Título: Denumerable Markov Chains. Generating Functions, Boundary Theory, Random Walks O

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Sinopsis

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Markov chains are among the basic and most important examples of random processes. This book is about time-homogeneous Markov chains that evolve with discrete time steps on a countable state space.

A specific feature is the systematic use, on a relatively elementary level, of generating functions associated with transition probabilities for analyzing Markov chains. Basic definitions and facts include the construction of the trajectory space and are followed by ample material concerning recurrence and transience, the convergence and ergodic theorems for positive recurrent chains. There is a side-trip to the Perron-Frobenius theorem. Special attention is given to reversible Markov chains and to basic mathematical models of population evolution such as birth-and-death chains, Galton-Watson process and branching Markov chains.

A good part of the second half is devoted to the introduction of the basic language and elements of the potential theory of transient Markov chains. Here the construction and properties of the Martin boundary for describing positive harmonic functions are crucial. In the long final chapter on nearest neighbor random walks on (typically infinite) trees the reader can harvest from the seed of methods laid out so far, in order to obtain a rather detailed understanding of a specific, broad class of Markov chains.

The level varies from basic to more advanced, addressing an audience from master's degree students to researchers in mathematics, and persons who want to teach the subject on a medium or advanced level. Measure theory is not avoided; careful and complete proofs are provided. A specific characteristic of the book is the rich source of classroom-tested exercises with solutions.

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