

BOOK REVIEW

Chin Long Chiang, *An Introduction to Stochastic Processes and their Applications*, Robert E. Krieger Publishing Co., New York, 1980, 544 pp + Index, \$36.50

This book is a revised and expanded version of part I of the book *Introduction to Stochastic Processes in Biostatistics* published by the same author in 1968. The book is ideal for studying mathematical modeling in Biology and Medicine, and also contains one chapter for engineering-related queueing processes. The required mathematical techniques are self-contained. Readers with basic knowledge in mathematical statistics will find this book an excellent source of material to learn the theory and applications of stochastic processes.

Chapter 1 contains a review of basic concepts about random variables, emphasizing conditional arguments. Probability generating functions, as discussed in Chapter 2, are treated as the backbone for discrete state stochastic processes, throughout the book. Chapter 3 is concerned with exponential-type distributions and maximum likelihood estimation. Chapters 4 through 6 are basic treatments of Markov chains and their applications. The gambler's ruin problem is discussed in the context of difference equations. Renewal processes, which are extensions of Poisson processes, are discussed in Chapter 7. It would be more logical to introduce the Poisson process back in Chapter 3 because of its association with the exponential distribution, and of its extension to renewal processes. Chapters 8 and 9 consider some stochastic models for population growth, including Poisson processes, birth processes, death processes, migration processes, and epidemic models. The appendix on first-order differential equations is very helpful and instructional. Chapter 10 is concerned with queueing system and birth and death process. The next three chapters, as well as Chapter 16, provide detailed discussion of various illness-death processes which have many applications in medicine. The basic theories of continuous time Markov processes are used in Chapters 14 and 15 to give solutions to the transition probabilities of finite Markov processes. Finally, Chapter 17 gives an introduction to the general birth-illness-death process.

The book presents a broad spectrum of topics related to theory and applications of stochastic processes in biology and medicine. It serves as a good textbook both for mathematicians and for biologists with a strong mathematical background.

There is no discussion of how to estimate or test the parameters of the models except where the maximum likelihood estimator is mentioned. Any real application of a model always needs to extend to the point where data and model match.

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