

# CMSC 471 - Fall 2017

## Homework 6

### Due December 12

**Decision Trees:** The following dataset will be used to learn a decision tree for predicting whether a person is happy (H) or sad (S) based on the color of their shoes, whether they wear a wig, and the number of ears they have.

Color	Wig	Ears	Emotion
G	Y	2	S
G	N	2	S
G	N	2	S
B	N	3	S
B	N	2	H
R	N	2	H
R	N	2	H
R	N	2	H
R	Y	3	H

Draw the full tree that would be learned from these data. Hint: Don't resort to calculating information gain. Visual inspection of the dataset will suffice to get the right answer.

**Bayes Nets:** Consider a Bayesian network with two nodes: K, which is a boolean valued random variable that is true if an animal is a kangaroo; and A, which is true if an animal is angry. Use the following information to write down the structure and parameters for this network: (1) Half of all kangaroos

in the zoo are angry, and  $\frac{2}{3}$  of the animals in the zoo are kangaroos; (2)  
Only 1 in 10 of the other animals are angry.

Use the information above to compute the probability that an angry animal in the zoo is a kangaroo. You'll need to use Bayes rule and Law of Total Probability ([https://en.wikipedia.org/wiki/Law\\_of\\_total\\_probability](https://en.wikipedia.org/wiki/Law_of_total_probability)).