IIE Transactions (2008) **40**, 160

ISSN: 0740-817X print / 1545-8830 online
DOI: 10.1080/07408170701623260

Book review

Probability and Random Processes

V. Krishnan

John Wiley & Sons, Inc., Hoboken, N.J., 2006, ISBN 0-471-70354-0, 707 pp.

There are quite a number of text books and monographs on the topics of probability theory, random processes and their applications to science and engineering, ranging from very basic to rather advanced levels. Given this fact, one naturally wonders what might be novel or different about another book on these subjects.

Because of its significant difference in scope and coverage, *Probability and Random Processes* by V. Krishnan is a new and welcome addition to the literature. It is different in scope in that it is a one-stop reference guide that would serve as the guiding light for graduate students, faculty, practicing engineers and scientists from quite a variety of disciplines. It is different in coverage in that it incorporates topics that are usually covered in at least two levels: (i) the senior/first year graduate level (Chapters 1–15); and (ii) the second level course on more advanced topics (Chapters 16–23). As a reference guide it is not simply a compendium of rules and formulae. The author very meticulously develops the theory and illustrates that theory with numerous examples taken from different domains of study.

The book is composed of 23 chapters and seven appendices. Chapters 1–3 introduce the reader to the basic concepts from the algebra of sets, the basic axioms of probability, and the fundamental ideas from the principles of counting and combinatorics. Chapters 4–7 provide a detailed overview of the notion of random variables covering both discrete and continuous types. The author provides an unusual array of examples covering eight discrete and over 18 types of continuous distributions that arise in many application areas including finance, insurance, communication theory, and other engineering disciplines. The important concepts relating to conditional distributions, Bayes theorem, joint densities, moments, and characteristic/moment generating functions are treated extensively in Chapters 8–11. A thorough characterization of the properties of functions of random variables is developed in Chapters 12 and 13.

Many of the fundamental concepts that are key to random analysis include various inequalities such as Chebyshev, Markov, Chernoff bounds and different notions of convergence of a sequence of random variables. These topics are covered in Chapter 14. Numerical algorithms for generating a sequence of random variables from a given distribution is quite basic to any simulation study and this topic is very well covered in Chapter 15. After a brief introduction to key results from matrix algebra in Chapter 16, Chapter 17 develops the important tools for characterizing the properties of random vectors. Chapter 18 contains an extensive coverage of many key results from the theory of point estimation and hypothesis testing. Chapters 19 and 20 very carefully develop the theory of random processes and their classification with several standard examples. Chapter 21 covers the important topic of characterizing the output of a linear system when excited by a random process. This is basic to the design of various types of filters in communications theory.

Chapter 22 provides a comprehensive coverage of the now classical Wiener and Kalman filtering. The concluding Chapter 23 provides an excellent overview of the probabilistic methods in transmission tomography.

The Appendices range from an overview of Fourier transforms to a detailed set of tables for several standard distributions. The book contains well over 300 worked examples, 400 figures and a wide array of tables with complementing facts.

The author deserves congratulations for aggregating such a wide ranging set of results under one cover and for having developed a one-stop reference guide that would serve well the needs of a wide ranging community of students, teachers and researchers.

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