1. Record Nr. UNINA9910254291403321

Autore	Lanchier Nicolas
Titolo	Stochastic Modeling / / by Nicolas Lanchier
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2017
ISBN	3-319-50038-4
Edizione	[1st ed. 2017.]
Descrizione fisica	1 online resource (XIII, 303 p. 63 illus., 6 illus. in color.)
Collana	Universitext, , 0172-5939
Disciplina	003.76
Soggetti	Probabilities Mathematical models Probability Theory and Stochastic Processes Mathematical Modeling and Industrial Mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	1. Basics of Measure and Probability Theory -- 2. Distribution and Conditional Expectation -- 3. Limit Theorems -- 4. Stochastic Processes: General Definition -- 5. Martingales -- 6. Branching Processes -- 7. Discrete-time Markov Chains -- 8. Symmetric Simple Random Walks -- 9. Poisson Point and Poisson Processes -- 10. Continuous-time Markov Chains -- 11. Logistic Growth Process -- 12. Wright-Fisher and Moran Models -- 13. Percolation Models -- 14. Interacting Particle Systems -- 15. The Contact Process -- 16. The Voter Model -- 17. Numerical Simulations in C and Matlab.
Sommario/riassunto	Three coherent parts form the material covered in this text, portions of which have not been widely covered in traditional textbooks. In this coverage the reader is quickly introduced to several different topics enriched with 175 exercises which focus on real-world problems. Exercises range from the classics of probability theory to more exotic research-oriented problems based on numerical simulations. Intended for graduate students in mathematics and applied sciences, the text provides the tools and training needed to write and use programs for research purposes. The first part of the text begins with a brief review of measure theory and revisits the main concepts of probability theory, from random variables to the standard limit theorems. The second part

covers traditional material on stochastic processes, including martingales, discrete-time Markov chains, Poisson processes, and continuous-time Markov chains. The theory developed is illustrated by a variety of examples surrounding applications such as the gambler's ruin chain, branching processes, symmetric random walks, and queueing systems. The third, more research-oriented part of the text, discusses special stochastic processes of interest in physics, biology, and sociology. Additional emphasis is placed on minimal models that have been used historically to develop new mathematical techniques in the field of stochastic processes: the logistic growth process, the Wright–Fisher model, Kingman's coalescent, percolation models, the contact process, and the voter model. Further treatment of the material explains how these special processes are connected to each other from a modeling perspective as well as their simulation capabilities in C and Matlab™.