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Book Review

Bootstrap Methods and their Application. Eds. A. C. Davison and D. V. Hinkley. Cambridge University Press. 1997. Pp. x + 582. £24.95 (paperback), £70.00 (hardback). ISBN 0 521 57391 2 (hardback), 0 521 57471 4 (paperback).

The advent of modern computers has enabled statisticians to make extensive use of simulation both to check the assumptions underlying conventional analyses and to tackle previously intractable problems. Within a frequentist framework, the last 20 years have seen the intensive development of resampling or bootstrap methods for evaluating the properties of estimators, hypothesis testing and model selection, for both independent and dependent data.

This text seeks not only to provide an introduction to bootstrap methods, but also to illustrate their application to a wide range of practical problems. The emphasis on applications is reinforced by the accompanying Splus software, which permits readers to work through the examples and practical exercises in the text for themselves and provides an excellent tool-kit for tackling research problems.

Chapters 2 and 3 present the key bootstrap concepts for independent data, including survival, stratified, finite population, missing and hierarchical data. They consider estimation of bias and standard error, together with simple confidence interval techniques. In addition, the accessible discussion of influence values, which enable an increased understanding of and confidence in bootstrap calculations, is a welcome feature.

The remainder of the book considers detailed application of the bootstrap to a variety of problems. Chapter 4 deals with testing and Chapter 5 confidence intervals, including a comparison of the various methods. Chapter 6 extends these ideas in the context of linear and robust regression, and also considers bootstrap procedures for model selection. Appropriate approaches for non-linear regression techniques, including generalised linear models, are described in Chapter 7, while Chapter 8 deals with more complex data structures such as time series and point processes.

Chapter 9 reviews the multifarious techniques available for reducing the number of bootstrap simulations, and illustrates their use with a number of examples. Potentially one of the more difficult chapters, its contents could help make bootstrap analysis of complex problems computationally feasible. A curtailed account of semi-parametric likelihood inference is given in Chapter 10, and Chapter 11 describes the computer code and illustrates its use.

Ample references are provided by each chapter's bibliographic notes and the concluding bibliography; the subject and example indexes are comprehensive and helpful. Hints and references, but no solutions, are provided for the theoretical problems and computer practicals which conclude each chapter.

While simulation can help researchers avoid tedious mathematical calculations based on dubious assumptions, it does not obviate the need for critical evaluation of the statistical techniques available and their suitability for the problem in hand. The authors illustrate these points with real examples, and this, I believe, represents the particular strength of this book. It should help researchers exploit the power of bootstrap techniques while avoiding the pitfalls.

Overall, this is a timely, comprehensive and well presented text on the bootstrap, which I recommend to statistical practitioners, researchers and students alike.

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