Assignment 3 – Jakub Rysiak

Excercise 1

The two variables that we encounter in the umbrella world are the binary variable that can be either rain or no rain, and the observable variable umbrella, which can also only be true or false.

Hence the unobserved variable for time-slice t would be: $X_t = \{R_t\}$, which can have value rain or not-rain.

The observed variable set E_t would be: $E_t = \{U_t\}$, which can similarly be umbrella or not-ubrella

The Dynamic model $P(X_t \mid X_{t-1})$ also known as the transition matrix represents the probabilities of going from one state to the other, in this case it would look like this:

	R	¬R
R	0.7	0.3
¬R	0.3	0.7

The observation model $P(E_t \mid X_t)$ also known as the sensor model, shows the probability of an evidence variable given the state variable, in this case it would be:

	U	¬U
R	0.9	0.1
¬R	0.2	0.8

Which in this case means that If R is true, then there is 0.9 chance for umbrella, and 0.1 chance for the lack of umbrella. If it doesn't rain, the chance for umbrella is 0.2, and the chance for not umbrella is 0.8.

HMM assumptions

1. The first assumption in this model is that the next state of weather is only dependent on the current state, which in this case is not completely reasonable, since it can be dependent on the season and how many days it has rained.
2. The other assumption is that the only thing that affects whether umbrella is true is weather, which I would say is reasonable since there aren't many other reasons to bring an umbrella. There are possibly some things that could make the person not take it with them, such as being in a rush, but it is not unreasonable to assume weather is the main predictor.