

<<模式识别与神经网络>>

图书基本信息

书名：<<模式识别与神经网络>>

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前言

Pattern recognition has a long and respectable history within engineering, especially for military applications, but the cost of the hardware both to acquire the data ( signals and images ) and to compute the answers made it for many years a rather specialist subject. Hardware advances have made the concerns of pattern recognition of much wider applicability. In essence it covers the following problem: 'Given some examples of complex signals and the correct decisions for them, make decisions automatically for a stream of future examples.' There are many examples from everyday life: Name the species of a flowering plant. Grade bacon rashers from a visual image. Classify an X-ray image of a tumour as cancerous or benign. Decide to buy or sell a stock option. Give or refuse credit to a shopper. Many of these are currently performed by human experts, but it is increasingly becoming feasible to design automated systems to replace the expert and either perform better ( as in credit scoring ) or 'clone' the expert ( as in aids to medical diagnosis ) . Neural networks have arisen from analogies with models of the way that humans might approach pattern recognition tasks, although they have developed a long way from the biological roots. Great claims have been made for these procedures, and although few of these claims have withstood careful scrutiny, neural network methods have had great impact on pattern recognition practice. A theoretical understanding of how they work is still under construction, and is attempted here by viewing neural networks within a statistical framework, together with methods developed in the field of machine learning. One of the aims of this book is to be a reference resource, so almost all the results used are proved ( and the remainder are given references to complete proofs ) . The proofs are often original.

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### 内容概要

本书是模式识别和神经网络方面的名著，讲述了模式识别所涉及的统计方法、神经网络和机器学习等分支。

书的内容从介绍和例子开始，主要涵盖统计决策理论、线性判别分析、弹性判别分析、前馈神经网络、非参数方法、树结构分类、信念网、无监管方法、探寻优良的模式特性等方面的内容。

本书可作为统计与理工科研究生课程的教材，对模式识别和神经网络领域的研究人员也是极有价值的参考书。

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### 作者简介

里普利 (B.D.Ripley) 著名的统计学家，牛津大学应用统计教授。

他在空间统计学、模式识别领域作出了重要贡献，对S的开发以及S-PLUS和R的推广应用有着重要影响。

20世纪90年代他出版了人工神经网络方面的著作，影响很大，引导统计学者开始关注机器学习和数据挖掘。

除本书外，他还著有Modern Applied Statistics with S和S Programming。

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书籍目录

1 Introduction and Examples 1.1 How do neural methods differ? 1.2 The pattern recognition task 1.3 Overview of the remaining chapters 1.4 Examples 1.5 Literature2 Statistical Decision Theory 2.1 Bayes rules for known distributions 2.2 Parametric models 2.3 Logistic discrimination 2.4 Predictive classification 2.5 Alternative estimation procedures 2.6 How complex a model do we need? 2.7 Performance assessment 2.8 Computational learning approaches3 Linear Discriminant Analysis 3.1 Classical linear discriminatio 3.2 Linear discriminants via regression 3.3 Robustness 3.4 Shrinkage methods 3.5 Logistic discrimination 3.6 Linear separatio andperceptrons4 Flexible Diseriminants 4.1 Fitting smooth parametric functions 4.2 Radial basis functions 4.3 Regularization5 Feed-forward Neural Networks 5.1 Biological motivation 5.2 Theory 5.3 Learning algorithms 5.4 Examples 5.5 Bayesian perspectives 5.6 Network complexity 5.7 Approximation results6 Non-parametric Methods 6.1 Non-parametric estlmation of class densities 6.2 Nearest neighbour methods 6.3 Learning vector quantization 6.4 Mixture representations7 Tree-structured Classifiers 7.1 Splitting rules 7.2 Pruning rules 7.3 Missing values 7.4 Earlier approaches 7.5 Refinements 7.6 Relationships to neural networks 7.7 Bayesian trees8 Belief Networks 8.1 Graphical models and networks 8.2 Causal networks 8.3 Learning the network structure 8.4 Boltzmann machines 8.5 Hierarchical mixtures of experts9 Unsupervised Methods .....10 Finding Good Pattern FeaturesA Statistical SidelinesGlossaryReferencesAuthor IndexSubject Index

## 章节摘录

插图：The calculations here are from Hjort ( 1986 ) ; versions of these formulae are given by Aitchison & Dunsmore ( 1975 ) ( up to the differences in the meaning of their multivariate  $t$  ) and Geisser ( 1993 ) . This approach is originally due to Geisser ( 1964, 1966 ) . The differences between the predictive and plug-in approaches will be small or zero for roughly equally prevalent classes. In other cases, for example screening for rare diseases or when very few data are available, the differences can be dramatic as shown by the examples in Aitchison & Dunsmore ( 1975, 11.5-11.6 ) . The latter do have groups with  $n_k$  only slightly greater than  $p$ , for example  $p = 8$  and  $n_2 = 11$  when fitting a covariance matrix to each class, which would be seen as over-fitting in the plug-in approach. ( Indeed, one might choose not to use all the variables, or perhaps to restrict the class of covariance matrices considered. ) Aitchison et al. ( 1977 ) conducted a small-sample simulation comparison of the plug-in and predictive methods for two multivariate normal populations. They were ( correctly ) criticized by Moran & Murphy ( 1979 ) for using the accuracy of the estimation of the log-odds as the basis of comparison rather than error rates, and for including mainly equal sample sizes of the two classes. Moran & Murphy's results show very little difference in the error rates, and show that for estimation of the log-odds the debiasing methods of Section 2.5 are effective in removing the dramatic optimism of the plug-in method where it occurs.

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### 媒体关注与评论

“ .....模式分类和神经网络技术应用A-面的优秀教材 .....Ripley写了一本详尽、易懂的教材 .....这本书用简明的形式和迷人的风格介绍了统计模式识别和神经网络的数学理论，必将在该领域中广为流传。

” ——《自然》“ 这本书特别值得关注，是理论与实例的完美结合。

” ——A.Gelman.国际统计学会杂志“ 我极力推荐这本书，任何一位研究人员都可以领教Ripley的博学多才，并从书中给出的大量参考文献中获益匪浅。

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### 编辑推荐

随着人工智能、信息检索和海量数据处理等技术的发展，模式识别成为了研究热点。

在《模式识别与神经网络(英文版)》中，Ripley将模式识别领域中的统计方法和基于神经网络的机器学习这两个关键思想结合起来：以统计决策理论和计算学习理论为依据，建立了神经网络理论的坚实基础。

在理论层面，《模式识别与神经网络(英文版)》强调概率与统计；在实践层面。

则强调模式识别的实用方法。

《模式识别与神经网络(英文版)》已被国际知名大学采用为教材，对于研究模式识别和神经网络的专业人士，也是不可不读的优秀参考书。



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