JOURNAL OF QUALITY TECHNOLOGY
2021, VOL. 53, NO. 3, 332

BOOK REVIEW

Probability, by Lawrence M. Leemis. La Vergne, TN: Lighting Source, 2017, 566 pp., $45.00, ISBN: 978-0-9829-1747-3.

The book covers probability, and mostly distribution models, for undergraduate students who have learned courses in multivariate calculus and linear algebra. Together with another book by the same author, named *Mathematical Statistics*, this book is supposed to be the first course in a mathematical statistics sequence of classes. The book's selection of topics aligns with all the topics associated with Exam P given by the Society of Actuaries and Exam 1 given by the Casualty Actuarial Society. Compared with other textbooks that cover probability, this book arranges multivariate random variables in later chapters, to give readers enough time to get used to working with univariate random variables. And this book has a very detailed presentation of important concepts from basic intuition to concrete mathematical expressions. As the author pointed out in the very beginning of the book, "the purpose of this book is to hone your already-intuitive probability notions into a mathematical framework." After reading this book, I feel that this goal has been neatly achieved and students who have their first exposure to probability would benefit a lot from this detailed textbook. The book also presents R code to implement calculation of some examples or visualize some statistical figures such as the histogram and scatterplot.

The homework problems are comprehensive. There is a progression of the problems that starts with straightforward application of learned concepts to more engaging ones, like the Tanujit's creation, a complex concept that is first graphically displayed, then mathematical articulation jumps in to transform this complex concept into probability density functions. Other examples, the "reckless rectilinear Russell" and the "risk-averse rectilinear Russell," endorse different walking strategies from home to work; graphical display of this everyday practice reveals an interesting analytic intricacy that could be formulated as a probability problem.

The presentation of the topics is also clear and thoughtful. For example, to present the Poisson distribution, two historic trajectories are delineated. One is the interpretation of the Poisson distribution as a numerical approximation of the binomial distribution. There is a detailed illustration of how the limiting distribution of the binomial distribution could be derived, which is shown to have the same form as the Poisson distribution. Another trajectory is more in alignment with the physical processes the Poisson process aims to articulate, the stochastic process when events occur following some patterns. Meticulous efforts are taken to graphically illustrate what the stochastic process looks like and what the assumptions are of the event occurrence that underlie the Poisson distribution. After the distribution model is established, examples are given to illustrate how probabilities could be derived based on the distribution for different situations. This is an example of how concepts in the book are presented. Readers will find their curiosity and questions gradually raised, then sequentially answered. The author carefully decided the order of the information to be presented and provided expanded discussions or illustration, like the various shapes of the beta distribution for different parameter values. There are also many tables that summarize the concepts by listing them together. Compared with the first edition, this second edition is enriched with more concepts, such as the moment-ratio diagrams at the end of Chapter 5 and a univariate distribution relationship chart at the end of Chapter 8.

Shuai Huang
University of Washington
Seattle, WA
shuai.huang.ie@gmail.com

https://doi.org/10.1080/00224065.2020.1764417