

Necessary and Sufficient Conditions for Recurrence and Transience of Markov Chains, in Terms of Inequalities

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Abstract

For an aperiodic, irreducible Markov chain with the non-negative integers as state space it is shown that the existence of a solution to $\sum_{j=0}^{\infty} p_{ij} y_j \leq y_i ; i \geq N > 0$ in which $y_i \rightarrow \infty$ is necessary and sufficient for recurrence, and the existence of a bounded solution to the same inequalities, with $y_k < y_0, \dots, y_{N-1}$ for some $k \geq N$, is necessary and sufficient for transience.

Keywords: RECURRENCE, TRANSIENGE