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Woess, Wolfgang
Markov chains and discrete potential theory. (Catene di Markov e teoria del potenziale nel discreto). (Italian)
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This book is entirely devoted to the study of Markov chains on finite or enumerable spaces. It comes from a series of lectures given by the author, and constitutes essentially a clear and accessible basic course on the theory of Markov chains on discrete spaces, only assuming that basic notions of probability theory are known. All along, several examples are given and discussed. So in particular the notions of irreducibility, periods, recurrence, invariant measure and convergence to it, random walks (mainly on finite groups and on trees) are introduced, the whole with some emphasis on generating functions. The course moves then towards the potential theory of discrete chains, introducing (super)harmonicity, induced chains, Riesz decomposition, domination principle. The book is finally completed with two chapters on Martin boundary, developing the concepts of supermartingale, excessive measure, minimal and Poisson boundaries, and establishing the convergence at boundary and the representation of superharmonic functions. The examples of random walks on $\mathbb{Z}^d$ and on infinite trees are eventually discussed in detail.

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