Eli Bronstein

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EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY | B.S. in Electrical Engineering and Computer Science

- **GPA** : 3.9 / 4.0. **Graduated** : May 2019.
- **Classes** : Robotics, Deep Reinforcement Learning, Machine Learning, Convex Optimization, Probability, Linear Algebra

RESEARCH AND WORK EXPERIENCE

SOFTWARE ENGINEER | Symbio Robotics — Sep 2019 - present

- Implemented automatic and efficient computation of dynamic coordinate frame velocities.
- Designed hybrid motion-force controller and trajectory generation method to obey linear/angular derivative bounds for waxing demo.
- Created a state machine-based framework to run software- and hardware-based endurance tests. Used to test robustness of mission-critical components that are required to operate for long durations.
- Created a robot performance test framework to collect metrics and determine success via hypothesis testing against baselines.
- Integrated robot control platform with PyBullet to perform simulated tests and simplify the development and debugging of applications.
- Started a research paper reading group to cover motion/path planning, optimal control, RL, learning-based control, etc.

UNDERGRADUATE RESEARCHER | InterACT Lab (Prof. Anca Dragan) at UC Berkeley — Sep 2017 - Jun 2019

- Worked on game-theoretic hierarchical planning for human and autonomous car interaction: combined long-horizon solution to high-level dynamic game between human and autonomous vehicle (computed offline) with short receding-horizon online trajectory planning. **Published** in ICRA 2019 (arxiv.org/abs/1810.05766).
- Analyzed sample complexity of learning methods (PPO, neural net, deep IRL) on the model-free to model-based spectrum in the context of human-robot car interaction to determine the asymptotic relationship between amount of training data and the robot's achieved reward.
- Integrated autonomous car planning codebase with a realistic driving simulation for human-robot interaction experiments.

UNDERGRADUATE RESEARCHER | Hybrid Systems Lab at UC Berkeley — Jan - May 2019

- Worked on novel algorithm for real-time safety analysis based on Hamilton-Jacobi reachability to provide strong safety guarantees while efficiently performing tasks in uncertain environments. **Published** in CDC 2019 (arxiv.org/abs/1905.00532).
- Deployed safety algorithm with vision-based planner on Turtlebot to navigate through cluttered office environment.

ROBOTICS INSTITUTE SUMMER SCHOLAR | Intelligent Coordination and Logistics Lab at CMU — Jun 2017 - Apr 2019

- Created a Bayesian hierarchical statistical model for bus dwell times to provide real-time predictions to adaptive traffic signal control systems. Made the model robust to high stochasticity of bus patterns, data-lightweight, and computationally efficient.
- Showed ability of Bayesian model to maximize proportion of low-error predictions (compared to traditional offline and online regression).
- Invited to continue research remotely with lab to generalize model, resulting in integration with an adaptive traffic signal control system.
- **Published** in IEEE Transactions on Intelligent Transportation Systems (ieeexplore.ieee.org/abstract/document/9042883).

PROJECTS

GRASP TRANSFER BY PARTS — Mar - May 2019

- Developed method to transfer robust grasps precomputed on an object dataset to a novel object using a grasping-by-parts approach.
- Segmented novel object into parts approximated by superquadrics, identified most similar part from object dataset using a superquadric similarity algorithm, transferred precomputed grasps from dataset part to novel object part, and evaluated quality of transferred grasp.

MULTI-TEACHER SINGLE-TASK POLICY DISTILLATION IN DEEP REINFORCEMENT LEARNING — Oct - Dec 2018

- Extended policy distillation in RL to the multi-teacher case: student neural net learns from multiple teacher neural nets.
- Framed multi-teacher case as a multi-armed bandit problem (learning from teacher is similar to pulling an arm) and compared performance of several bandit algorithms. Applied contextual bandit algorithm to learn holistic policy from multiple subspace teachers.

SKILLS

- **Programming languages** : proficient in Python; experience with: C, Java.
- **Frameworks** : proficient in SciPy, NumPy, Pandas, PyBullet, Pytest; experience with PyTorch, Keras, scikit-learn, ROS.

SELECTED AWARDS

- **National Science Foundation (NSF) Research Experience for Undergraduates (REU) Scholarship Recipient** (2017) - received funding to conduct and present research as part of the CMU Robotics Institute Summer Scholars Program.