Probability and Random Processes, by Venkatarama KRISHNAN, Hoboken, NJ: Wiley-InterScience, Wiley Survival Guides in Engineering and Science, 2006, ISBN-13 978-0-471-70354-9, xiii + 723 pp., $125.00.

This book is an introduction to probability and random processes for engineering scientists, written by an engineering scientist. The book is designed to give senior undergraduates and beginning graduate students in engineering and physical sciences a thorough understanding of the modern concepts of probability theory, mathematical statistics, stochastic processes and linear signal systems with their associated Wiener and Kalman filters.

The text consists of 23 chapters and seven appendices. The first 13 chapters are devoted to probability and distribution theory. To promote the usual axioms, definitions, theorems, etc., practical applications, numerous examples, multiple graphs, and many visual aids are interlaced smoothly into the storyline. Chapter 14 provides some basic inequalities commonly used throughout the text (Chebyshev, Markov, Chernoff, Cauchy–Schwartz, and Jensen inequality) and develops the central limit theorem as well as the weak and strong law of large numbers. One of the book's strengths is its thematic focal point, guiding the reader to better understand the theoretical aspects developed throughout Chapters 1–14. Therefore, Chapter 15 builds up some techniques of generating random variates from some special type of distributions and in turn presents overlaying histograms with their specific densities, checking the goodness of fit. Chapters 16 and 17 introduce various matrix properties, discusses several aspects of matrix algebra and applies these to Gaussian random vectors. At this point, the author recognizes that the reader must have some familiarity of vector spaces. Chapter 18 provides a few elements of point estimation (bias, mean square error, consistency, maximum likelihood, and efficiency). The author develops a more comprehensive understanding of the definitions stated above for the regression model and then continues providing aspects on interval estimation and hypothesis testing. Extensive discussions and illustrations are also given to explain the meaning of type one and two errors. The chapter is completed by showing numerous examples of how Bayesian estimation is used. The rest of the text is focused on the principles and advanced techniques in various subjects in stochastic processes and their application in the analysis of random phenomena observed in engineering and the physical sciences. Emphasis is given on the principles and procedures of spectral analysis, Poison processes, and Brownian motions as well as moving average, autoregressive, and independent increment processes. Elements on martingale theory are also stated. Finally, Chapters 21–23 provide an overview of linear systems filtering and their applications.

The style and focus combined makes this book an excellent read for students who wish to deepen and enrich their understanding of random processes using various techniques from statistical analysis. As the author points out, the strength of the text is the development of the theory using numerous examples (over 300 examples) followed by visual aids (over 400 diagrams). It is written for students who want to span the bridge between their elementary knowledge and modern literature on probability and random processes. This book is suitable for students and practicing engineers that need a quick reference to probability distributions and random processes. This is a great reference tool as an addition to any text on the first course in probability and random processes in engineering and physical sciences. This book does not contain exercises or problems at any section throughout the text. Overall, this book has a very convincing concept. It is an introduction to applied probability, statistics and stochastic process. The reader learns the basics of probability, simulation, statistics and random processes. Theory in probability and statistical analysis are paired with carefully chosen examples on various mathematical and engineering aspects. There are very few typographical errors (see, e.g., eqs. 3.3.8, 3.3.10, p. 359, it should read $\hat{\mathbf{a}}$, etc.). The information is presented in a very manageable format for undergraduates in engineering and it would make a perfect basis for preparing undergraduate lectures on random processes using probabilistic modeling.

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