Introduction

Tuesday, June 16, 2020 10:41 AM

Github Implementations (Unofficial):
https://github.com/dennybritz/reinforcement-learning
Reinforcement learning consists of an agent interacting with its environment trying to achieve a goal in spite of uncertainty about its environment
Elements of a Reinforcement Learning System:
- Policy
  - This defines the agents way of behaving at a particular time. It is a mapping from perceived states of the environment to actions to be taken
  - Policies may be stochastic (outputting probabilities for each possible action)
- Reward Signal
  - This defines the goal of the reinforcement learning problem as the agent seeks to maximize it
  - These may be stochastic functions of the environment and actions taken
- Value Function
  - This defines what is good in the long run, i.e. the value of a state is the total amount of reward an agent can expect to accumulate in the future, starting from that state
  - Note that this is a prediction of future rewards
  - Note that the estimation of values is the crux of reinforcement learning problems
- Model (optional)
  - This is something that mimics the behavior of the environment or allows inferences to be made about how the environment will behave
  - Reinforcement learning methods that use models are called model-based methods while reinforcement learning methods that don't use models are called model-free methods

Reinforcement Learning involves a trade-off between exploration and exploitation
- Exploration is the learning of the value of states while exploitation is taking advantages of known states that will lead to high reward

Evolutionary Methods:
- Methods that apply multiple static policies to independent instances of an environment then carry the policies that obtained the most reward and some random variations of those policies over to the next generation, then repeat this process

Optimal Control:
- The problem of designing a controller to minimize or maximize a measure of a dynamical system's behavior over time

Dynamic Programming:
- A class of methods for solving optimal control problems by solving the Bellman equation

Markov Decision Processes:
- The discrete, stochastic version of the optimal control problem

Curse of Dimensionality:
- The fact that in dynamic programming the computational requirements grow exponentially with the number of state variables