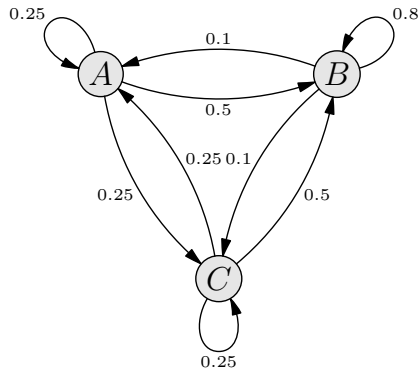


project 16: Markov chains for predictions

Consider once again our Markov model λ_2 and the corresponding transition matrix P_2 for the behavior of “guarding the treasure in room B ”



$$P_2 = \begin{bmatrix} 0.25 & 0.10 & 0.25 \\ 0.50 & 0.80 & 0.50 \\ 0.25 & 0.10 & 0.25 \end{bmatrix}$$

task 16.1: the likelihood of a future event

Given λ_2 , compute the *log-likelihood* of the event “if an NPC is currently in room B , it will stay there for the next τ time steps and then move to another room”. That is compute the log-likelihood

$$\mathcal{L}(X_0 = B, X_1 = B, \dots, X_\tau = B, X_{\tau+1} \neq B)$$

Recall that this log-likelihood amounts to

$$\begin{aligned} \mathcal{L} &= \sum_{t=0}^{\tau-1} \ln p(X_{t+1} = B \mid X_t = B) + \ln(1 - p(X_{\tau+1} = B \mid X_\tau = B)) \\ &= \tau \cdot \ln p(X_{t+1} = B \mid X_t = B) + \ln(1 - p(X_{\tau+1} = B \mid X_\tau = B)) \end{aligned}$$

Compute the value of this expression for $\tau \in \{5, 10, 100\}$.

task 16.2: the likelihood of another future event

For λ_2 and $\tau \in \{5, 10, 100\}$, compute the *log-likelihood* of the event “if an NPC is currently in room B , it will stay there for the next τ time steps and then move to room C ”.

task 16.3: the likelihood of yet another future event

For λ_2 and $\tau \in \{5, 10, 100\}$, compute the *log-likelihood* of the event “if an NPC is currently in room B , it will not enter room A for the next τ steps in time”.