ASEN 6519-007 Decision Making under Uncertainty
Homework 4: Basic Reinforcement Learning

March 4, 2020

1 Exercises

Question 1. (20 pts) Using the deep learning library of your choice (e.g. Flux.jl, Knet.jl, Tensorflow, Keras), fit a neural network to approximate the function $f(x) = cos(20\,x^2)$ for the range $x \in [0, 1]$. Plot a set of 100 data points fed through the trained model and plot the learning curve.

Question 2. (30 pts) Implement **two** different traditional or deep learning algorithms to learn a policy for the `DMUStudent.HW4.gw` grid world environment. Use a discount factor of $\gamma = 0.95$ to encourage the agent to reach goals more quickly. Plot a learning curve for each and comment on why one performs better than the other. You must implement these algorithms from scratch yourself; you are not permitted to use libraries specially designed for Reinforcement learning.[1]

2 Challenge Problem

Question 3. (50 pts) Learn a policy for the mountain car environment `DMUStudent.HW4.mc`. You may use *any* libraries. A discount factor of $\gamma = 0.99$ is used for evaluation. A score of 35 or greater will receive full credit.[1][2]

---

[1] Both `HW4.gw` and `HW4.mc` implement the RLInterface.jl interface. Details can be found at `https://github.com/JuliaPOMDP/RLInterface.jl`. This interface will allow you to collect data from the environment and evaluate policies with it.

[2] Your submission should be either a `Function` that takes the state as the single argument and returns an action, or a `POMDPs.Policy`.