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Pattern Classification

Second Edition

PATTERN CLASSIFICATION

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WILEY
STUDENT
EDITION

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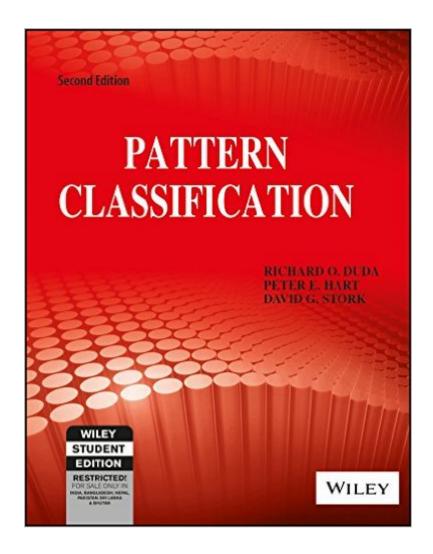
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Synopsis

The book provides an inexpensive matlab toolbox for the main algorithms in pattern classification. It contains supporting algorithms for data generation and visualization and contains step-by-step worked examples. Ã Â bayesian decision theory Ã Â maximum-likelihood and bayesian parameter estimation Ã Â nonparametric techniques Ã Â linear discriminant functions Ã Â multilayer neural networks Ã Â stochastic methods Ã Â nonmetric methods Ã Â algorithm-independent machine learning Ã Â unsupervised learning and clustering

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Customer Reviews

This book is a revised edition of Duda and Hart's classic text on Pattern Classification which was originally published in 1973. In fact, the 1973 edition of the book played a pivotal role in introducing me (and countless researchers of my generation) to the field of pattern classification. Needless to say, I was looking forward to the release of the revised edition. Unfortunately, I was extremely disappointed with the new edition. I had expected much more from the masters: Duda and Hart!My reasons for disappointment with this book are as follows:Given the 27 years that have elapsed since the publication of the first edition of the book, and the immense progress that has taken place in pattern recognition, machine learning, computational learning theory, grammar inference, statistical inference, algorithmic information theory, and related areas, the revisions and additions in the 2000 edition are essentially of a patchwork nature. In my opinion, they do not reflect the current understanding of the topic of pattern classification.A disproportionate number of pages are devoted to topics like density estimation despite the fact that it has been well established in recent years,

through the work of Vapnik and others, that when working with limited data, trying to solve the problem of pattern classification through density estimation (which turns out to be, in a well-defined sense of the term, a much harder problem than pattern classification) is rather futile. When modern techniques for learning pattern classifiers from limited data sets (e.g., support vector classifiers) are touched on in the book, the treatment is disappointingly superficial and in some cases, misleading.

The 1973 edition of Pattern Classification by Richard Duda and Peter Hart is one of the most cited books in the fields of image processing, machine vision, and classification. It contains perhaps the clearest, most comprehensible descriptions of statistical inference ever written. Though intended for the image processing audience, it is general in its approach, and is broader in coverage than other contemporary books like the redoubtable Van Trees (1969). The section on Bayesian Learning anticipates the EM algorithm which appeared a few years later (Dempster, et al. 1977) and their description of Parzen windows for density estimation is more often cited than Parzen's own papers.The appearance of the 2000 2nd edition led this writer to wonder if D&H could repeat with an offering as good as their first. In particular, would D&H have kept up with the considerable growth in methodology in the 1990s? Well, they have! With the addition of David Stork as third author, the second addition re-presents the basic theory, illustrated with some beautiful and complex figures, and knits it neatly with an exposition of neural networks, stochastic methods for posterior determination, nonmetric classification (tree search and string parsing), and clustering. Chapter 9 is a particularly interesting review of the recent machine learning research making the point that, absent knowledge of a problem's specific domain, no one classifier is better that any other. This chapter also reviews solutions to the problem of training on too-small samples including the Jackknife and bootstrap methods, and newer bagging and boosting algorithms popular in data mining applications.

The 1973 book by Duda and Hart was a classic. It surveyed the literature on pattern classification and scene analysis and provided the practitioner with wonderful insight and exposition of the subject. In the intervening 28 years the field has exploded and there has been an enormous increase in technical approaches and applications.With this in mind the authors and their new coauthor David Stork go about the task of providing a revision. True to the goals of the original the authors undertake to describe pattern recognition under a variety of topics and with several available methods to cover each topic. Important new areas are covered and old but now deemed less significant are dropped. Advances in statistical computing and computing in general also

dictate the topics. So although the authors are the same and the title is almost the same (note that scene analysis is dropped from the title) it is more like an entirely new book on the subject rthan a revision of the old. For a revision, I would expect to see mostly the same chapters with the same titles and only a few new chapters along with expansion of old chapters.Although I view this as a new book, that is not necessarily bad. In fact it may be viewed as a strength of the book. It maintains the style and clarity of the original that we all loved but represents the state-of-the-art in pattern recognition at the beginning of the 21st Century.The original had some very nice pictures. I liked some of them so much that I used them with permission in the section on classification error rate estimation in my bootstrap book. This edition goes much further with beautiful graphics including many nice three-dimensional color pictures like the one on the cover page.

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