Pieter Abbeel

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Employment

UC Berkeley, Electrical Engineering and Computer Sciences Department
Professor July 2017 - present
Associate Professor July 2014 - June 2017
Assistant Professor August 2008 - June 2014

Academic Background

Stanford University, Stanford, California USA

Ph.D., Computer Science, 2008
"Apprenticeship Learning and Reinforcement Learning with Application to Robotic Control"
Advisor: Andrew Y. Ng

Research Summary

Programming robots remains notoriously difficult, as is illustrated by the large discrepancy between the capabilities of robots in tele-operation versus robots under autonomous control. Equipping robots with the ability to learn would by-pass the need for what often ends up being time-consuming task specific programming. A first type of learning algorithms being developed in Abbeel's lab is apprenticeship learning, in which robots learn from watching human demonstrations. Apprenticeship learning has enabled the most advanced helicopter aerobatics to-date, including maneuvers such as chaos, tic-tocs, and auto-rotation landings which only exceptional expert human pilots can fly, as well as challenging robotic manipulation skills, such as knot-tying and cloth manipulation. A second type of learning algorithms developed in Abbeel's lab is reinforcement learning, which considers the problem of learning control policies through a directed process of trial and error. Abbeel's group has shown that deep neural net control architectures can be learned that map directly from recent percepts to actions. This work has already enabled learning a variety of manipulation primitives, such as screwing caps onto bottles, stacking lego-blocks, placing a tight-fitting ring around a pole, and some simple assembly tasks, as well as learning simulated locomtion and playing Atari games.

Honors and Awards

- Diane McEntyre Award for Excellence in Teaching 2018 (Computer Science, UC Berkeley)
- IEEE Fellow, 2018
- Presidential Early Career Award for Scientists and Engineers (PECASE), 2016.
- CRA-E Undergraduate Research Faculty Mentoring Award, 2016
- National Science Foundation Early Career Development Program Award (NSF-CAREER), 2014.
- Darpa Young Faculty Award (Darpa-YFA), 2013.
- Office of Naval Research Young Investigator Program (ONR-YIP), 2013.
- Air Force Office of Scientific Research Young Investigator Research Program (AFOSR-YIP), 2012.
- Dick Volz Best U.S. Ph.D. Thesis in Robotics and Automation of 2008, awarded in 2012.
- IEEE Robotics and Automation Society (RAS) Early Career Award, 2012.
- IEEE Senior Member (since 2012).
- MIT Technology Review Top Young Innovators under 35 (TR35), 2011
- Sloan Foundation Fellow, 2011.
- Okawa Foundation Research Grant Award, 2010.

Best Paper Awards

- Best Automation Paper Finalist at the IEEE International Conference on Robotics and Automation (ICRA) 2018. "Learning Robotic Assembly from CAD," Garrett Thomas*, Melissa Chien*, Aviv Tamar, Juan Aparicio Ojea, Pieter Abbeel.
- Best Paper Award at the International Conference on Learning Representations (ICLR) 2018. "Continuous Adaptation via Meta-Learning in Nonstationary and Competitive Environments," Maruan Al-Shedivat, Trapit Bansal, Yuri Burda, Ilya Sutskever, Igor Mordatch, Pieter Abbeel.
- Best Paper Award at Neural Information Processing Systems (NIPS) 2016. "Value Iteration Networks," Aviv Tamar, Yi Wu, Garrett Thomas, Sergey Levine, Pieter Abbeel.

- Best Robotic Manipulation Paper Award at the International Conference on Robotics and Automation (ICRA), 2015. "Learning Contact-Rich Manipulation Skills with Guided Policy Search," Sergey Levine, Nolan Wagener and Pieter Abbeel.
- Best Medical Robotics Paper Finalist at the International Conference on Robotics and Automation (ICRA), 2015. "Learning by Observation for Surgical Subtasks: Multilateral Cutting of 3D Viscoelastic and 2D Orthotropic Tissue Phantoms," Adithyavairavan Murali, Siddarth Sen, Ben Kehoe, Animesh Garg, Seth McFarland, Sachin Patil, Walter Douglas Boyd, Susan Lim, Pieter Abbeel, Ken Goldberg.
- Best Robotic Vision Paper Award at the International Conference on Robotics and Automation (ICRA), 2013. "Tracking Deformable Objects with Point Clouds," John Schulman, Alex Lee, Jonathan Ho and Pieter Abbeel.
- Best Robotic Vision Paper, Finalist, at the International Conference on Robotics and Automation (ICRA), 2012. "A Textured Object Recognition Pipeline for Color and Depth Image Data," Jie Tang, Stephen Miller, Arjun Singh and Pieter Abbeel.
- Best Medical Robotics Paper Award at the International Conference on Robotics and Automation (ICRA), 2010. "Superhuman Performance of Surgical Tasks by Robots using Iterative Learning from Human-Guided Demonstrations," Jur van den Berg, Stephen Miller, Daniel Duckworth, Humphrey Hu, Xiao-Yu Fu, Andrew Wan, Ken Goldberg and Pieter Abbeel.
- Best Application Paper Award at the Twenty-fifth International Conference on Machine Learning (ICML), 2008. "Learning for Control from Multiple Demonstrations," Adam Coates, Pieter Abbeel and Andrew Y. Ng.

Representative Papers

Publications are available from the website listed on the first page (numbers match).

AvE: Assistance via Empowerment. Yuqing Du, Stas Tiomkin, Emre Kiciman, Daniel Polani, Pieter Abbeel, Anca Dragan. In *Neural Information Processing Systems (NeurIPS)*, Conference: Vancouver, Canada (Virtual), December 2020.

AVID: Learning Multi-Stage Tasks via Pixel-Level Translation of Human Videos. Laura Smith, Nikita Dhawan, Marvin Zhang, Pieter Abbeel, Sergey Levine. In *Proceedings of Robotics: Science and Systems (R:SS)*, Conference: Corvallis, Oregon (virtual), July 2020.

Geometry-Aware Neural Rendering. Josh Tobin, OpenAI Robotics, Pieter Abbeel. In *Neural Information Processing Systems (NeurIPS)*, Conference: Vancouver, Canada, December 2019.

Guiding Policies with Language via Meta-Learning. John D. Co-Reyes, Abhishek Gupta, Suvansh Sanjeev, Nick Altieri, John DeNero, Pieter Abbeel, Sergey Levine. In *Proceedings of the 7th International Conference on Learning Representations (ICLR)*, Conference: New Orleans, USA, May 2019.

Soft Actor-Critic: Off-Policy Maximum Entropy Deep Reinforcement Learning with a Stochastic Actor. Tuomas Haarnoja, Aurick Zhou, Pieter Abbeel, Sergey Levine. In *Proceedings of the International Conference on Machine Learning (ICML)*, Conference: Stockholm, Sweden, July 2018.

Hindsight Experience Replay. Marcin Andrychowicz, Filip Wolski, Alex Ray, Jonas Schneider, Rachel Fong, Peter Welinder, Bob McGrew, Josh Tobin, Pieter Abbeel, Wojciech Zaremba. In *Neural Information Processing Systems (NIPS)*, Conference: Long Beach, CA, December 2017.

One-Shot Imitation Learning. Yan (Rocky) Duan, Marcin Andrychowicz, Bradly Stadie, Jonathan Ho, Jonas Schneider, Ilya Sutskever, Pieter Abbeel, Wojciech Zaremba. In *Neural Information Processing Systems (NIPS)*, Conference: Long Beach, CA, December 2017.

Model-Agnostic Meta-Learning for Fast Adaptation of Deep Networks. Chelsea Finn, Pieter Abbeel, Sergey Levine. In *Proceedings of the International Conference on Machine Learning*, Conference: Sydney, Australia, August 2017.

Trust Region Policy Optimization. John Schulman, Sergey Levine, Philipp Moritz, Michael I. Jordan, Pieter Abbeel. In *Proceedings of the 32nd International Conference on Machine Learning (ICML)*, Conference: July 2015.