Summary:

In this program, we place a keen emphasis on building practical robotics system skills. Through a series of projects and exercises, you will learn to work with sensor data for the task of perception, implement and apply artificial intelligence algorithms in the process of decision making, and then command your robot to take action!

Schedule:

Length of Term 1: 16 weeks

Class Frequency : Weekly

Time Commit : Approximately 15 hours per week

Prerequisites:

- Calculus and Linear Algebra (emphasis on transformation matrices)
- Statistics and Probability
- Intermediate Python
- Unix/Linux Command Line Basics (ls, cd, etc.)
- Basic Physics (Newtonian Mechanics)
- Familiarity with Jupyter Notebook a Plus
- Familiarity with Machine Learning is recommended, but not required.

Concepts Learned:

- ROS (Robot Operating System)
  - Nodes and Topics
  - Packages
  - Messaging Communication
  - Catkin Workspaces

- Forward Kinematics
- Inverse Kinematics
- Denavit-Hartenberg Parameters (DH Parameters)

- Perception
  - Calibration
  - Filtering
  - Segmentation
  - Point Clouds
  - Object Recognition
  - RANSAC
  - Sampling
  - 3D Perception (RGB-D)
  - Clustering (DBSCAN, K-means)

- Controls
  - Open-loop Control
  - Closed-loop Control
  - PID Controllers

- Deep Learning
  - Neural Networks
  - Classification
  - Deep Neural Networks
  - Convolutional Neural Networks (CNN)
  - Fully Convolutional Networks (FCN)
  - Semantic Segmentation

Projects:

As a student in this term, you will work on several projects using simulators available only at Udacity including:

- A project similar to NASA's planetary rover challenge.
- A project similar to Amazon's Robotics Challenge
- A PR-2 robot capable of processing RGB-D images to grasp objects

Term 1 Syllabus