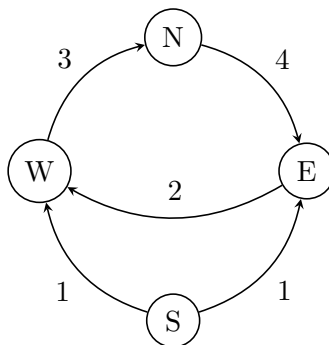


Discussion 9

Fall 2021

1. Jump Chain Stationary Distribution

Use properties of transient states and the jump chain to find the stationary distribution of this CTMC.



2. Two-Server System

A company has two servers (the second server is a backup in case the first server fails, so only one server is ever used at a time). When a server is running, the time until it breaks down is exponentially distributed with rate μ . When a server is broken, it is taken to the repair shop. The repair shop can only fix one server at a time, and its repair time is exponentially distributed with rate λ . Find the long-run probability that no servers are operational.

3. Gaussians and the MSE

Suppose you draw n i.i.d. data points $(x_1, y_1), \dots, (x_n, y_n)$, where n is a positive integer and the true relationship is $Y = WX + \varepsilon$, $\varepsilon \sim \mathcal{N}(0, \sigma^2)$. (That is, Y has a linear dependence on X , with additive Gaussian noise.) Show that finding the MLE estimate of W given the data points $\{(x_i, y_i) : i = 1, \dots, n\}$ is equivalent to minimizing the cost function

$$J(w) = \sum_{i=1}^n (y_i - wx_i)^2$$