**Thesis:** Adversarial Training for Skill Learning in a Mobile Robot

**Abstract:** Machine Learning in mobile robotics is sometimes hampered by the difficulties associated with the creation of a large corpus of labeled data that most neural network-based learning algorithms demand. In recent years, advances in the field of machine learning have been facilitated via the creation of large collaboratively-created labeled training datasets that researchers can use as the basis for experiments to validate and improve their candidate neural network architectures. For the field of robotics, however, tasks are so disparate and the physical devices so varied that in most cases the creation of collaborative benchmark datasets are impractical. Obtaining data from physical robot trials can be time-consuming and costly depending upon the nature of the task. One solution has been to create toolkits for developing trial data in simulation, but such approaches often struggle to translate well into the real world in which a mobile robot, with imperfect sensor data, must operate. Generative Adversarial Networks have gained notoriety for their ability to be trained to output new examples of their training data that are simultaneously accurate enough to fool a trained discriminator network but also of sufficient variation to appear as original examples of the real trial data. In this dissertation, I intend to exploit that characteristic to use a GAN to expand a dataset composed of physical trials created by a mobile robot performing a skill-based task. In particular, I trained a mobile robot to hit a small ball to a target by rotating itself with an attached putter head in a motion similar to a person putting a ball on a green in golf. Through a number of experiments, I found that a Generative Adversarial Network can expand a small corpus of labeled data in such a manner as to significantly improve the performance of a neural network that was trained to be the controller for the mobile robot performing the putting task.

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