

CECS 451
Assignment 13
Total: 22 Points

General Instruction

- Submit uncompressed file(s) in the Dropbox folder via BeachBoard (Not email or in class).
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1. Consider the 101×3 world shown in Figure 1. In the start state the agent has a choice of two deterministic actions, Up or Down, but in the other states the agent has one deterministic action, Right. Assuming a discounted reward function.
 - (a) (4 points) Compute the utility of each action as a function of γ .
 - (b) (4 points) Draw the utility of each action for the range $0 \leq \gamma < 1$ using **Matlab** or your familiar numerical analysis software.
 - (c) (2 points) For $\gamma = \frac{1}{2}$, which action is recommend? Why?

+50	-1	-1	-1	...	-1	-1	-1	+10
Start				...				
-50	+1	+1	+1	...	+1	+1	+1	-10

Figure 1: 101×3 world

2. Consider the following data set comprised of three binary input attributes (A_1 , A_2 , and A_3) and one binary output:
 - (a) (2 points) Compute $Gain(A_1)$.
 - (b) (2 points) Compute $Gain(A_2)$.
 - (c) (2 points) Compute $Gain(A_3)$.

Example	A_1	A_2	A_3	Output y
x_1	1	0	0	0
x_2	1	0	1	0
x_3	0	1	0	0
x_4	1	1	1	1
x_5	1	1	0	1

Figure 2: Example data set

3. (6 points) Consider the XOR function of three binary input attributes (A_1 , A_2 , and A_3), which produces the value 1 if and only if an odd number of the three input attributes has value 1. Draw a minimal-sized decision tree for the three-input XOR function.