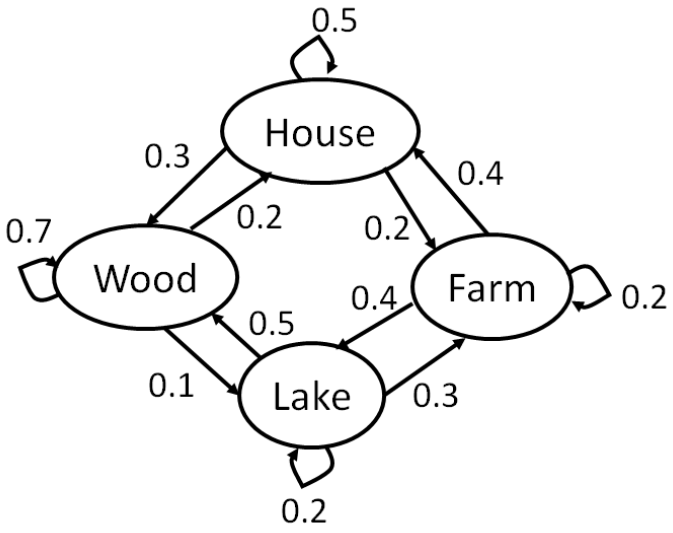
Fake Homework

Presume the following Markov Model



$$\Pi_{House} = 0.4$$

$$\Pi_{Farm} = 0.2$$

$$\Pi_{Woods} = 0.3$$

$$\Pi_{Lake} = 0.1$$

1. What is the probability of each of the following state sequences?

   (a) Farm, House, Farm, Lake

   (b) Woods, Woods, Farm, House, Farm

   (c) Farm, Farm, House

Let us expand the above model to be a full HMM using the emission probabilities below: $\boldsymbol{\phi_{i,j} = P(o_t = x_i | q_t = s_j)}$:

q\o	quack	woof	television	roar	bah	speech
House (locat 1)	0.1	0.2	0.3	0	0.1	0.3
Farm (locat 2)	0.3	0.2	0	0	0.4	0.1
Woods (locat 3)	0.1	0.3	0	0.6	0	0
Lake (locat 4)	0.7	0.1	0	0	0	0.2

(For reference, you can presume a duck quacks, a dog woofs, a bear roars, a sheep bahs, and a human speaks.)

2. What is the probability of each of the following sequences of states and observations:

   (a) P(q_1=Woods, o_1=woof, q_2=House, o_2=bah)

(b) P(q_1=House, o_1=woof, q_2=Farm, o_2=speech)

(c) P(q_1=Woods, o_1=roar, q_2=Woods, o_2=quack)

3. Suppose we observe the following sounds in order:

o_1=woof, o_2=roar, o_3=quack

Given the observations above:

(a) Use the Viterbi algorithm to assess the most likely set of states.

As you work on this problem, provide the values for

(b) $\delta_1(Farm)$
(c) $\delta_2(Woods)$