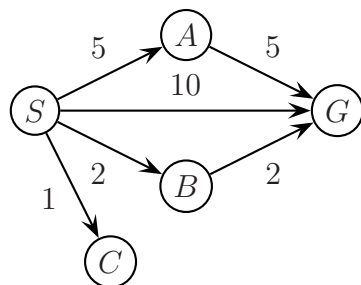


CS 188 Homework 7

Spring 2008

1 *Search* (5 points)

Consider the following search problem:



Node	h
<i>S</i>	4
<i>A</i>	3
<i>B</i>	2
<i>C</i>	100
<i>G</i>	0

Which path will each search algorithm return, assuming all successor functions work out in such a way that nodes are explored in alphabetical order whenever possible?

- (a) Breadth-first search
- (b) Depth-first search
- (c) Uniform-cost search
- (d) A* search
- (e) Greedy search

2 *Perceptrons* (4 points)

Imagine we have features f_1, f_2, f_3, f_4 and three classes, $\{x, y, z\}$. Assume we are training a multi-class perceptron using a learning rate of 0.5, and at a given point in the training, it has the following weight vectors:

$$w_x = \langle 0, 0, 0, 0 \rangle$$

$$w_y = \langle 0, 2, 0, 0 \rangle$$

$$w_z = \langle 2, 0, 1, 0 \rangle$$

(a) If we next encounter the instance $\langle 1, 0, 0, 1 \rangle$ with true label x , write the resulting weights after processing this new instance.

(b) Starting with the weights resulting from part (a), if we next encounter the instance $\langle 0, 1, 1, 1 \rangle$ with true label y , write the resulting weights after processing this new instance.

3 *Decision Trees* (4 points)

(a) Consider a domain with three Boolean attributes, $\{X, Y, Z\}$ and the target function $f(x, y, z) = x \text{ xor } z$. Let H be the space of decision trees over these attributes.

Is f realizable? If so, draw a decision tree which proves it; if not, argue why it is not.

(b) Consider the following data set:

X	Y	Z	f
1	0	1	1
1	1	0	0
0	0	0	0
0	1	1	1
1	0	1	1
0	0	1	0
0	1	1	1
1	1	1	0

Draw the decision tree which would be learned from this data using the recursive splitting algorithm presented in class. Assume that splits are chosen using information gain, and gain ties are broken to prefer splits by alphabetical order.