# Deep Reinforcement Learning Nanodegree Syllabus

## Contact Info

While going through the program, if you have questions about anything, you can reach us at support@udacity.com. For help from Udacity Mentors and your peers visit the Udacity Classroom.

## Nanodegree Program Info

Learn cutting-edge deep reinforcement learning algorithms—from Deep Q-Networks (DQN) to Deep Deterministic Policy Gradients (DDPG). Apply these concepts to train agents to walk, drive, or perform other complex tasks, and build a robust portfolio of deep reinforcement learning projects.

### Prerequisite Skills

A well-prepared learner is able to:

- This program requires experience with Python, probability, machine learning, and deep learning.
- Intermediate to advanced Python experience. You are familiar with object-oriented programming. You can write nested for loops and can read and understand code written by others.
- Intermediate statistics background. You are familiar with probability.
- Intermediate knowledge of machine learning techniques. You can describe backpropagation, and have seen a few examples of neural network architecture (like a CNN for image classification).
- You have seen or worked with a deep learning framework like TensorFlow, Keras, or PyTorch before.

### Required Software

- Jupyter notebook 6.0.1 or latest
- Anaconda 4.7
- Python 3.6
- IDE for C++ code OpenAI gym
- API stack for Deep RL Optional
- Unity Environment Optional
- AWS Regular acct. with CC

**Version**: 2.0.0

**Length of Program**: 100 Days*

** This is a self-paced program and the length is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. Actual hours may vary.*

# Part 1: Introduction to Deep Reinforcement Learning

# Part 2: Value-Based Methods

### Project: Navigation

Train an agent to navigate a large world and collect yellow bananas, while avoiding blue bananas.

**Supporting Lessons**

| Lesson | Summary |
|---|---|
| **Study Plan** | Obtain helpful resources to accelerate your learning in the second part of the Nanodegree program. |
| **Deep Q-Networks** | Extend value-based reinforcement learning methods to complex problems using deep neural networks. |

### Project: Optimize Your GitHub Profile

Other professionals are collaborating on GitHub and growing their network. Submit your profile to ensure your profile is on par with leaders in your field.

**Supporting Lessons**

| Lesson | Summary |
|---|---|
| **Opportunities in Deep Reinforcement Learning** | Learn about common career opportunities in deep reinforcement learning, and get tips on how to stay active in the community. |

# Part 3: Policy-Based Methods

### Project: Continuous Control

Train a double-jointed arm to reach target locations.

**Supporting Lessons**

| Lesson | Summary |
| --- | --- |
| **Study Plan** | Obtain helpful resources to accelerate your learning in the third part of the Nanodegree program. |
| **Introduction to Policy-Based Methods** | Policy-based methods try to directly optimize for the optimal policy. |
| **Policy Gradient Methods** | Policy gradient methods search for the optimal policy through gradient ascent. |
| **Proximal Policy Optimization** | Learn what Proximal Policy Optimization (PPO) is and how it can improve policy gradients. Also learn how to implement the algorithm by training a computer to play the Atari Pong game. |
| **Actor-Critic Methods** | Miguel Morales explains how to combine value-based and policy-based methods, bringing together the best of both worlds, to solve challenging reinforcement learning problems. |
| **Deep RL for Finance (Optional)** | Learn how to apply deep reinforcement learning techniques for optimal execution of portfolio transactions. |

### Project: Improve Your LinkedIn Profile

Find your next job or connect with industry peers on LinkedIn. Ensure your profile attracts relevant leads that will grow your professional network.

## Part 4: Multi-Agent Reinforcement Learning

### Project: Collaboration and Competition

Train a pair of agents to play tennis.

#### Supporting Lessons

| Lesson | Summary |
| --- | --- |
| **Study Plan** | Obtain helpful resources to accelerate your learning in the fourth part of the Nanodegree program. |
| **Introduction to Multi-Agent RL** | |
| **Case Study: AlphaZero** | |

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