Bookreviews

R. G. DAVIES

COMPUTER PROGRAMMING IN QUANTITATIVE BIOLOGY

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The increasing employment of digital computers in biology has brought about revolutionary changes in many methods of handling field data as well as in the testing and formulation of hypotheses. Although it can hardly be suggested that all biological problems require a numerical or statistical approach there is no doubt that digital computers have become powerful tools in all branches of biology by proving their fascinating ability in statistically grounded analysis of large quantities of data from any conceivable point of view.

In spite of great amount of softwear which has been made available to cover the majority of the commonly encountered problems many a scientist is apt to be at a loss when it comes to deciding which of the ready-made programs is the most suitable to meet his particular requirements or, as the case may be, how to cope with an unconventional problem. On top of that he has often to decide which of the available computers is to be used from the point of view of economy or program modification feasibility. Even though all botanists who use computers are inevitably dependent on the professional programmers they should have a sufficient understanding of programming techniques to be able to take an active part in choosing the optimum computation method to be used in solving their own scientific problems.

The book "Computer Programming in Quantitative Biology" by R. G. DAVIES is an excellent handbook treating the subject in a most instructive way which makes it comprehensible to all who want to gain a quick yet thorough insight into conventional computer-aided statistical methods. It is deliberately oriented towards topics and treatments likely to appeal to the biologist rather than to the statistician or computer scientist.

The subject is presented 16 chapters. The first is devoted to a brief historical survey of the quantitative and mathematical aspects of biology while the second deals with the principles of digital computers, their internal structure and functioning. Chapter 3 presents a synopsis of the major features of Fortran IV which is considered one of the most widely used programming languages. Chapter 4 presents an explanation of three simple statistical programs intended to help the biologist to embark on the use of computer methods. The problems associated with sorting, testing and summarising data are elucidated on eight programs given in chapter 5. Eleven programs presented in the fifth and sixth chapter represent the most common methods used in variance, correlation and regression analysis. The following two chapters give an elementary account of some aspects of matrix algebra which are essential for serious statistical programming; examples are presented in chapters 10—12 dealing respectively with multiple regression and multivariate analysis, nonparametric statistics and fitting theoretical distributions to data.

In chapter 13 the author explains models and computer simulation of complex biological processes. He discusses the difference between deterministic and stochastic models as well as other basic ideas of this very up-to-date method. Probit analysis, single-linkage cluster analysis and estimation of population-size by marking and recapturing is illustrated on three rather sophisticated programs in chapter 14. The last chapter deals with a few general aspects of efficiency in programming including the choice of the most suitable algorithm, economy in computer time, general guides for program testing and orher important connsiderations.

All the programs presented in the book are accompanied by a flow chart and a detailed discussion. They are of primary interest to biologists but they likely to prove equally useful to those involved in other natural sciences. The book is addressed to students with only an elementary knowledge of statistical methods; it is well equipped with literature and features a very rich and comprehensive author and subject index leading to specific aspects of theory.

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