Markov Chains : ergodicity

A Markov Chain $\{X_t\}_{t \geq 0}$ is said to be ergodic if it is irreductible, aperiodic, there exists a unique stationary distribution and it converges to stationarity.

example of an ergodic Markov Chain on the state space $\mathcal{X} = \{1, 2, 3\}$ with transition matrix (or transition Kernel)

$$P = \begin{pmatrix} 0.5 & 0.5 & 0 \\ 0.25 & 0.5 & 0.25 \\ 0 & 0.5 & 0.5 \end{pmatrix}$$

We can prove that this Markov Chain cummulates the four properties necessary to make it ergodic.

Ergodicity ensures that a MCMC method samples from the correct stationary distribution.