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Nota di contenuto	Front matter -- Contents -- Preface -- PART 1. Preliminaries -- Chapter One. Introduction to Probability and Random Variables -- Chapter Two. Introduction to Information Theory -- Chapter Three. Nonnegative Matrices -- PART 2. Hidden Markov Processes -- Chapter Four. Markov Processes -- Chapter Five. Introduction to Large Deviation Theory -- Chapter Six. Hidden Markov Processes: Basic Properties -- Chapter Seven. Hidden Markov Processes: The Complete Realization Problem -- PART 3. Applications to Biology -- Chapter Eight. Some Applications to Computational Biology -- Chapter Nine. BLAST Theory -- Bibliography -- Index -- Back matter
Sommario/riassunto	This book explores important aspects of Markov and hidden Markov processes and the applications of these ideas to various problems in computational biology. The book starts from first principles, so that no previous knowledge of probability is necessary. However, the work is rigorous and mathematical, making it useful to engineers and mathematicians, even those not interested in biological applications. A range of exercises is provided, including drills to familiarize the reader with concepts and more advanced problems that require deep thinking about the theory. Biological applications are taken from post-genomic biology, especially genomics and proteomics. The topics examined

include standard material such as the Perron-Frobenius theorem, transient and recurrent states, hitting probabilities and hitting times, maximum likelihood estimation, the Viterbi algorithm, and the Baum-Welch algorithm. The book contains discussions of extremely useful topics not usually seen at the basic level, such as ergodicity of Markov processes, Markov Chain Monte Carlo (MCMC), information theory, and large deviation theory for both i.i.d and Markov processes. The book also presents state-of-the-art realization theory for hidden Markov models. Among biological applications, it offers an in-depth look at the BLAST (Basic Local Alignment Search Technique) algorithm, including a comprehensive explanation of the underlying theory. Other applications such as profile hidden Markov models are also explored.