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Book review

Statistics in Genetics and in the Environmental Science

Edited by LT Fernholz, S Morgenthaler and W Stahel
Birkhauser Verlag, Basel, 2001; 183 pp. £52.22, hardcover.
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Statistics in Genetics and in the Environmental Science is a collection of papers from a statistical conference (Workshop on Statistics and the Sciences in Ascona, Switzerland, 1999). This is a book for serious readers who have had solid and sophisticated statistical training but want to gain insight into how mathematical statistics can be applied to real problems. The 'real problems' cover many seemingly non-overlapping interdisciplinary areas such as DNA microarrays, road traffic pollution, space debris, and so on. One paper proposes a stochastic model for carcinogenic development but does not provide any application to real data. Sometimes it is not even immediately clear as to what the real problems are. For example, two papers at the end propose improved versions of existing statistical methods of principal component analysis and sliced inverse regression, with computer simulations and asymptotic proofs but no data applications. Judging from the title of the book, these two papers appear to be in the wrong place.

In general, although being a mathematical statistician myself, I found that most of the papers contain rather complicated mathematics, which outweighs any aspect of applications. This is presumably due to the fact that all the authors are mathematical statisticians with no biologists, chemists or environmentalists as co-authors. It is unfortunate – although every work in the books seems to be of high quality, most readers will be taken aback or misled by the overwhelming symbols and mathematical formulae. The value of the book can thus be tarnished because it will appeal only to a limited readership.

Nonetheless, one paper stands out, which, I believe, will be read by a wide spectrum of people who are at the forefront of current biological research. It is the work entitled 'Outlier resistance, standardization, and modeling issues for DNA microarray data' by Amaratunga and Cabrera. They give a clear overview of the most crucial statistical issues inherent in microarray data. Their treatment of these issues does not blindly impose some methods or models to the data, but instead, they choose appropriate methods and models that best suited for a particular dataset. The message is that every dataset, albeit all from microarray experiments, is different in nature: different design, different pattern of noise, and different distribution of overall data. Thus, there is no universal black-box-like algorithm that inputs the data and outputs the results. That detailed mathematics of their approaches was published elsewhere perfectly suits the scope for a book that covers so many different areas. If anything, this article would be the main reason for me to buy the book.

Another paper, 'Space debris: Flux in a two dimensional orbit' by Brillinger caught my attention as well. For a person who knows nothing about the aeronautic and astronautic sciences, this article provides a general introduction of how a space phenomenon can be expressed probabilistically and so into mathematical formulae. After quickly reading the first two sections and going through the graphic illustrations, I decided to look up more references for research in this field.

After all, John Tukey was right in saying that the good thing about being a statistician is that we get to play in everybody's backyard. At least this book is an example in which statisticians make contributions to different field of sciences.

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Books received

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Alfonso Martinez Arias and Alison Stewart
Oxford University Press, Oxford. 2002; 410 pp. £28.99, hardback. ISBN 0-19-879284-0.

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Sinauer Associates Inc., Massachusetts. 2002. 603 pp. £42.99, hardback. ISBN 0-87893-916-4.

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John Wiley & Sons, Inc., New York. 2001; 371 pp. $99.95, hardback. ISBN 0-471-37973-5.

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Edited by Michael Syvanen and Clarence I Kado
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