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Multivariate Analysis of Ecological Data using CANCO

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Multivariate Analysis of Ecological Data using CANCO. 2003. Jan Leps and Petr Smilauer. Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211. 269 p. $110 hardback, ISBN 0 521 81409 X. $42 paperback, ISBN 0 521 89108 6.

This book is about understanding and applying multivariate statistical methods useful for analyzing complex ecological problems. Researchers and students seeking to improve their ability to collect and analyze data from field observations and experiments, especially those interested in the response or variation of biotic communities to environmental conditions or experimental manipulation, will find this handbook helpful. The methods discussed are widely used in plant community ecology, as well as other areas in biology.

The book is tutorial in nature. The authors provide advice on how to best apply the multivariate statistical methods using the CANOCO for Windows, a licensed computer program available to readers of the book on a trial basis. The authors also use Statistica for Windows to describe how to implement some methods not available in CANOCO.

The primary focus of the book is on ordination methods although classification methods are mentioned by comparison. The book begins with a coherent introduction to simple ordination methods, followed by a lucid description of constrained ordination methods (RDA, CCA) and permutation tests for testing multivariate statistical hypotheses. Then, a discussion of similarity measures is followed by an overview of classification and regression methods. The book concludes with seven case studies of varying difficulty. These case studies are supported by data sets and project files available from the book Web site.

The case studies comprise about one-third of the text. What sets this book apart, in addition to the case studies, is the use of examples to illustrate all the methods. An appropriate data set is presented for each method and a tutorial is given for implementing the computer programs. The authors do a good job of 1) explaining the concepts underlying each method, 2) illustrating how to use each procedure associated with the method, and 3) interpreting the results of each procedure. More discussion on the drawbacks of each procedure, as well as the differences among them, would help complete the picture.

The students with whom I shared the book wanted more discussion of what criteria a data set should satisfy for a given analysis, although they agreed the intent of the authors was most likely to illustrate each program rather than describe the nuts and bolts of each data analysis. Moreover, the students did say they appreciated the examples, the clear explanations relating the procedures to the biological questions and the availability of the data.

As an applied statistician, I found one or two incidences that need clarification or correction, such as voting against the null hypothesis rejection, p. 67; the relationship between factor analysis and principal coordinates analysis, PcoA, p. 86; testing a null hypothesis at a point, p. 93; and using stepwise selection to refer to forward selection of variables, while ignoring the backward elimination method usually included in the term, p. 70. On the other hand, I valued the references, which are plentiful and up to date. In addition, I enjoyed the authors' sense of humor, an quality rarely found in a statistical text. Overall, I though this was an easy-to-read, thoroughly enjoyable handbook.

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