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BOOK REVIEWS

Discriminant Analysis and Statistical Pattern Recognition by Geoffrey J. McLachlan, John Wiley & Sons, Inc., New York, 1992, Pages XV plus 526. Price DM 88.00.

The book starts with the following introduction : "Over the years a not inconsiderable body of literature has accumulated on discriminant analysis, with its usefulness demonstrated over many diverse fields, including the physical, biological and social sciences, engineering and medicine. The purpose of this book is to provide a modern, comprehensive, and systematic account of discriminant analysis, with the focus on the more recent advances in the field".

The introductory chapter in the book deals with the formulation of the problems, decision theoretic approach, sample-based allocation rules, assessment of model fit, error rates of allocation rules, posterior probabilities of group membership, and distances between groups.

The subsequent chapters deal with (i) likelihood based approaches to discrimination, (ii) discrimination via normal theory based models, (iii) distributional results for normal-based discriminant rules, (iv) practical applications of discriminant analysis, (v) data-analytic considerations with normal-based discriminant analysis, (vi) parametric discrimination via nonnormal models for feature variables, (vii) a semiparametric approach to the study of the widely used logistic model for discrimination, (viii) nonparametric approaches to discrimination, especially kernel discriminant analysis, (ix) assessment of various error-rates of a sample-based discriminant rule, (x) selection of suitable feature variables using a variety of criteria, and (xi) statistical analysis of image data.

This book is clearly not a textbook but an excellent monograph. It presents a wide spectrum of research work on classification and discrimination published during the period 1927-1990. About 1200 references have been cited. Surely a book of about 500 pages cannot provide an exhaustive bibliography. However, it is unfortunate that a few major historical papers have not been cited. In particular, the following papers deserve to be cited in this comprehensive monograph : Benington R.C. and Pearson K. (Biometrika, 1911-12), Ryley, K.V., Bell, J. and Pearson, K. (Biometrika, 1913); Tildesly, M.L. (Biometrika, 1921), Pearson, K. (Biometrika, 1926), Pearson, K. (Biometrika, 1928), Mahalanobis, P.C. (Biometrika, 1930), Mahalanobis, P.C. (Jour. Asiat. Soc. Bengal, 1930), Mahalanobis, P.C., Majumder, Rao, C.R. (Sankhyā, 1949), Rao, C.R. (Biometrika, 1948), Bose, R.C. and Roy, S.N. (Sankhyā, 1938). Besides these,

some important papers on classifiability, nearest neighbour rules and classification into multivariate normal distributions have not been included in the list of references.

The book presents proofs of a few results; one has to go to the original sources for almost all results presented including some major ones. The book mainly emphasizes the theoretical developments and very few applications to concrete data sets have been presented.

The criticisms given above may be ignored in view of the commendable work by the author. This is the first comprehensive monograph on discrimination and statistical pattern recognition. The other books and monographs available on this topic are either specialised, selective or unsatisfactory from statistical viewpoint. The major bulk of the book is on the works following the classical developments. "Some of the new advances that are highlighted are regularized discriminant analysis," proposed by Friedman (1989), and "bootstrap-based discriminant rule". The last chapter is devoted to the statistical analysis of image data. "Here the focus is on how to form contextual allocation rules that offer improved performances over the classical noncontextual rules, which ignore the spatial dependence between neighboring images". The literature on spatial pattern recognition and image analysis is growing at a very fast rate. In this connection, the following monograph is worth mentioning. Spatial Statistics and Imaging (1991) by A. Possolo (ed.), IMS Lecture Notes Monograph Series, Vol. 20.

Applied and theoretical statisticians as well as investigators working in areas which use discriminant techniques will find this book extremely valuable. The author should be thanked for his efforts for collecting and editing a vast spectrum of results, providing an excellent review of the literature and a source for almost all major works on discrimination and classification till 1990.

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