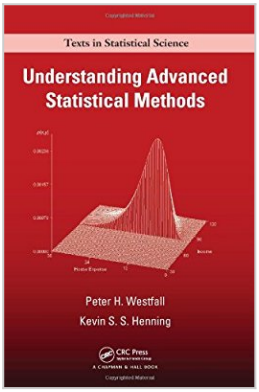

Understanding Advanced Statistical Methods (Chapman & Hall/CRC Texts in Statistical Science)

By Peter Westfall, Kevin S. S. Henning

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Providing a much-needed bridge between elementary statistics courses and advanced research methods courses, **Understanding Advanced Statistical Methods** helps students grasp the fundamental assumptions and machinery behind sophisticated statistical topics, such as logistic regression, maximum likelihood, bootstrapping, nonparametrics, and Bayesian methods. The book teaches students how to properly model, think critically, and design their own studies to avoid common errors. It leads them to think differently not only about math and statistics but also about general research and the scientific method.

With a focus on statistical models as *producers* of data, the book enables students to more easily understand the machinery of advanced statistics. It also downplays the "population" interpretation of statistical models and presents Bayesian methods before frequentist ones. Requiring no prior calculus experience, the text employs a "just-in-time" approach that introduces mathematical topics, including calculus, where needed. Formulas throughout the text are used to explain why calculus and probability are essential in statistical modeling. The authors also intuitively explain the theory and logic behind real data analysis, incorporating a range of application examples from the social, economic, biological, medical, physical, and engineering sciences.

Enabling your students to answer the *why* behind statistical methods, this text teaches them how to successfully draw conclusions when the premises are flawed. It empowers them to use advanced statistical methods with confidence and develop their own statistical recipes. Ancillary materials are available on the book’s website.

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Editorial Review

Review

"This nicely written textbook fills the gap between elementary statistics courses and more advanced research methods courses. The book helps one to grasp the key assumptions and machinery behind advanced statistical topics … Each chapter ends with useful exercises."
?*Mathematical Reviews*, August 2014

"… full of interesting insights and excellent examples and explanations for essential basic statistical concepts. The use of thought experiments; the detailed algebraic developments of proofs; and the explanations of frequentist and Bayesian statistics, confidence intervals, hypothesis testing, and so on, are all first rate. … a solid teaching resource."
?*Australian & New Zealand Journal of Statistics*, 2014

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?*Biometrics*, June 2014

"This book contains just as many formulas as other statistics texts, but with intuitive, engaging, insightful, and irreverent explanations … the authors strive mightily to part the curtain that hides the fundamentals of statistical thinking from most students. … The book has 20 chapters that cover the usual topics, and more, in an undergraduate/graduate math stat text; it is suitable for a fast-paced semester course offered to serious students. The ‘and more’ refers to the strong emphasis throughout the book on thoughtful applications in a wide variety of disciplines. … The coverage of mathematical statistics is extensive and benefits from a substantial effort by the authors to explain the intuition motivating the procedures and the correct interpretation of specific results. … A companion Web site has a wealth of material useful for the instructor and students. … the text represents a successful effort by the authors to advance and improve the statistics education paradigm for courses offered to upper-level undergraduate and graduate students."
?*The American Statistician*, May 2014

"There is a gap between elementary statistics courses and advanced research techniques. This gap is reflected by difficulties in linking statistical theory with its application in the real world. This book is an ideal way to overcome this problem. …
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This book helps to teach students to explore statistics more deeply, avoiding the typical trap of students learning little about the applications of what they are studying and why they are doing it. I think this book will be very useful in the sense that students will be forced to think differently about things, not only about math and statistics, but also about research and the scientific method.
The reviewer enjoyed reading the book and it is worth emphasising its usefulness for teachers, students and researchers."
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"The book covers the content of a typical undergraduate math stat text, but with much more thought to application than a typical text. It appears to be close to Rice's text (*Mathematical Statistics and Data Analysis*) in spirit and level, but perhaps comes closer to that spirit than Rice's. It would be worth considering for a course using Rice. I also recommend it as a reference for anyone teaching applied statistics."
?Martha K. Smith, Professor Emerita of Mathematics, University of Texas at Austin

"I work with scientists who are pioneers in their fields and their ignorance of statistical concepts never ceases to amaze me. I believe most of this can be traced to the way we teach statistics to non-statisticians: as a bag of tools rather than a systematic way to think about data collection and analysis. This book is unique in the way it approaches this topic. It does not subscribe to the cookbook template of teaching statistics but focuses instead on understanding the distinction between the observed data and the mechanisms that generated it. This focus allows a better distinction between models, parameters, and estimates and should help pave a way to instill statistical thinking to undergraduate students."
?Mithat Gönen, Memorial Sloan-Kettering Cancer Center

"**Understanding Advanced Statistical Methods** is an excellent source for the curious student. The book introduces a novel approach to learning statistics by providing comprehensive coverage of concepts in a captivating framework. Students are not only encouraged to understand the intuition and structure behind the concepts, but also motivated to think seriously about the pertinent questions before they ask. Therefore, the book strives to build a solid background in fundamental concepts and to equip students with the necessary skills so that they can expand their toolbox in their future endeavors. The book will no doubt be the standard reference in advanced statistics courses and bring about profound changes in how statistics should be taught."
?Ozzy Akay, Assistant Professor, Texas Tech University

"Don't let the authors' exuberant and iconoclastic style fool you into thinking that this book is not a serious text. It definitely is. The style has a purpose?to romp around the field's sacred cows and show the reader as quickly as possible the real working principles behind how statistical methods are developed and some of the methods' most important applications. In that sense, the subject of the book truly is theoretical statistics, but both the motivation and the presentation are so thoroughly grounded in practice that many readers will see it as a practical guide. But the authors don't intend for it to be a statistical cheat sheet: each of their many engaging and illuminating examples points forward to more that could be studied, and invites readers to pursue those studies. This isn't the last statistics textbook students will ever need, but it should be the first."
?Randy Tobias, Director, Linear Models R&D, SAS Institute Inc.

About the Author

Peter H. Westfall is the Paul Whitfield Horn Professor of Statistics and James Niver Professor of Information Systems and Quantitative Sciences at Texas Tech University. A Fellow of the ASA and the AAAS, Dr. Westfall has published several books and over 100 papers on statistical theory and methods. He also has won several teaching awards and is the former editor of *The American Statistician*. He earned a PhD in statistics from the University of California, Davis.

Kevin S.S. Henning is a clinical assistant professor of business analysis in the Department of Economics and International Business at Sam Houston State University, where he teaches business statistics and forecasting. He earned a PhD in business statistics from Texas Tech University.

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