

# Anca Dragan

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## Current Position

Assistant Professor, UC Berkeley, EECS Department. 2015-present

## Education

PhD, Robotics, Carnegie Mellon University, USA. 2009-2015

Advisor: Siddhartha Srinivasa. *"Legible Robot Motion Planning"*.

B.Sc., Computer Science, Jacobs University Bremen, Germany. 2006-2009

Advisors: Michael Kohlhase and Herbert Jaeger.

## Awards

TR 35. 2017

MIT Tech Review 35 Innovators under 35

Okawa Foundation Award. 2017

Awarded to 9 faculty in the United States

NSF CAREER Award. 2017

*"Towards Autonomously Generating Robot Behavior for Coordination with Humans – Accounting for Effects on Human Actions "*

Best Cognitive Robotics Paper Finalist, IROS. 2016

*"Active Information Gathering over Human Internal State"*

Best HRI Paper Finalist, ICRA. 2016

*"Reducing Supervisor Burden in Online Learning from Demonstration"*

SCS Disseration Award Honorable Mention. 2015

For "Legible Robot Motion Planning"

Best Paper and Best Student Paper Finalist, ICRA. 2015

*"Motion Primitives via Optimization"*

Rising Stars in EECS. 2014

Awarded to 40 EECS graduate and postdoctoral women.

Siebel Scholar. 2014

For academic excellence and demonstrated leadership.

Best Reviewer Award Finalist. 2014

Robotics: Science and Systems

Dan David Scholarship. 2014

For the Future Direction of Artificial Intelligence, 2014.

**CITEC Award for Excellence in Doctoral HRI Research.** 2014

At the International Conference on Human-Robot Interaction in 2014.

**Intel PhD Fellow.** 2013

I was one of the 14 students who were awarded the Intel PhD Fellowship.

**Best Paper Award Finalist**, Robotics: Science and Systems. 2013

*"Generating Legible Motion"*

**Best Paper Award Finalist**, Robotics: Science and Systems. 2012

*"Formalizing Assistive Teleoperation"*

**Best Paper Award Nomination**, International Symposium on Human-Robot Communication. 2012

*"Online Customization of Teleoperation Interfaces"*

**Google Anita Borg Scholar.** 2012

I was one of the 25 students in the U.S. who were awarded the Google Anita Borg Memorial Scholarship.

**HRI Pioneer.** 2011

I was selected to participate in the Human-Robot Interaction Pioneers Workshop, a highly selective workshop seeking to foster creativity, communication, and collaboration across HRI.

## Teaching

**Algorithmic Human-Robot Interaction (CS294-115)**, UC Berkeley. 2015, 2016, 2017

Instructor. Ratings: 6.4/7 6.3/7.

**Human-Compatible AI (CS294-125)**, UC Berkeley. 2016

Co-instructor. Rating: 6.8/7.

**Introduction to Artificial Intelligence (CS188)**, UC Berkeley. 2016, 2017

Co-instructor 2016, Instructor 2017. Rating: 6.5/7, 6.23/7.

**Manipulation Algorithms**, Carnegie Mellon University. 2014

Co-instructor.

**Mathematical Fundamentals for Robotics**, Carnegie Mellon University. 2011

TA for Prof. Michael Erdmann.

**Computability and Complexity**, Jacobs University Bremen. 2009

TA for Prof. Herbert Jaeger.

**General Computer Science I and II**, Jacobs University Bremen. 2007-2009

TA for Prof. Michael Kohlhase.

**General Electrical Engineering I and II**, Jacobs University Bremen. 2007-2008

TA for Prof. Werner Bergholz.

## Mentoring

**Current PhD Students**, Smitha Milli, Ellis Ratner, Sid Reddy, Andreea Bobu, Andrea Bajcsy, Kush Bhatia, Dylan Hadfield-Menell, Sandy Huang, Jaime Fisac, Aaron Bestick.

**Former PhD Students**, Dorsa Sadigh (Faculty at Stanford).

**Masters Students**, Chang Liu.

**Current Undergraduate Students**, Allan Zhou, Nick Landolfi, Jason Zhang, Hong Jeon, McKane Andrus, Andy Palaniappan, Dhruv Malik, Steven Wang.

**Selected Former Undergraduate Students**, Minae Kwon (Cornell), Lawrence Chang (UPenn), Glen Chao (PhD at U. Michigan), Rachel Holladay (PhD at MIT), Kenton Lee (PhD at UW).

## Outreach

**BAIR AI4ALL Camp**, Founded and ran a summer camp for high school students from low-income families on human-centered AI.

**InterACT Summer Internship**, Founded a lab internship program offered yearly to one Bay Area high-school girl.

**High School Curriculum Development**, Working with 5 local teachers on incorporating robotics and AI into science and math education in their schools..

**Lectures on Robotics, CS, and Math**, Carlmont High, SAILORS, Ellis School for Girls, Hawken School, Leap@CMU, Carnegie Science Center, Wilkinsburg Gifted Class.

**Talks at Women in STEM events and panels**, SWE, Fem Tech, Women in Tech SF Summit, WICSE.

**Research Team Leader**, OurCS: Opportunities for undergraduate research in Computer Science..

**Talks to Berkeley Undergraduates on Integrating Interaction into Robotics**, EECS Honors, HKN General Meeting, Transfer Students Breakfast with Faculty, etc..

**Lab Tours**, Tours and demos to the general public, particularly to children aged 2-18.

## Professional Activities

**Co-PI for the Center on Human-Compatible AI**: Our mission is AI that is (provably) beneficial to humanity; <http://humancompatible.ai>

**BAIR Steering Committee**: I helped found and am on the steering committee of the Berkeley AI Research Lab (BAIR); <http://bair.berkeley.edu>.

**Program Chair**: *Conference on Robot Learning*, 2018.

**Chair**: *Bay Area Robotics Symposium*, 2016 and 2017.

**Associate Editor (or equivalent)**: ACM Transactions on HRI (Computational HRI track), AURO (special issue), ICRA 2017, HRI 2016, WAFR 2016, IROS 2016, ARSO 2014.

**Workshops Chair**: *Robotics: Science and Systems*, 2017.

**Workshop Organizer**: *Algorithms for Human-Robot Interaction*, Paris 2016.

**Workshop Organizer**: *Algorithms for Human-Robot Interaction*, UC Berkeley 2015.

**Workshop Organizer**: *Planning for Human-Robot Interaction*, RSS 2016.

**Workshop Organizer**: *Human-Robot Collaboration*, RSS 2013.

**Workshop Organizer**: *Robot Learning*, ICML 2013.

**Workshop Organizer**: *Collaborative Manipulation*, HRI 2013.

**AI Prelim Examiner**: UC Berkeley EECS, 2016, 2017.

**Robotics Roadmap Contributor**: Contributed to the Robotics Roadmap, 2016.

**Grant Panels**: NSF, NASA.

## Invited Talks

- Robot Transparency as Optimal Control**, Workshop on Transparency and Interpretability in 2017 Machine Learning Systems (NIPS).
- Communication via Physical Action**, Workshop on Emergent Communication (NIPS). 2017
- Learning to Coordinate with and Help People**, Conference on Robot Learning (CoRL) Keynote. 2017
- How will algorithmic HRI shape autonomous driving?**, Workshop on Mathematical Models, 2017 Algorithms, and HRI (RSS).
- Getting around misspecified objectives**, Reinforcement Learning and Decision Making (RLDM) 2017 Keynote.
- Learning Human Values**, Huawei AI Workshop, Orange Institute. 2017
- Cars that Coordinate with People**, O'Reily AI Keynote, Workshop on Machine Learning 2016-2017 for Intelligent Transportation Workshop (NIPS), Machine Intelligence and Self Driving Vehicles Meetup Series (Mercedes-Benz), Ford Research Seminar, Workshop on Robotics and Vehicular Technologies for Self-driving cars (ICRA).
- Interactively Learning Robot Objectives**, Workshop on Reliable Machine Learning (NIPS) 2016 Simons Workshop on Interactive Learning.
- Estimating and Adapting to Human Internal State**, Shared Autonomy Workshop (IROS). 2016
- How Robots Influence our Actions**, Trust Workshop (RSS), Safety Workshop (Microsoft Research) 2016 Human-Robot Collaboration Workshop (IROS).
- Robot Planning for Interaction with Humans**, BEARS Symposium, Fem Tech, Intercampus Open 2016 House, HKN Honors Society, SWARM Lab, Cognitive Science Seminar, UC Berkeley.
- Challenges and Opportunities for Deep Learning in HRI**, CITRIS Day, UC Berkeley. 2015
- Interaction as Manipulation**, Caltech, UCSD, Stanford, UC Berkeley, MIT, UW, GaTech, Cornell 2015 Harvard, Princeton, U Toronto, McGill, USC, CMU, UT Austin.
- A Mathematical Formalism for Legible Robot Motion**, University of Southern California. 2014
- Robot Motion for Seamless Human-Robot Collaboration**, Cornell University. 2014
- A Personal Robot for a Better Quality of Life**, Carnegie Science Center. 2013
- Learning to Collaborate with People**, The Machine Learning Lunch, Carnegie Mellon. 2013
- Robot Motion for Seamless Human-Robot Collaboration**, Stanford University. 2013
- Enabling Physical Systems to Seamlessly Collaborate with Their Users**, Intel. 2013
- Optimal Robot Motion for Human-Robot Collaboration**, DLR Germany. 2013
- Robot Motion for Seamless Human-Robot Collaboration**, Georgia Tech. 2013
- The Practical Side of Optimization**, Guest Lecture, Carnegie Mellon University. 2012
- Assistive Teleoperation**, CFR, Carnegie Mellon University. 2012
- Optimal Planning for Robotic Manipulation**, Intel Science and Technology Center. 2012
- Learning from Experience and Demonstration for Manipulation Planning**, Google. 2012
- Optimization in the Real World**, Guest Lecture, Carnegie Mellon University. 2011
- Manipulation Planning: How do we learn from experience?**, SELECT Laboratory. 2011
- Trajectory Optimization with Goal Sets**, CFR, Carnegie Mellon University. 2011

## Publications (Conferences and Journals)

- [1] A. Bajcsy, D. Losey, M. O'Malley, and A.D. Dragan. Learning from richer human guidance: Augmenting comparison-based learning with feature queries. In *International Conference on Human-Robot Interaction (HRI)*, 2018.
- [2] M. Kwon, S. Huang, and A.D. Dragan. Expressing robot incapability. In *International Conference on Human-Robot Interaction (HRI)*, 2018.
- [3] C. Basu, Singhal M, and A.D. Dragan. Learning from richer human guidance: Augmenting comparison-based learning with feature queries. In *International Conference on Human-Robot Interaction (HRI)*, 2018.
- [4] D. Hadfield-Menell, S. Milli, P. Abbeel, S. Russell, and A.D. Dragan. Inverse reward design. In *Neural Information Processing Systems (NIPS)*, 2017. **(oral, acceptance rate 1.2%)**.
- [5] J. Fisac, M. Gates, J. Hamrick, C. Liu, D. Hadfield-Menell, S. Sastry, T. Griffiths, and A.D. Dragan. Pragmatic-pedagogic value alignment. In *International Symposium on Robotics Research (ISRR)*, 2017.
- [6] M. Laskey, J. Mahler, A.D. Dragan, and K. Goldberg. Dart: optimizing noise injection in imitation learning. In *Conference on Robot Learning (CoRL)*, 2017.
- [7] A. Bajcsy, D. Losey, M. O'Malley, and A.D. Dragan. Learning robot objectives from physical human interaction. In *Conference on Robot Learning (CoRL)*, 2017. **(full length talk, acceptance rate 10%)**.
- [8] S. Huang, P. Abbeel, and A.D. Dragan. Enabling robots to communicate their objectives. In *Robotics: Science and Systems (RSS)*, 2017.
- [9] D. Sadigh, A.D. Dragan, S. Sastry, and S. Seshia. Active preference-based learning of reward functions. In *Robotics: Science and Systems (RSS)*, 2017.
- [10] S. Milli, D. Hadfield-Menell, A.D. Dragan, P. Abbeel, and S. Russell. Should robots be obedient? In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017.
- [11] D. Hadfield-Menell, A.D. Dragan, P. Abbeel, and S. Russell. The off-switch game. In *International Joint Conference on Artificial Intelligence (IJCAI)*, 2017.
- [12] J. Andreas, A.D. Dragan, and D. Klein. Translating neuralese. In *Association for Computational Linguistics (ACL)*, 2017.
- [13] M. Laskey, S. Krishnan, J. Mahler, K. Jamieson, A.D. Dragan, and K. Goldberg. Comparing human-centric and robot-centric sampling for robot learning from demonstration. In *International Conference on Robotics and Automation (ICRA)*, 2017.
- [14] C. Basu, Q. Yang and D. Hungerman, Singhal M, and A.D. Dragan. Do you want your autonomous car to drive like you? In *International Conference on Human-Robot Interaction (HRI)*, 2017.
- [15] A. Zhou, D. Hadfield-Menell and A. Nagabaudi, and A.D. Dragan. Expressive robot motion timing. In *International Conference on Human-Robot Interaction (HRI)*, 2017.

- [16] J. Fisac, C. Liu, J. Harick, K. Hedrick, S. Sastry, T. Griffiths, and A.D. Dragan. Generating plans that predict themselves. In *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2016.
- [17] D. Hadfield-Menell, A.D. Dragan, P. Abbeell, and S. Russell. Collaborative inverse reinforcement learning. In *Neural Information Processing Systems (NIPS)*, 2016.
- [18] N. Mehr, R. Horowitz, and A.D. Dragan. Inferring and assisting with constraints in shared autonomy. In *Conference on Decision and Control (CDC)*, 2016.
- [19] D. Sadigh, S. Sastry, S. Seshia, and A.D. Dragan. Information gathering actions over human internal state. In *International Conference on Intelligent Robots and Systems (IROS)*, 2016. **(best cognitive robotics paper award finalist)**.
- [20] A. Bestick, R. Bajcsy, and A.D. Dragan. Implicitly assisting humans to choose good grasps in robot to human handovers. In *International Symposium on Experimental Robotics (ISER)*, 2016.
- [21] M. Laskey, J. Lee, C. Chuck, D.V. Gealy, W. Hsieh, F.T. Pokorny, A.D. Dragan, and K. Goldberg. Using a hierarchy of supervisors in learning from demonstration. In *International Conference on Automation Science and Engineering (CASE)*, 2016.
- [22] Z. Marinho, B. Boots, A.D. Dragan, A. Byravan, G.J. Gordon, and S.S. Srinivasa. Functional gradient motion planning in reproducing kernel hilbert spaces. In *Robotics: Science and Systems (R:SS)*, 2016.
- [23] D. Sadigh, S. Sastry, S. Seshia, and A.D. Dragan. Planning for autonomous cars that leverages effects on human drivers. In *Robotics: Science and Systems (R:SS)*, 2016.
- [24] C. Liu, J. Harick, J. Fisac, A.D. Dragan, K. Hedrick, S. Sastry, and T. Griffiths. Goal inference improves objective and perceived performance in human-robot collaboration. In *Autonomous Agents and Multiagent Systems (AAMAS)*, 2016.
- [25] S. Nikolaidis, A.D. Dragan, and S.S. Srinivasa. Viewpoint-based legibility optimization. In *International Conference on Human-Robot Interaction (HRI)*, 2016.
- [26] M. Laskey, S. Staszak, W. Y. Hsieh, F.T. Pokorny, J. Mahler, A.D. Dragan, and K. Goldberg. Shiv: Reducing supervisor burden in dagger using support vectors for efficient learning from demonstrations in high dimensional state spaces. In *International Conference on Robotics and Automation (ICRA)*, 2016. **(best HRI paper award finalist)**.
- [27] A.D. Dragan, K. Muellin, J.A. Bagnell, and S.S. Srinivasa. Movement primitives via optimization. In *International Conference on Robotics and Automation (ICRA)*, 2015. **(best paper and best student paper award finalist)**.
- [28] A.D. Dragan, S. Bauman, J. Forlizzi, and S.S. Srinivasa. Effects of robot motion on human-robot collaboration. In *International Conference on Human-Robot Interaction (HRI)*, 2015.
- [29] A.D. Dragan, R. Holladay, and S.S. Srinivasa. From legibility to deception. In *Autonomous Robots (AURO)*, 2015.
- [30] R. Holladay, A.D. Dragan, and S.S. Srinivasa. Legible robot pointing. In *International Symposium on Human and Robot Communication (Ro-Man)*, 2014.

- [31] A.D. Dragan, R. Holladay, and S.S. Srinivasa. An analysis of deceptive robot motion. In *Robotics: Science and Systems (R:SS)*, 2014.
- [32] A.D. Dragan and S.S. Srinivasa. Integrating human observer inferences into robot motion planning. *Autonomous Robots (AURO)*, 2014.
- [33] E. Cha, A.D. Dragan, and S.S. Srinivasa. Pre-school children’s first encounter with a robot. In *International Conference on Human-Robot Interaction (HRI)*, 2014. (late-breaking report).
- [34] E. Cha, A.D. Dragan, and S.S. Srinivasa. Effects of speech on perceived capability. In *International Conference on Human-Robot Interaction (HRI)*, 2014. (late-breaking report).
- [35] A.D. Dragan and S.S. Srinivasa. Familiarization to robot motion. In *International Conference on Human-Robot Interaction (HRI)*, 2014.
- [36] H. Admoni, A.D. Dragan, B. Scassellati, and S.S. Srinivasa. Deliberate delays during robot-to-human handovers improve compliance with gaze communication. In *International Conference on Human-Robot Interaction (HRI)*, 2014.
- [37] A.D. Dragan and S.S. Srinivasa. A policy blending formalism for shared control. *International Journal of Robotics Research (IJRR)*, 2013.
- [38] M. Zucker, N. Ratliff, A.D. Dragan, M. Pivtoraiko, M. Klingensmith, C. Dellin, J. Bagnell, and S.S. Srinivasa. CHOMP: Covariant Hamiltonian Optimization for Motion Planning. *International Journal of Robotics Research (IJRR)*, 2013.
- [39] A.D. Dragan, K.T. Lee, and S.S. Srinivasa. Teleoperation with intelligent and customizable interfaces. *Journal of Human-Robot Interaction (JHRI)*, 2013.
- [40] A.D. Dragan and S.S. Srinivasa. Generating legible motion. In *Robotics: Science and Systems (R:SS)*, 2013. **(best paper award finalist)**.
- [41] E. Cha, A.D. Dragan, and S.S. Srinivasa. Effects of robot capability on user acceptance. In *International Conference on Human-Robot Interaction (HRI)*, 2013. (late-breaking report).
- [42] K.T. Lee, A.D. Dragan, and S.S. Srinivasa. Legible user input for intent prediction. In *International Conference on Human-Robot Interaction (HRI)*, 2013. (late-breaking report).
- [43] A.D. Dragan, K.T. Lee, and S.S. Srinivasa. Legibility and predictability of robot motion. In *International Conference on Human-Robot Interaction (HRI)*, 2013.
- [44] K. Strabala, M.K. Lee, A.D. Dragan, J. Forlizzi, S.S. Srinivasa, M. Cakmak, and V. Micelli. Towards seamless human-robot handovers. *Journal of Human-Robot Interaction (JHRI)*, 2013.
- [45] A.D. Dragan and S.S. Srinivasa. Formalizing assistive teleoperation. In *Robotics: Science and Systems (R:SS)*, 2012. **(best paper award finalist)**.
- [46] A.D. Dragan and S.S. Srinivasa. Online customization of teleoperation interfaces. In *International Symposium on Human and Robot Communication (Ro-Man)*, 2012. **(best paper award finalist)**.

- [47] K. Strabala, M.K. Lee, A.D. Dragan, J. Forlizzi, and S.S. Srinivasa. Learning the communication of intent prior to physical collaboration. In *International Symposium on Robot and Human Interactive Communication (Ro-Man)*, 2012.
- [48] A.D. Dragan and S.S. Srinivasa. Assistive teleoperation for manipulation tasks. In *International Conference on Human-Robot Interaction (HRI)*, 2012. (late-breaking report).
- [49] S.S. Srinivasa, D. Berenson, M. Cakmak, A. Collet, M.R. Dogar, A.D. Dragan, R.A. Knepper, T. Niemueller, K. Strabala, M. Vande Weghe, and J. Ziegler. HERB 2.0: Lessons learned from developing a mobile manipulator for the home. *Proc. of the IEEE, Special Issue on Quality of Life Technology*, 2012.
- [50] A.D. Dragan, G. Gordon, and S.S. Srinivasa. Learning from experience in manipulation planning: Setting the right goals. In *International Symposium on Robotics Research (ISRR)*, 2011.
- [51] A.D. Dragan, N. Ratliff, and S.S. Srinivasa. Manipulation planning with goal sets using constrained trajectory optimization. In *International Conference on Robotics and Automation (ICRA)*, 2011.