Foundations of Statistical Algorithms: With References to R Packages (Chapman & Hall/CRC Computer Science & Data Analysis)

By Claus Weihs, Olaf Mersmann, Uwe Ligges

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A new and refreshingly different approach to presenting the foundations of statistical algorithms, **Foundations of Statistical Algorithms: With References to R Packages** reviews the historical development of basic algorithms to illuminate the evolution of today's more powerful statistical algorithms. It emphasizes recurring themes in all statistical algorithms, including computation, assessment and verification, iteration, intuition, randomness, repetition and parallelization, and scalability. Unique in scope, the book reviews the upcoming challenge of scaling many of the established techniques to very large data sets and delves into systematic verification by demonstrating how to derive general classes of worst case inputs and emphasizing the importance of testing over a large number of different inputs.

Broadly accessible, the book offers examples, exercises, and selected solutions in each chapter as well as access to a supplementary website. After working through the material covered in the book, readers should not only understand current algorithms but also gain a deeper understanding of how algorithms are constructed, how to evaluate new algorithms, which recurring principles are used to tackle some of the tough problems statistical programmers face, and how to take an idea for a new method and turn it into something practically useful.

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Editorial Review

Review

"My main take away is that these authors spend a lot of time thinking about issues that I never think about. They argue strongly that I, as a statistician, should think about them more, and I find their argument compelling. I certainly enjoyed the various flashes of insight into computation I had as I read their book. … The book's case studies … are incredibly detailed and deep, far beyond the case studies typically used to illustrate these methods. … I greatly enjoyed the overall arc of the book and found it quite compelling. … a nice book to have on the shelf in case you find yourself suspicious about something computational, or want to find a case study illustrating some topic in computation."
?Luke W. Miratrix, *Journal of the American Statistical Association*, March 2015

"… it provides the necessary skills to construct statistical algorithms and hence to contribute to statistical computing. And I wish I had the luxury to teach from **Foundations of Statistical Algorithms** to my graduate students … a rich book that should benefit a specific niche of statistical graduates and would-be-statisticians, namely those ready to engage into serious statistical programming. It should provide them with the necessary background, out of which they should develop their own tools."
?Christian Robert on his blog, February 2014

"The book is suitable for readers who not only want to understand current statistical algorithms, but also gain a deeper understanding of how the algorithms are constructed and how they operate. It is addressed first and foremost to students and lecturers teaching the foundations of statistical algorithms."
?Ivan K?ivý, *Zentralblatt MATH* 1296

"… an invaluable resource on several levels. … For a student who wants to become a competent professional in data science, this monograph is an absolute must, with hard-to-find alternatives. For those who are established in the profession, it is a reference to a broad range of issues encountered in everyday practice. Liberally dispensed advice and insights will be particularly appreciated by the practically oriented reader."
?*Mathematical Reviews*, June 2015

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