
Functional Data Analysis Ramsay

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Density Estimation for Statistics and Data Analysis
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Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators
The Art of Semiparametrics
The Oxford Handbook of Functional Data Analysis

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Applied Functional Data Analysis Springer
Science & Business Media

This book can be considered a companion to two other highly acclaimed books involving James Ramsay and Bernard Silverman: *Functional Data Analysis, Second Edition* (2005) and *Applied Functional Data Analysis* (2002). This user's manual also provides the documentation for the S+FDA library for S-

Plus. *S+Functional Data Analysis* OUP Oxford
Object Oriented Data Analysis is a framework that facilitates inter-disciplinary research through new terminology for discussing the often many possible approaches to the analysis of complex data. Such data are naturally arising in a wide variety of areas. This book aims to provide ways of thinking that enable the making of sensible choices. The main points are illustrated with many real data examples, based on the authors' personal experiences, which have motivated the invention of a wide array of analytic

methods. While the mathematics go far beyond the usual in statistics (including differential geometry and even topology), the book is aimed at accessibility by graduate students. There is deliberate focus on ideas over mathematical formulas. J. S. Marron is the Amos Hawley Distinguished Professor of Statistics, Professor of Biostatistics, Adjunct Professor of Computer Science, Faculty Member of the Bioinformatics and Computational Biology Curriculum and Research Member of the Lineberger Cancer Center and the Computational Medicine Program, at the University of

North Carolina, Chapel Hill. Ian L. Dryden is a Professor in the Department of Mathematics and Statistics at Florida International University in Miami, has served as Head of School of Mathematical Sciences at the University of Nottingham, and is joint author of the acclaimed book *Statistical Shape Analysis*.

S+Functional Data Analysis Springer
This Handbook aims to present a state of the art exploration of the high-tech field of functional data analysis, by gathering together most of major advances in this area.

Finite Mixture Models CRC Press

Complex multivariate testing problems are frequently encountered in many scientific disciplines, such as engineering, medicine and the social sciences. As a result, modern statistics needs permutation testing for complex data with low sample size and many variables, especially in observational studies. The Authors give a general overview on permutation tests with a focus on recent theoretical advances within univariate and multivariate complex permutation testing problems, this book brings the reader completely up to date with today's current

thinking. Key Features: Examines the most up-to-date methodologies of univariate and multivariate permutation testing. Includes extensive software codes in MATLAB, R and SAS, featuring worked examples, and uses real case studies from both experimental and observational studies. Includes a standalone free software NPC Test Release 10 with a graphical interface which allows practitioners from every scientific field to easily implement almost all complex testing procedures included in the book. Presents and discusses solutions to the most important and frequently encountered real problems in multivariate analyses. A supplementary website containing all of the data sets examined in the book along with ready to use software codes. Together with a wide set of application cases, the Authors present a thorough theory of permutation testing both with formal description and proofs, and analysing real case studies. Practitioners and researchers, working in different scientific fields such as engineering, biostatistics, psychology or medicine will benefit from this book. Spatio-Temporal Statistics with R John

Wiley & Sons

This book contains the ideas of functional data analysis by a number of case studies. The case studies are accessible to research workers in a wide range of disciplines. Every reader should gain not only a specific understanding of the methods of functional data analysis, but more importantly a general insight into the underlying patterns of thought. There is an associated web site with MATLABr and S?PLUSr implementations of the methods discussed.

Functional and High-Dimensional Statistics and Related Fields CRC Press

Functional Data Analysis Springer Science & Business Media

Functional Data Analysis Springer

Geostatistical Functional Data Analysis

Explore the intersection between geostatistics and functional data analysis with this insightful new reference *Geostatistical Functional Data Analysis* presents a unified approach to modelling functional data when spatial and spatio-temporal correlations are present. The Editors link together the wide research areas of geostatistics and functional data analysis to provide the reader with a new

area called geostatistical functional data analysis that will bring new insights and new open questions to researchers coming from both scientific fields. This book provides a complete and up-to-date account to deal with functional data that is spatially correlated, but also includes the most innovative developments in different open avenues in this field. Containing contributions from leading experts in the field, this practical guide provides readers with the necessary tools to employ and adapt classic statistical techniques to handle spatial regression. The book also includes: A thorough introduction to the spatial kriging methodology when working with functions A detailed exposition of more classical statistical techniques adapted to the functional case and extended to handle spatial correlations Practical discussions of ANOVA, regression, and clustering methods to explore spatial correlation in a collection of curves sampled in a region In-depth explorations of the similarities and differences between spatio-temporal data analysis and functional data analysis Aimed at mathematicians, statisticians, postgraduate students, and researchers

involved in the analysis of functional and spatial data, Geostatistical Functional Data Analysis will also prove to be a powerful addition to the libraries of geoscientists, environmental scientists, and economists seeking insightful new knowledge and questions at the interface of geostatistics and functional data analysis.

Information and Communication Technologies John Wiley & Sons

This book presents the latest research on the statistical analysis of functional, high-dimensional and other complex data, addressing methodological and computational aspects, as well as real-world applications. It covers topics like classification, confidence bands, density estimation, depth, diagnostic tests, dimension reduction, estimation on manifolds, high- and infinite-dimensional statistics, inference on functional data, networks, operatorial statistics, prediction, regression, robustness, sequential learning, small-ball probability, smoothing, spatial data, testing, and topological object data analysis, and includes applications in automobile engineering, criminology, drawing recognition, economics, environmetrics, medicine,

mobile phone data, spectrometrics and urban environments. The book gathers selected, refereed contributions presented at the Fifth International Workshop on Functional and Operatorial Statistics (IWFOS) in Brno, Czech Republic. The workshop was originally to be held on June 24-26, 2020, but had to be postponed as a consequence of the COVID-19 pandemic. Initiated by the Working Group on Functional and Operatorial Statistics at the University of Toulouse in 2008, the IWFOS workshops provide a forum to discuss the latest trends and advances in functional statistics and related fields, and foster the exchange of ideas and international collaboration in the field.

Object Oriented Data Analysis University of Illinois Press

The book provides an application-oriented overview of functional analysis, with extended and accessible presentations of key concepts such as spline basis functions, data smoothing, curve registration, functional linear models and dynamic systems Functional data analysis is put to work in a wide a range of applications, so that new problems are likely to find close analogues in this book

The code in R and Matlab in the book has been designed to permit easy modification to adapt to new data structures and research problems

Functional Data Analysis with R and MATLAB Springer Science & Business Media

A thoroughly revised and updated edition of this introduction to modern statistical methods for shape analysis Shape analysis is an important tool in the many disciplines where objects are compared using geometrical features. Examples include comparing brain shape in schizophrenia; investigating protein molecules in bioinformatics; and describing growth of organisms in biology. This book is a significant update of the highly-regarded 'Statistical Shape Analysis' by the same authors. The new edition lays the foundations of landmark shape analysis, including geometrical concepts and statistical techniques, and extends to include analysis of curves, surfaces, images and other types of object data. Key definitions and concepts are discussed throughout, and the relative merits of different approaches are presented. The authors have included

substantial new material on recent statistical developments and offer numerous examples throughout the text. Concepts are introduced in an accessible manner, while retaining sufficient detail for more specialist statisticians to appreciate the challenges and opportunities of this new field. Computer code has been included for instructional use, along with exercises to enable readers to implement the applications themselves in R and to follow the key ideas by hands-on analysis. Statistical Shape Analysis: with Applications in R will offer a valuable introduction to this fast-moving research area for statisticians and other applied scientists working in diverse areas, including archaeology, bioinformatics, biology, chemistry, computer science, medicine, morphometrics and image analysis .

Linear Processes in Function Spaces

Springer Science & Business Media
Theoretical Foundations of Functional Data Analysis, with an Introduction to Linear Operators provides a uniquely broad compendium of the key mathematical concepts and results that are relevant for the theoretical development of functional

data analysis (FDA). The self-contained treatment of selected topics of functional analysis and operator theory includes reproducing kernel Hilbert spaces, singular value decomposition of compact operators on Hilbert spaces and perturbation theory for both self-adjoint and non self-adjoint operators. The probabilistic foundation for FDA is described from the perspective of random elements in Hilbert spaces as well as from the viewpoint of continuous time stochastic processes. Nonparametric estimation approaches including kernel and regularized smoothing are also introduced. These tools are then used to investigate the properties of estimators for the mean element, covariance operators, principal components, regression function and canonical correlations. A general treatment of canonical correlations in Hilbert spaces naturally leads to FDA formulations of factor analysis, regression, MANOVA and discriminant analysis. This book will provide a valuable reference for statisticians and other researchers interested in developing or understanding the mathematical aspects of FDA. It is also suitable for a graduate level special topics course.

Permutation Tests for Complex Data
Springer Nature

The three-volume set of LNCS 12532, 12533, and 12534 constitutes the proceedings of the 27th International Conference on Neural Information Processing, ICONIP 2020, held in Bangkok, Thailand, in November 2020. Due to COVID-19 pandemic the conference was held virtually. The 187 full papers presented were carefully reviewed and selected from 618 submissions. The papers address the emerging topics of theoretical research, empirical studies, and applications of neural information processing techniques across different domains. The second volume, LNCS 12533, is organized in topical sections on computational intelligence; machine learning; robotics and control.

Nonparametric Functional Estimation and Related Topics CRC Press

Addressing a broad range of big data analytics in cross-disciplinary applications, this essential handbook focuses on the statistical prospects offered by recent developments in this field. To do so, it covers statistical methods for high-dimensional problems, algorithmic

designs, computation tools, analysis flows and the software-hardware co-designs that are needed to support insightful discoveries from big data. The book is primarily intended for statisticians, computer experts, engineers and application developers interested in using big data analytics with statistics. Readers should have a solid background in statistics and computer science.

Functional Data Analysis with R and MATLAB CRC Press

The book provides an application-oriented overview of functional analysis, with extended and accessible presentations of key concepts such as spline basis functions, data smoothing, curve registration, functional linear models and dynamic systems Functional data analysis is put to work in a wide a range of applications, so that new problems are likely to find close analogues in this book The code in R and Matlab in the book has been designed to permit easy modification to adapt to new data structures and research problems

New Developments in Classification and Data Analysis Routledge

In recent years, there has been a great

deal of interest and activity in the general area of nonparametric smoothing in statistics. This monograph concentrates on the roughness penalty method and shows how this technique provides a unifying approach to a wide range of smoothing problems. The method allows parametric assumptions to be realized in regression problems, in those approached by generalized linear modelling, and in many other contexts. The emphasis throughout is methodological rather than theoretical, and it concentrates on statistical and computation issues. Real data examples are used to illustrate the various methods and to compare them with standard parametric approaches. Some publicly available software is also discussed. The mathematical treatment is self-contained and depends mainly on simple linear algebra and calculus. This monograph will be useful both as a reference work for research and applied statisticians and as a text for graduate students and other encountering the material for the first time.

Functional Data Analysis Springer

The theme of the meeting was “Statistical Methods for the Analysis of Large Data-

Sets". In recent years there has been increasing interest in this subject; in fact a huge quantity of information is often available but standard statistical techniques are usually not well suited to managing this kind of data. The conference serves as an important meeting point for European researchers working on this topic and a number of European statistical societies participated in the organization of the event. The book includes 45 papers from a selection of the 156 papers accepted for presentation and discussed at the conference on "Advanced Statistical Methods for the Analysis of Large Data-sets."

Nonparametric Functional Data Analysis Springer Science & Business Media
Included here are expressions in the functional domain of such classics as linear regression, principal components analysis, linear modelling, and canonical correlation analysis, as well as specifically functional techniques such as curve registration and principal differential analysis. Data arising in real applications are used throughout for both motivation and illustration, showing how functional approaches allow us to see new things,

especially by exploiting the smoothness of the processes generating the data. The data sets exemplify the wide scope of functional data analysis; they are drawn from growth analysis, meteorology, biomechanics, equine science, economics, and medicine. The book presents novel statistical technology while keeping the mathematical level widely accessible. It is designed to appeal to students, applied data analysts, and to experienced researchers; and as such is of value both within statistics and across a broad spectrum of other fields. Much of the material appears here for the first time.

Nonparametric Regression and Generalized Linear Models Springer Science & Business Media

This text focuses on the use of smoothing methods for developing and estimating differential equations following recent developments in functional data analysis and building on techniques described in Ramsay and Silverman (2005) *Functional Data Analysis*. The central concept of a dynamical system as a buffer that translates sudden changes in input into smooth controlled output responses has led to applications of previously analyzed

data, opening up entirely new opportunities for dynamical systems. The technical level has been kept low so that those with little or no exposure to differential equations as modeling objects can be brought into this data analysis landscape. There are already many texts on the mathematical properties of ordinary differential equations, or dynamic models, and there is a large literature distributed over many fields on models for real world processes consisting of differential equations. However, a researcher interested in fitting such a model to data, or a statistician interested in the properties of differential equations estimated from data will find rather less to work with. This book fills that gap.

Functional and Shape Data Analysis
Springer

This book contains the ideas of functional data analysis by a number of case studies. The case studies are accessible to research workers in a wide range of disciplines. Every reader should gain not only a specific understanding of the methods of functional data analysis, but more importantly a general insight into the underlying patterns of thought. There is an

associated web site with MATLABr and S?PLUSr implementations of the methods discussed.

Recent Advances in Functional Data Analysis and Related Topics Springer Science & Business Media

An up-to-date, comprehensive account of major issues in finite mixture modeling This volume provides an up-to-date account of the theory and applications of modeling via finite mixture distributions. With an emphasis on the applications of mixture models in both mainstream analysis and other areas such as unsupervised pattern recognition, speech recognition, and medical imaging, the book describes

the formulations of the finite mixture approach, details its methodology, discusses aspects of its implementation, and illustrates its application in many common statistical contexts. Major issues discussed in this book include identifiability problems, actual fitting of finite mixtures through use of the EM algorithm, properties of the maximum likelihood estimators so obtained, assessment of the number of components to be used in the mixture, and the applicability of asymptotic theory in providing a basis for the solutions to some of these problems. The author also considers how the EM algorithm can

be scaled to handle the fitting of mixture models to very large databases, as in data mining applications. This comprehensive, practical guide: * Provides more than 800 references-40% published since 1995 * Includes an appendix listing available mixture software * Links statistical literature with machine learning and pattern recognition literature * Contains more than 100 helpful graphs, charts, and tables Finite Mixture Models is an important resource for both applied and theoretical statisticians as well as for researchers in the many areas in which finite mixture models can be used to analyze data.