CMP9132M, Advanced Artificial Intelligence
Workshop Week 5: Markov Models

Task

Consider the "weather" example mentioned during the lecture. In this case though, the random variable w_t can assume, with same probability, any of the following four values: Sunny (S), Rainy (R), Foggy (F), Windy (W). For simplicity, only one of these weather states can occur at any given time t (e.g. it cannot be both Rainy and Windy). In addition, we assume the weather changes can be represented by a Markov Model with the transition probabilities specified in the table below.

1) Formalize, using appropriate mathematical notation, the following problem statement:

> What is the probability of having two particular weather states w_{t+1} and w_t , given the known weather states w_{t-1} and w_{t-2} ?

2) What is the probability (i.e. numerical value) of having w_{t+1} = Sunny and w_t = Rainy, given that w_{t-1} = Foggy and w_{t-2} = Windy?

3) What is the probability of having two consecutive days with the same weather, $w_{t+1} = w_t$, given w_{t-1} = Rainy and w_{t-2} = Sunny?

4) Using a programming language of your choice, write a simple program that solves the problem stated in 1) for each possible value of w_{t+1} , w_t , w_{t-1} , w_{t-2} , where these are four inputs given by the user.

Transition Probabilities

$P(w_t \mid w_{t-1})$	Sunny	Rainy	Foggy	Windy
Sunny	0.5	0.2	0.1	0.2
Rainy	0.1	0.6	0.1	0.2
Foggy	0.4	0.4	0.1	0.1
Windy	0.1	0.2	0.1	0.6