CISC 481 Homework 2

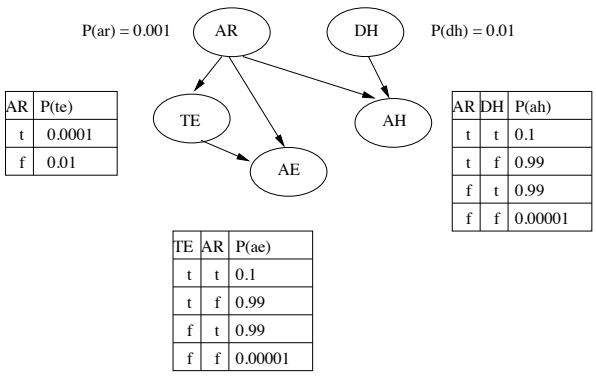
November 15, 2019

1. (20 pts, 10 ea) From exercise 10.3 in the book: The *monkey-and-bnanas problem* is faced by a monkey in a laboratory with some bananas hanging out of reach from the ceiling. A box is available that will enable the monkey to reach the bananas if he climbs on it. Intitially, the monkey is at A, the bananas at B, and the box at C. The monkey and box have height Low, but if the monkey climbs onto the box he will have height $High$, the same as the bananas. The actions available to the monkey include Go from one place to another, $Push$ an object from one place to another, $ClimbUp$ onto or $ClimbDown$ from an object, and $Grasp$ or $Ungrasp$ an object. The result of a $Grasp$ is that the monkey holds the object if the monkey and object are in the same place at the same height.

   (a) Write down the initial state description.

   (b) Write the six action schemas.

2. (20 pts) Consider the Bayes Net in Figure 1:



AR	P(te)
t	0.0001
f	0.01

AR	DH	P(ah)
t	t	0.1
t	f	0.99
f	t	0.99
f	f	0.00001

TE	AR	P(ae)
t	t	0.1
t	f	0.99
f	t	0.99
f	f	0.00001

ar – patient has arthritis
dh – patient has dishpan hands
te – patient has tennis elbow
ae – patient's elbow aches
ah – patient's hand aches

Figure 1: Bayesian Network depicting aches and potential causes

Use the information in the Bayesian network to answer the following query: If we know that a patient has pain in their elbow and pain in their hand, what is the probability that they have arthritis? Please show all work.

3. (20 pts) From exercise 18.6 in the book: Consider the following data set comprised of three binary input attributes (A_1, A_2, A_3) and one binary output:

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

Use the decision tree learning algorithm with information gain to learn a decision tree for these data. Show the computations made to determine the attribute to split at each node.