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Laura Smith

Education

University of California, Berkeley 2016 – present
B.A. Computer Science GPA: 3.963/4.00
Selected Coursework: Linear System Theory* (IP), Deep Reinforcement Learning* (A^+), Machine Learning (A^+), Operating Systems & System Programming (A), Real Analysis (A), Artificial Intelligence (A^+), Probability & Random Processes (A), Discrete Math & Probability Theory (A^+), Web Architecture* (A), Data Science (A^+), Data Structures & Algorithms (A), Statistics (A^+), * - indicates graduate level

Research

UC Berkeley Robot Learning Lab May 2018 – present
Undergraduate Researcher
Working under the mentorship of Professor Pieter Abbeel in developing sample-efficient, vision-based methods, via representation learning and model-based RL approaches, for allowing robots to learn complex skills in real-world domains.

SOLAR: Deep Structured Latent Representations for Model-Based Reinforcement Learning.
Published at the International Conference on Machine Learning (ICML) 2019.
Mentored by Ph.D. student Marvin Zhang and Professors Pieter Abbeel & Sergey Levine at UC Berkeley
Model-based RL has proven to be a data efficient approach for learning control tasks but is difficult to utilize in domains with complex observations, such as images, due to modeling bias. In this work, we propose a method for learning *representations* suitable for iterative model-based policy improvement which enable a highly efficient method based on the linear-quadratic regulator (LQR) to be used for systems with image observations. We demonstrate its efficacy on a range of robotics tasks, including manipulation with a real-world robotic arm directly from images.

AVID: Learning Multi-Stage Tasks via Pixel-Level Translation of Human Videos.
Accepted in three Neural Information Processing Systems (NeurIPS) 2019 workshops.
Under review for the IEEE International Conference on Robotics and Automation (ICRA) 2020.
Mentored by Ph.D. student Marvin Zhang and Professors Pieter Abbeel & Sergey Levine at UC Berkeley
Robotic imitation learning typically utilizes demonstrations provided via the robot itself, which is cumbersome or even impossible in practice. In contrast, humans can learn from *watching* others, imagining how they would perform the task themselves, and then practicing on their own. We adopt a similar strategy of imagination and practice in this project to solve complex, long-horizon tasks, like operating a coffee machine or getting objects from within a closed drawer. We construct our learning process to be largely automatic, from intuitive task specification via videos of humans to automated training with minimal human intervention.

Learning Cross-Domain Composition of Skills from Unstructured Videos.
Current. Mentored by Ph.D. student Marvin Zhang and Professors Pieter Abbeel & Sergey Levine at UC Berkeley
With an eye towards real-world deployment, we need to be able to learn from diverse, unstructured data that may bear little semblance to test-time demonstrations, e.g. YouTube videos. We hypothesize that unsupervised image translation can, similar to deep supervised learning, discover underlying structure common across videos of different tasks, invariant to background and viewpoint (e.g. object permanence, uniform connectedness, physical priors) given enough data. We can then learn primitives from videos by any demonstrator given in any domain and arbitrarily compose them using a human-in-the-loop, model-based RL procedure.

Publications

Laura Smith, Nikita Dhawan, Marvin Zhang, Pieter Abbeel, Sergey Levine.
AVID: Learning Multi-Stage Tasks via Pixel-Level Translation of Human Videos.
accepted in *NeurIPS Deep Reinforcement Learning, Learning from Rich Experience & Robot Learning* Workshops, 2019, and in submission to the *IEEE International Conference on Robotics and Automation (ICRA)*, 2020

Marvin Zhang*, Sharad Vikram*, **Laura Smith**, Pieter Abbeel, Matthew Johnson, Sergey Levine.
SOLAR: Deep Structured Latent Representations for Model-Based Reinforcement Learning.
published and presented at *International Conference on Machine Learning (ICML)*, 2019

Teaching

Advanced Robotics* (CS 287) Fall 2019
Teaching Assistant (current)
Responsible for design & development of new course materials, office hours.

Introduction to Artificial Intelligence (CS 188) Fall 2018, Spring 2019
Teaching Assistant
Developed materials, taught sections, held office hours. Headed up writing & administering of exams (Sp'19).

Discrete Mathematics & Probability Theory (CS 70) Spring 2018
Course Reader
Helped students internalize concepts through problem sets in a 1-1 setting in addition to grading assignments.

Foundations of Data Science (CS C8) Fall 2017
Official Course Tutor
Held two small-group tutoring sections weekly as well as normal office hours.

Data Structures & Algorithms (CS 61B) Summer 2017
Lab Assistant
Answered questions and helped with debugging strategies during lab sections.

Volunteering & Outreach

Robot Learning Lab Outreach August 2018 – present
Assisted with PR2 demonstrations and presentations for small groups of visitors to the lab as well as larger-scale events like UC Berkeley's annual public open house, Cal Day. Delivered lectures for the introductory CS course, The Beauty and Joy of Computing, as well as for its annual CS Education Day for high school students to expose students to exciting topics in AI.

Upsilon Pi Epsilon (CS Honors Society) Spring 2018
Held weekly office hours covering topics from lower-division CS courses for the undergraduate community.

Cal Launchpad, Education Committee Fall 2017 – Fall 2018
Spearheaded creation and teaching educational workshops for members of the community. Topics cover practical machine learning, regression fundamentals, probability theory in decision making.

Personal Projects

Unsupervised Learning of Object-Centric Representations for Vision-Based Planning
Incorporated the notion of physical priors to enable learning dynamics generalizable to environments in which the same physical properties hold as seen in training and to perform physics-aware planning. Derived graphical model structure and resulting variational objective to learn a sparse representation of images to handle arbitrarily many objects of few classes. Coupled with modular dynamics models, this representation enables sensible planning.

Unbiased News Generation
Wrote a program which aims to remove bias from news reports, motivated by the prevalent fake-news problem. Given a user's query, performed sentiment analysis on related, as determined by unsupervised clustering, articles taken from 5 major outlets. Averaged over emotionally-charged statements to return an 'unbiased' article stitched together using a sequence-to-sequence model for meaningful language.