

Representation and Characterization of Quasistationary Distributions for Markov Chains

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We consider Quasistationary Distributions (QSDs) for Markov chains with a unique absorbing state and an irreducible set of non-absorbing states. As is well-known, every QSD has an associated absorption parameter describing the exponential tail of the absorption time under the law of the process with the QSD as the initial distribution. The analysis associated with the existence and representation of QSDs corresponding to a given parameter is according to whether the moment generating function of the absorption time starting from any non-absorbing state evaluated at the parameter is finite or infinite, the finite or infinite moment generating function regimes, respectively. We provide necessary and sufficient conditions for the existence and uniqueness of QSDs in each regime and obtain representation formulas for them. In the finite regime, all QSDs are in the convex hull of a Martin entry boundary associated with the parameter. In the infinite when a QSD exists, it is unique and can be represented by a renewal-type formula. Applications include new perspectives on existing results in the field.

In Special Session 51 on Discrete Stochastic Models and Applications at the Mathematical Congress of the Americas 2025.