Michael LASKEY

PERSONAL DATA

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RESEARCH STATEMENT

My goal is to build robust sequential learning systems that are scalable, safe and user-friendly in the data collection process. My research has examined how to enable this by training vision models to recover from error in sequential tasks. Leading a team of seven students, I have developed and applied several new techniques in the fields of Home Robotics, Self-Driving Cars and Warehouse Order Fulfillment.

EDUCATION

FALL 2013 - MAY 2018	M.S/Ph.D in Artificial Intelligence/ Robotics **U.C.-Berkeley**
FALL 2009 - MAY 2013	B.S. in Electrical Engineering **U.M.-Ann Arbor**

REPRESENTATIVE PROJECTS

CURRENT | **Algorithmic Development for Robust Imitation Learning**. A problem with Imitation Learning is that when robot's make mistake, they can't recover and errors compound. To prevent this, it is common to let the robot fail in order to learn how to recover. However, allowing the robot to fail makes it challenging to build safe and scalable systems. Thus, I developed DART (Disturbances for Augmenting Robot Trajectories), which injects small noise into the supervisor's policy to simulate error. By injecting noise into the supervisor's policy and not using the robot's, DART collects data safely and in parallel. A blog post on this work can be found at http://bair.berkeley.edu/blog/2017/10/26/dart/.

CURRENT | **First Order Simulators for Self-Driving Cars**. Selected and managed a team of four top EECS students to create a simulator for driving behaviors at intersections. The goal is to create fast python based simulations, which can enable rapid prototyping of algorithms for self-driving car agents. Our system first uses Object Detection to extracted driving behavior from live traffic camera streams. Then applies DART to train multi-agent deep policies over a distributed EC2 network.

CURRENT | **Robotic Manipulation for the Home**. Leveraging recent advances in Imitation Learning and Object Detection, such as Faster R-CNNs and YOLO, we have trained a Toyota HSR robot to perform home tasks, such as picking up playing cards or retrieving objects from a cupboard. Recently, we have applied DART to train the HSR robot to perform the sequential task of making a bed. DART was used to re-train an object detection network to identify key grasp points on the bed sheet to tension. A video can be found at https://youtu.be/HbNNkrk9aOI

MAY 2017	**Order Fulfillment in Warehousing**. Implemented an end-to-end prototype system for packing boxes using the Dex-Net Grasping Software and an Industrial ABB YuMi Robot. Given a heap of objects the robot would search for a given set and pack them into a box. I specifically applied Imitation Learning to train the YuMi to singulate objects from the heap and close the cardboard boxes. A video of the system can be found at https://www.youtube.com/watch?v=i6K3GI2_EgU.

TEACHING EXPERIENCE

FALL 2017	**CS 189/289-Machine Learning GSI** Designed and implemented a new curriculum focused on bridging the gap between classical ML and Deep Learning for a class size of 300. The new curriculum includes teaches students how to train CNNs and GANs in Tensorflow.
FALL 2016	**CS 188-Introduction To Artificial Intelligence GSI** Taught a Discussion section of 20 students and led Office hours. Classed focus on search algorithms and Reinforcement Learning.

PAST EMPLOYERS

MAY - AUGUST 2013	**Intel Inc.** Implemented Machine Learning algorithms in $C\#$ to track the movement of a person using pedometer data for Augmented Reality Applications.
SEPT. - MAY 2013	**University of Michigan** Taught a Lab of 30 students in Verilog for intro Level Digital Design.

PROFESSIONAL EXPERIENCE

MACHINE LEARNING	Imitation Learning (i.e. Sequential Supervised Learning), Multi-Armed Bandits, Policy Gradients, Gaussian Processes
COMPUTER VISION	Object Detection, Convolutional Neural Networks, GANs
ROBOTICS	Motion Planning, Grasp Planning
SOFTWARE	EC2, Amazon Mechanical Turk, Tensorflow, PyTorch, ROS, Ray, OpenCV
MANAGERIAL	Mentored up to Ten Bachelors and Master Students, Experience in Recruiting and Interviewing

FELLOWSHIPS & AWARDS

CASE 2017	Best Student Paper Award Finalist
ICRA 2016	Best Human Robot Interaction Paper Award Finalist
ICRA 2016	Best Manipulation Paper Award Finalist
2013	National Science Foundation Graduate Research Fellowship

PUBLICATIONS

Imitation Learning

1. **Laskey, M.**, Powers, C., Joshi, R., Poursohi, A., Goldberg, K. *Learning Robust Bed Making Using Deep Imitation Learning with DART* Under Review

2. Liang, J., Mahler, J., **Laskey, M.**, Li, P. and Goldberg, K. *Using dVRK Teleoperation to Facilitate Deep Learning of Automation Tasks for an Industrial Robot* In Automation Science and Engineering (CASE), 2017

3. Chen, C., Krishnan, S., **Laskey, M.**, Fox, R. and Goldberg, K., *An Algorithm and User Study for Teaching Bilateral Manipulation via Iterated Best Response Demonstrations* In Automation Science and Engineering (CASE), 2017

4. Chuck, C., **Laskey, M.**, Krishnan, S., Joshi, R. and Goldberg, K. *Statistical data cleaning for deep learning of automation tasks from demonstrations.* In Automation Science and Engineering (CASE) 2017

5. **Laskey, M.**, Chuck, C., Lee, J., Mahler, J., Krishnan, S., Jamieson, K., Dragan, A. and Goldberg, K., 2016. *Comparing human-centric and robot-centric sampling for robot deep learning from demonstrations* In Robotics and Automation (ICRA), 2017

6. **Laskey, M.**, Staszak, S., Hsieh, W.Y.S., Mahler, J., Pokorny, F.T., Dragan, A.D. and Goldberg, K. *Shiv: Reducing supervisor burden in dagger using support vectors for efficient learning from demonstrations in high dimensional state spaces* In Robotics and Automation (ICRA)

Machine Learning for Robotic Grasping

1. Mahler, J., Liang, J., Niyaz, S., **Laskey, M.**, Doan, R., Liu, X., Ojea, J.A. and Goldberg, K. *Dex-Net 2.0: Deep Learning to Plan Robust Grasps with Synthetic Point Clouds and Analytic Grasp Metrics.* Robotic Science and Systems (RSS) 2017

2. **Laskey, M.**, Lee, J., Chuck, C., Gealy, D., Hsieh, W., Pokorny, F.T., Dragan, A.D. and Goldberg, K., *Robot grasping in clutter: Using a hierarchy of supervisors for learning from demonstrations.* In Automation Science and Engineering (CASE), 2016

3. Mahler, J., Pokorny, F.T., Hou, B., Roderick, M., **Laskey, M.**, Aubry, M., Kohlhoff, K., Kröger, T., Kuffner, J. and Goldberg, K. *Dex-net 1.0: A cloud-based network of 3d objects for robust grasp planning using a multi-armed bandit model with correlated rewards.* In Robotics and Automation (ICRA), 2016

4. **Laskey, M**, Mahler, J., McCarthy, Z., Pokorny, F.T., Patil, S., Van Den Berg, J., Kragic, D., Abbeel, P. and Goldberg, K., 2015, August. *Multi-armed bandit models for 2d grasp planning with uncertainty* In Automation Science and Engineering (CASE), 2016

Planning & Controls in Uncertainty

1. Lee, J., **Laskey, M.**, Fox, R., Goldberg, K. *Derivative-Free Failure Avoidance Control for Manipulation using Learned Support Constraints* Under Review

2. Mahler, J., Krishnan, S., **Laskey, M.**, Sen, S., Murali, A., Kehoe, B., Wang, J.,Franklin, M., Abbeel, P. Goldberg, K. *Learning Accurate Kinematic Control of Cable-driven Surgical Robots using Data Cleaning and Gaussian Process Regression* In Automation Science and Engineering (CASE), 2015

3. Patil, S., Kahn, G., **Laskey, M.**, Schulman, J., Goldberg, K., Abbeel, P. *Scaling up Gaussian belief space planning through Covariance-free Trajectory Optimization and Automatic Differentiation* In Algorithmic Foundations of Robotics XI, 2015

INVITED TALKS

NOVEMBER 2017	"DART: Noise Injection for Robust Imitation Learning", Conference on Robot Learning (CORL)
OCTOBER 2017	"Robust Imitation Learning", Berkeley Artificial Intelligence (BAIR) Seminar
JULY 2017	"Pixels-to-Policies from Fallible Human Demonstrations", RSS Workshop on High-Dimensional Learning from Demonstrations
JUNE 2017	"Imitation Learning for Industrial Applications", Caterpillar Inc. Deep Learning Seminar
DECEMBER 2016	"Comparing Robot-Centric and Human-Centric Sampling for Deep Learning from Demonstrations", Berkeley Artificial Intelligence (BAIR) Seminar
NOVEMBER 2015	"Reducing the Data in Imitation Learning", Algorithms for HRI Workshop
FEBRUARY 2015	"Multi-Armed Bandits for Robotic Grasping Under Uncertainty" Berkeley Institute of Design Seminar Series