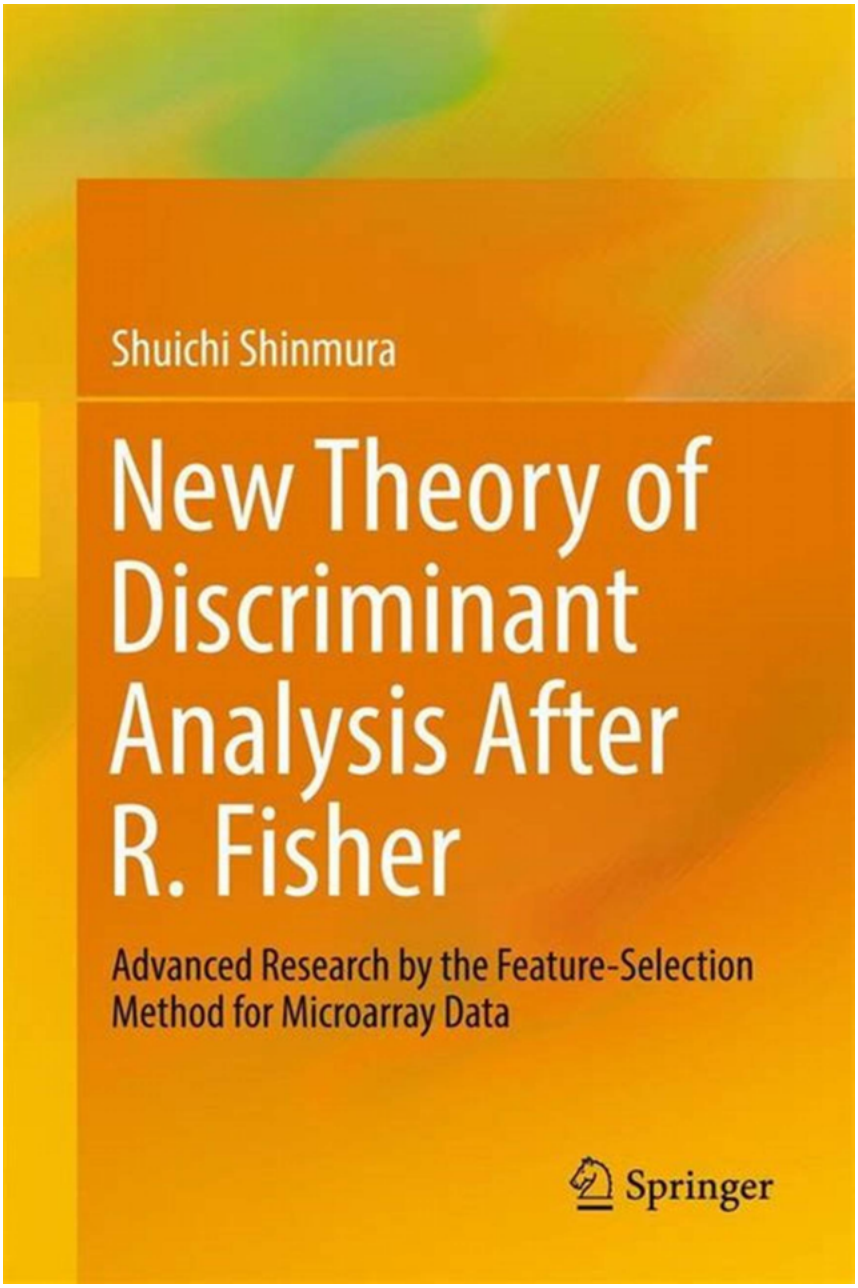
The Revolutionary New Theory of Discriminant Analysis After Fisher That Will Blow Your Mind!

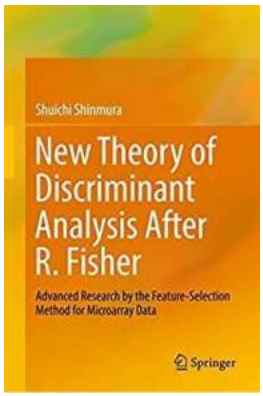


Discriminant analysis is a powerful statistical technique used to classify observations into different groups or categories based on their measured

features. Ever since its inception by Ronald Fisher in the early 1930s, discriminant analysis has played a crucial role in various fields such as finance, marketing, biology, and social sciences. It has been the go-to method for decision-making, pattern recognition, and prediction.

What is Fisher's Linear Discriminant Analysis?

Fisher's Linear Discriminant Analysis (LDA) is a classical technique that aims to find a linear combination of features that maximizes class separability. It seeks to project high-dimensional data onto a lower-dimensional space while maximizing the distance between different classes. Fisher's LDA assumes that the data follows a multivariate normal distribution and has equal class covariances.



New Theory of Discriminant Analysis After R. Fisher: Advanced Research by the Feature Selection Method for Microarray Data

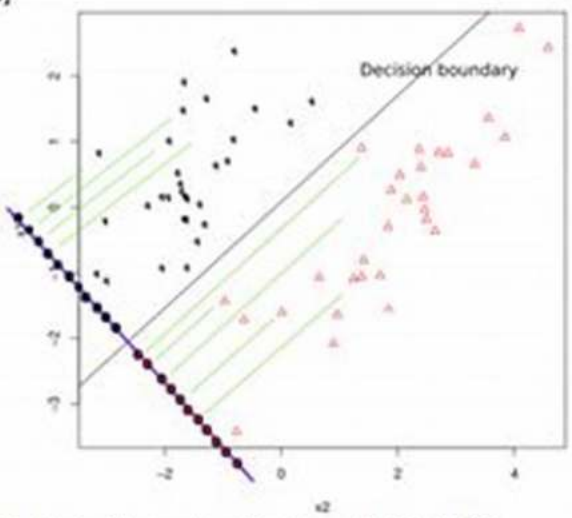
by Shuichi Shinmura (1st ed. 2016 Edition, Kindle Edition)

4 out of 5

Language	: English
File size	: 5469 KB
Screen Reader	: Supported
Print length	: 228 pages

16- Consider Fisher's linear discriminant analysis (LDA) method for binary classification. Comment on the following True/False statements: [25 points: Only for grads]

a) LDA method projects p-dimensional data into a one-dimensional space and then compares it with a threshold to determine the class label [T/F]
b) LDA method is more appropriate for linearly separable data. [T/F]
c) In developing LDA, the mean values of both classes $\boldsymbol{m}_1 = \sum_{i=1}^{N_1} \boldsymbol{x}_i$ and $\boldsymbol{m}_2 = \sum_{i=1}^{N_2} \boldsymbol{x}_i$ play essential roles. [T/F]
d) The main objective of this approach is to transform data into a space such that the resulting data points demonstrate minimum within-class variations and maximum between-class variations. [T/F]
e) The resulting model using LDA is always equivalent to that of linear classification with LSE. [T/F]



Introducing the New Theory of Discriminant Analysis

After decades of research and development, a group of brilliant statisticians and data scientists have now come up with a groundbreaking new theory that revolutionizes discriminant analysis as we know it. This new theory challenges the assumptions made by Fisher in his LDA, leading to improved classification accuracy and robustness in real-world scenarios.

The Key Advancements in the New Theory

The new theory of discriminant analysis introduces several key advancements that set it apart from Fisher's LDA. These advancements are based on a deeper understanding of the underlying data distribution and the nature of the problem being solved.

1. **Relaxation of Distributional Assumptions**

   Unlike Fisher's LDA, the new theory relaxes the assumption of multivariate normality. It acknowledges that in practice, data often deviates from strict

normality, requiring more flexible approaches to handle complex and diverse datasets. The new theory accommodates a wider array of data distributions, allowing for greater accuracy in real-world scenarios.

2. **Consideration of Unequal Covariance Matrices**

   Fisher's LDA assumes equal class covariances, which can be a limitation in many real-world problems. The new theory addresses this limitation by considering the case of unequal covariance matrices. By allowing for variations in covariance structures, the new theory provides a more comprehensive perspective on data separability and significantly improves classification performance.

3. **Incorporation of Nonlinear Transformations**

   In contrast to the linear projections in Fisher's LDA, the new theory incorporates nonlinear transformations, enabling more flexible modeling of complex relationships between features. This added flexibility allows for better separation of classes, particularly when dealing with high-dimensional data. The new theory leverages advanced machine learning techniques to learn these nonlinear transformations and extract the most meaningful information for classification tasks.

The Impact of the New Theory

The implications of the new theory of discriminant analysis are far-reaching. Its advancements have already started to gain traction in various industries, leading to improved decision-making, enhanced risk assessment, and more accurate predictions. By relaxing distributional assumptions, accounting for unequal covariance matrices, and incorporating nonlinear transformations, the new theory provides a more robust framework for analyzing complex datasets and driving actionable insights.

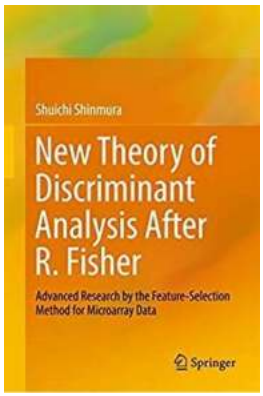
Real-World Applications

The new theory of discriminant analysis after Fisher finds applications in diverse fields, including:

- Financial fraud detection
- Medical diagnosis
- Image recognition
- Sentiment analysis
- Customer segmentation
- And many more!

The Future of Discriminant Analysis

The new theory of discriminant analysis represents a major breakthrough in the field. It opens up new possibilities for researchers and practitioners, promising more accurate and reliable results in various domains. As advancements continue to be made in statistical modeling, machine learning, and data analysis, discriminant analysis will continue to evolve, contributing to our understanding of complex systems and aiding decision-making processes in an ever-changing world.



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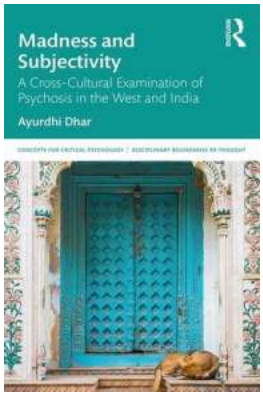
This is the first book to compare eight LDFs by different types of datasets, such as Fisher's iris data, medical data with collinearities, Swiss banknote data that is a linearly separable data (LSD), student pass/fail determination using student attributes, 18 pass/fail determinations using exam scores, Japanese automobile data, and six microarray datasets (the datasets) that are LSD. We developed the 100-fold cross-validation for the small sample method (Method 1) instead of the LOO method. We proposed a simple model selection procedure to choose the best model having minimum M2 and Revised IP-OLDF based on MNM criterion was found to be better than other M2s in the above datasets.

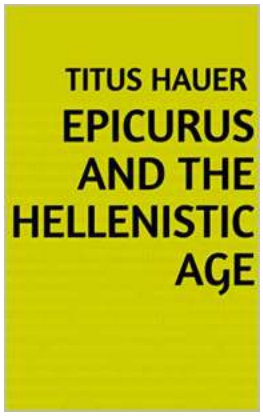
We compared two statistical LDFs and six MP-based LDFs. Those were Fisher's LDF, logistic regression, three SVMs, Revised IP-OLDF, and another two OLDFs. Only a hard-margin SVM (H-SVM) and Revised IP-OLDF could discriminate LSD theoretically (Problem 2). We solved the defect of the generalized inverse matrices (Problem 3).

For more than 10 years, many researchers have struggled to analyze the microarray dataset that is LSD (Problem 5). If we call the linearly separable model "Matroska," the dataset consists of numerous smaller Matroskas in it. We develop the Matroska feature selection method (Method 2). It finds the surprising structure of the dataset that is the disjoint union of several small Matroskas. Our theory and methods reveal new facts of gene analysis.



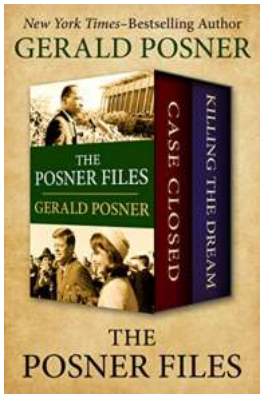
Cross Cultural Examination Of Psychosis In The West And India Concepts For

Mental health is a topic that has gained significant attention in recent years, with a growing focus on understanding the different ways in which...



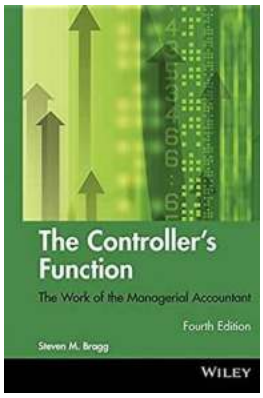
The Philosophy of Pleasure: Unveiling Epicurus and the Vibrant Hellenistic Age

The Hellenistic period, following the conquests of Alexander the Great, marked a significant era in ancient history. This period witnessed an amalgamation of cultures, ideas,...



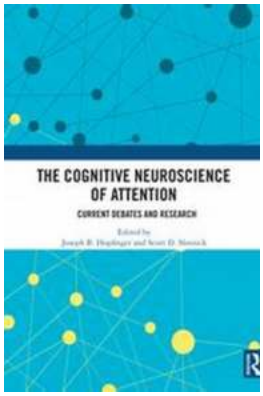
Case Closed And Killing The Dream: Unraveling the Mysteries Behind Unsolved Crimes

In a world constantly yearning for closure and justice, unsolved crimes have a peculiar way of haunting our thoughts. They challenge our societal understanding of order and...



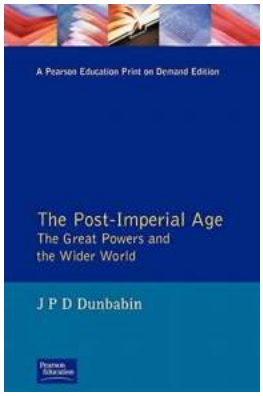
The Controller Function: Mastering the Art of Commanding Success

In today's fast-paced and ever-changing business landscape, the role of a controller is more critical than ever. These individuals hold the key to managing and monitoring a...



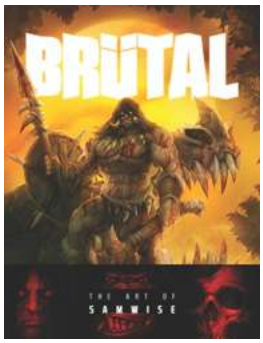
Current Debates and Research: Unraveling the Mysteries of the World

Have you ever wondered what the world would be like without debates and research? Imagine a scenario where there are no discussions on scientific breakthroughs, no debates on...



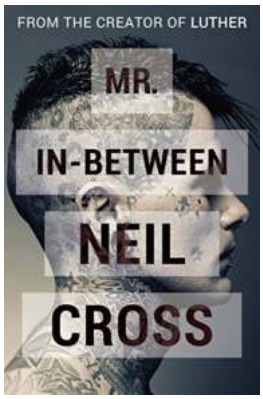
The Great Powers And The Wider World: How They Shape Global Dynamics

Have you ever wondered how the actions of a few powerful nations can affect the entire world? The great powers, which include countries such as the United...



The Brutal Beauty: Exploring the Captivating Art of Samwise

When it comes to the world of art, few names can rival the reputation and talent of Samwise Didier. Known for his distinctive style that seamlessly blends fantasy,...



Mr In Between: Delving into the World of Neil Cross

Neil Cross, a renowned British author and screenwriter, has been captivating audiences for years with his gripping narratives and electrifying storytelling. Known for his...