligent Robots *R:SS*
2024 Workshop on Mechanisms for Mapping Human Input to Robots *R:SS*
2024 6th Workshop on Long-term Human Motion Prediction *ICRA*
2024 6th Workshop on Lifelong Learning and Personalization in Long-Term HRI *HRI*
2023 Workshop on Interactive Learning with Implicit Human Feedback *ICML*
2022 Workshop on Aligning Robot Representations with Humans *CoRL*
2022–2023 Dream/CPAR Seminar *UC Berkeley*
2022 2nd Workshop on Social Intelligence in Humans and Robots *R:SS*
2021 1st Workshop on Social Intelligence in Humans and Robots *ICRA*
2020 Workshop on Advances and Challenges in Imitation Learning for Robotics *R:SS*
2020–2021 SemiAutonomous Vehicles Seminar *UC Berkeley*

External Reviewer for Workshops, Conferences, Journals, and Grant Panels
Robotics: CoRL, ICRA, R:SS, HRI, IROS, L4DC, RA-L, T-RO, T-MECH, T-HRI
Machine Learning: NeurIPS, ICML, ICLR, AAAI, Nature: Machine Intelligence
Grant Panels: NSF CISE and FRR

Selected Invited Talks

Why Robots Aren't Superhuman in Our Human World

2024 TEDx *MIT*

Aligning Robot and Human Representations

2024 Autonomy Talks *ETH*
2024 6.161: Robotics Science & Systems *MIT*
2024 16-886: Models & Algorithms for Interactive Robotics *CMU*
2023 International Symposium on the Mathematics of Neuroscience *ISMoN*

2023 Center for Human-Compatible AI Workshop *CHAI*
2023 Stanford Robotics Seminar *Stanford*
2023 Department Seminar *MIT, Princeton, Georgia Tech, Cornell, Brown, NYU, UIUC, UCSD*
2022 UW Robotics Colloquium *UW*
2022 New Trends in Aerospace Seminar Series *MIT*
2022 CS 6960: Human-AI Alignment *U of Utah*

Inducing Structure in Robot Learning via Human-Guided Representations

2022 SemiAutonomous Vehicles Seminar *UC Berkeley*
2021 Workshop on Aware Learning: How to Benefit from Priors *CDC*
2021 Workshop on Human-AI Collaboration in Sequential Decision-Making *ICML*
2021 Human And Robot Partners (HARP) Lab Reading Group *CMU*
2021 CS287H: Algorithmic Foundations of Human-Robot Interaction *UC Berkeley*

Journal Articles

[J3] **Learning Perceptual Concepts by Bootstrapping from Human Queries**
A. Bobu, C. Paxton, W. Yang, B. Sundaralingam, Y.W. Chao, M. Cakmak, D. Fox.
IEEE Robotics and Automation Letters (RA-L), 2022.

[J2] **Inducing Structure in Reward Learning via Feature Learning**
A. Bobu, M. Wiggert, C. Tomlin, A. D. Dragan.
The International Journal of Robotics Research (IJRR), 2022.

[J1] **Quantifying Hypothesis Space Misspecification in Learning from Human-Robot Demonstrations and Physical Corrections**
A. Bobu, A. Bajcsy, J. F. Fisac, S. Deglurkar, A. D. Dragan.
IEEE Transactions on Robotics (T-RO), 2019.
Best paper award honorable mention.

Conference Publications

[12] **Adaptive Language-Guided Abstraction from Contrastive Explanations**
A. Peng, B. Z. Li, I. Sucholutsky, N. Kumar, J. A. Shah, J. Andreas, **A. Bobu**
Conference on Robot Learning (CoRL), 2024. (in review)

[11] **Preference-Conditioned Language-Guided Abstraction**
A. Peng, **A. Bobu**, B. Z. Li, T. R. Sumers, I. Sucholutsky, N. Kumar, T. L. Griffiths, J. A. Shah
ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2024.

[10] **Aligning Robot and Human Representations**
A. Bobu*, A. Peng*, P. Agrawal, J. A. Shah, and A. D. Dragan.
ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2024.

[9] **Diagnosing and Repairing Feature Representations Under Distribution Shifts**
I. Lourenço, **A. Bobu**, C. R. Rojas, B. Wahlberg.
IEEE Conference on Decision and Control (CDC), 2023.

[8] **Diagnosis, Feedback, Adaptation: A Human-in-the-Loop Framework for Test-Time Policy Adaptation**
A. Peng, A. Netanyahu, M. K. Ho, T. Shu, **A. Bobu**, J. A. Shah, P. Agrawal.
International Conference on Machine Learning (ICML), 2023.

[7] **SIRL: Similarity-based Implicit Representation Learning**
A. Bobu*, Y. Liu*, R. Shah, D. S. Brown, and A. D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2023.

[6] **Teaching Robots to Span the Space of Functional Expressive Motion**
A. Sripathy, **A. Bobu**, Z. Li, K. Sreenath, D. S. Brown, and A. D. Dragan.
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.

[5] **Dynamically Switching Human Prediction Models for Efficient Planning**
A. Sripathy*, **A. Bobu***, D. S. Brown, A. D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.

[4] **Situational Confidence Assistance for Lifelong Shared Autonomy**
M. Zurek*, **A. Bobu***, D. S. Brown, A. D. Dragan.
IEEE International Conference on Robotics and Automation (ICRA), 2021.

[3] **Feature Expansive Reward Learning: Rethinking Human Input**
A. Bobu*, M. Wiggert*, C. Tomlin, A. D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2021.
Best paper award finalist.

[2] **LESS is More: Rethinking Probabilistic Models of Human Behavior**
A. Bobu*, D. Scobee*, J. F. Fisac, S. Sastry, A. D. Dragan.
ACM/IEEE International Conference on Human Robot Interaction (HRI), 2020.
Best paper award winner.

[1] **Learning Under Misspecified Objective Spaces**
A. Bobu, A. Bajcsy, J. F. Fisac, A. D. Dragan.
Conference on Robot Learning (CoRL), 2018.
Invited to special issue.

Workshop Publications

[W7] **Getting Aligned on Representational Alignment**
I. Sucholutsky, L. Muttenthaler, A. Weller, A. Peng, **A. Bobu**, B. Kim, B. C. Love, E. Grant, I. Groen, J. Achterberg, J. B. Tenenbaum, K. M. Collins, K. L. Hermann, K. Oktar, K. Greff, M. N. Hebart, N. Jacoby, Q. Zhang, R. Marjieh, R. Geirhos, S. Chen, S. Kornblith, S. Rane, T. Konkle, T. P. O'Connell, T. Unterthiner, A. K. Lampinen, K. Muller, M. Toneva, T. L. Griffiths
Workshop on Representational Alignment (Re-Align), ICLR 2024.

[W6] **Time-Efficient Reward Learning via Visually Assisted Cluster Ranking**
D. Zhang, M. Carroll, **A. Bobu**, A. D. Dragan.
Workshop on Human-in-the-Loop Learning, NeurIPS 2022.

[W5] **Efficient Robot Teaching by Learning Intermediate Human-Guided Representations**
A. Bobu.
Companion of the Robotics: Science and Systems (RSS), 2022.

[W4] **Aligning Robot Representations with Humans**
A. Bobu, A. Peng.
Workshop on Collaborative Robots and the Work of the Future, ICRA 2022.

[W3] **Detecting Hypothesis Space Misspecification in Robot Learning from Human Input**
A. Bobu, A. D. Dragan.
Companion of the ACM/IEEE International Conference on Human-Robot Interaction, 2020.

[W2] **Adapting to Continuously Shifting Domains**
A. Bobu, E. Tzeng, J. Hoffman, T. Darrell.
Workshop at the International Conference on Learning Representations (ICLR), 2018.

[W1] **Patch-Based Discrete Registration of Clinical Brain Images**
A. V. Dalca, **A. Bobu**, N. S. Rost, P. Golland.
Patch-based Techniques in Medical Imaging (MICCAI Patch-MI), 2016.
Best paper award winner.

Patents

Concept Training Technique for Machine Learning
A. Bobu, B. Sundaralingam, C. Paxton, M. Cakmak, W. Yang, Y. Chao, D. Fox.
U.S. Patent 17982401.