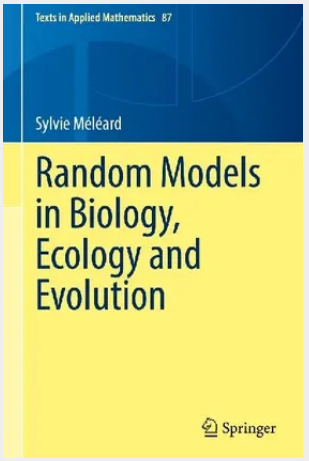
Méléard

Random Models in Biology, Ecology and Evolution



This book defines and develops probabilistic tools for modeling populations, describing the dynamics of biological quantities such as population size, allele proportions, and individual locations. Beginning with discrete Markovian models (random walks, Galton–Watson processes), it gradually introduces stochastic calculus, stochastic differential equations, and jump Markov processes, including continuous-time branching processes and birth-and-death processes. It also explores discrete and continuous models of genetic evolution, genealogies, and the Wright–Fisher process and coalescent theory. Throughout, the book emphasizes the computation of biologically relevant quantities and includes numerous exercises. The final chapter demonstrates the application of probabilistic tools to real-world biological problems and discusses recent research in detail.

Written and course-tested by a leading expert, this book offers a solid foundation in the mathematical modeling of biological systems, population dynamics, genetic evolution, and ecological impact.

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