Course: ENPM808F – Robot Learning
Semester: Fall 2016
Day(s): Monday
Time: 7:00-9:40pm
Location: JMP 2121
Instructor: Donald A. Sofge
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Course Description

Machine learning may be used to greatly expand the capabilities of robotic systems, and has been applied to a variety of robotic system functions including planning, control, and perception. Robot Learning covers the application of machine learning techniques for which data is used to generate (through induction) a model that is then used by the robot to perform tasks. A wide variety of representations and techniques are available to generate models including multilayer perceptrons (e.g., trained through backpropagation or evolutionary algorithms), Radial Basis Functions, Sparse Representations, Support Vector Machines, Random Decision Forests, Bayesian Networks, and Deep Networks (Convolutional Neural Networks). Ultimately we would like for the robots to expand their knowledge and improve their own performance through learning while operating in the environment (on-line and/or lifelong learning). This graduate course will explore the application of machine learning techniques to robotic systems, focusing primarily on key useful representations and model building techniques for application in non-stationary robotic systems. Greater attention will be paid to machine learning for robot control than for perception.

Course grade will be based on the student’s performance on the following:
- Homework (20% of the overall grade)
- Quizzes (10% of the overall grade)
- Course Project Presentation (20% of the overall grade)
- Course Project Final Report (20% of the overall grade)
- Take Home Final Exam (30% of the overall grade)

Textbook(s)

INCLUDE THE FOLLOWING:


Course Outline

- Motor Learning and the Evolution of Intelligence
- Behavior Based Robotics
- Robot Shaping and Evolving Behaviors
- Crossing the Reality Gap
- Reinforcement Learning
- Value versus Policy Iteration
- Q-Learning and Actor-Critic Models
- Memory-Based Learning
- Imitation Learning and Learning from Demonstration
- Deep Reinforcement Learning with CNNs
- On-line and Lifelong Learning

Code of Academic Integrity

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity of the Student Honor Council, please visit http://shc.umd.edu/SHC/HonorPledgeInformation.aspx.