APP MTH 3020 Stochastic Decision Theory

Tutorial 5

Week 11, Friday, October 19

1. On Gallifrey, it is either sunny, rainy or foggy, and it is interesting to attempt to predict what the weather will do tomorrow. We have the following table of probabilities of what tomorrow's weather will be like given today's weather, based on historical data.

		Tomorrow		
		Sunny	Rainy	Foggy
Today	Sunny	0.8	0.05	0.15
	Rainy	0.2	0.6	0.2
	Foggy	0.2	0.3	0.5

Table 1: Probabilities of tomorrow's weather based on today's weather.

   a. Draw a state diagram of this process.
   b. Given that today is sunny, what is the probability that tomorrow is sunny and that the day after is rainy?
   c. Given that today is foggy, what's the probability that it will be rainy in two days from now?

2. On Gallifrey people also use umbrellas. If you find yourself locked in a room, the only piece of evidence about the weather outside is if your keeper is carrying your daily meal enter that room with an umbrella or not. Suppose that the probability of seeing an umbrella based on the weather is as shown in the following table.

	Probability of umbrella
Sunny	0.1
Rainy	0.8
Foggy	0.3

Table 2: Probabilities of seeing an umbrella based on the weather.

   a. The day you were locked in the room, it was sunny and the next day the keeper carried an umbrella. Assuming that the prior probability that the keeper carries an umbrella is 0.5, what is the probability that the second day was rainy?
   b. Again, suppose that the day you were locked in the room, it was sunny and the next day the keeper carried an umbrella, but not on day 3. Assuming again that the prior probability that the keeper carries an umbrella is 0.5, what is the probability that it is foggy on day 3?