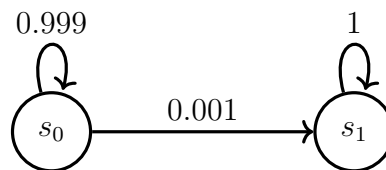


Quantitative Verification – Exercise sheet 5

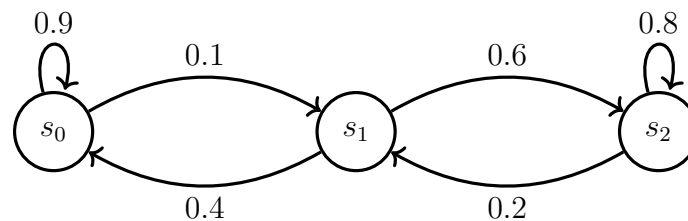
Exercise 5.1

Compute the probability of reaching s_1 from s_0 in the following simple Markov Chain. Additionally, compute the probability of reaching s_1 within 10 steps.



Exercise 5.2

Write down the matrix representation of the following Markov Chain. Suppose the initial distribution is $\pi_0 = [1, 0, 0]$, i.e. the process starts in s_0 . What is the transient distribution after three time steps?



Remark. Download and install the PRISM Model Checker from <http://www.prismmodelchecker.org/download.php> or <https://github.com/prismmodelchecker/prism/releases>.

Solution 5.1

Probability of reaching s_1 in n steps is $1 - (0.999)^n$. As $n \rightarrow \infty$, probability $\rightarrow 1$.

Solution 5.2

Matrix representation of the given Markov Chain is:

$$P = \begin{bmatrix} 0.9 & 0.1 & 0 \\ 0.4 & 0 & 0.6 \\ 0 & 0.2 & 0.8 \end{bmatrix}$$

Transient distribution after 3 steps is $\pi_0 P^3 = [0.801 \quad 0.097 \quad 0.102]$.