

MTH 371: Assignment II

November 17, 2024

Instructions

- Use statistical software R/Python for your codes.
- Only basic built-in functions available in R/Python are allowed.
- In each question, show the simulations with relevant graphs.
- Due date is November 26, 2024 (11.59 p.m. IST). No late assignments will be accepted.
- Submit all of your work which include the codes, results, graphs and reports.

1. (5 Marks) Let us assume writing a paper has four stages; read (r), write (w), e-mail (e), surf (s). It is studied as a finite state discrete time Markov chain. The one step transition probability is given by

$$P = \begin{matrix} & \begin{matrix} r & w & e & s \end{matrix} \\ \begin{matrix} r \\ w \\ e \\ s \end{matrix} & \begin{pmatrix} 0.5 & 0.3 & 0 & 0.2 \\ 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.3 & 0.3 \\ 0 & 0.2 & 0.3 & 0.5 \end{pmatrix} \end{matrix}$$

Assume that $X_0 = r$, simulate a Markov Chain for first N steps.

2. (5 Marks) Let there be a discrete time Markov chain with the state space $S = \{0, 1, 2\}$. The one step transition probability is given by

$$P = \begin{bmatrix} 0.7 & 0.2 & \\ 0.4 & & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

It is given that when the process starts the MC was in state 1. Answer the following.

- (a) Find the missing probabilities.
- (b) What will be P^{10} , P^{20} , P^{50} . What do you observe.