

Exercise set 14: Markov Models

These problems are three of the four examples done in the notes. Trying to do them on your own will let you know if you have understood the material. Refer to [the "Four examples" PDF file](#) if you get stuck.

1. Consider the state transition matrix:

$$\begin{array}{cc} & \begin{array}{cc} a & b \end{array} \\ \begin{array}{c} a \\ b \end{array} & \begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix} \end{array}$$

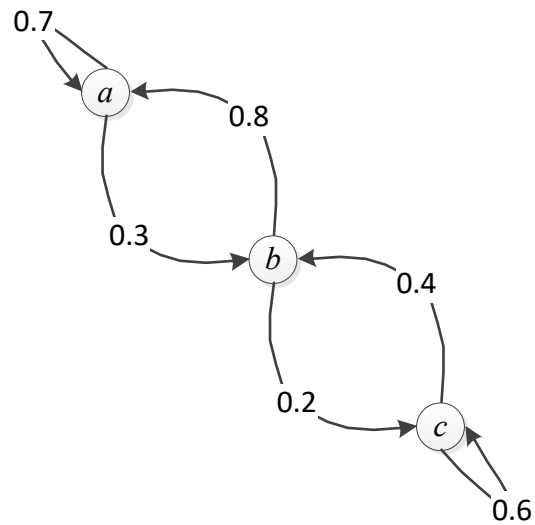
- Draw the graph for this matrix.
- Calculate the equilibrium distribution of this system algebraically.
- Check that your answer in b. is reasonable by multiplying the matrix by itself several times and seeing if the results tend toward your answer in b.

2. Consider the state transition matrix:

$$\begin{array}{ccc} & \begin{array}{ccc} a & b & c \end{array} \\ \begin{array}{c} a \\ b \\ c \end{array} & \begin{bmatrix} 0.8 & 0.1 & 0.1 \\ 0.1 & 0.7 & 0.2 \\ 0.2 & 0.2 & 0.6 \end{bmatrix} \end{array}$$

- Draw the graph for this matrix.
- Calculate the stable distribution of this system algebraically.
- Check that your answer in b. is reasonable by multiplying the matrix by itself several times and seeing if the columns tend toward your answer in b.

3. Consider the directed graph below where the vertices represent states and the weights on the edges represent the probabilities of moving from one state to another.



- Draw the state transition matrix for the graph.
- What is the long-term stable distribution of this system?