Chiara Brombin Luigi Salmaso

## Permutation Tests in Shape Analysis



# <u>Permutation Tests In Shape Analysis Springerbriefs In Statistics</u>

**Chiara Brombin** 

#### **Permutation Tests In Shape Analysis Springerbriefs In Statistics:**

Permutation Tests in Shape Analysis LUIGI SALMASO, Chiara Brombin, 2013-09-06 Statistical shape analysis is a geometrical analysis from a set of shapes in which statistics are measured to describe geometrical properties from similar shapes or different groups for instance the difference between male and female Gorilla skull shapes normal and pathological bone shapes etc Some of the important aspects of shape analysis are to obtain a measure of distance between shapes to estimate average shapes from a possibly random sample and to estimate shape variability in a sample 1 One of the main methods used is principal component analysis Specific applications of shape analysis may be found in archaeology architecture biology geography geology agriculture genetics medical imaging security applications such as face recognition entertainment industry movies games computer aided design and manufacturing This is a proposal for a new Brief on statistical shape analysis and the various new parametric and non parametric methods utilized to facilitate shape analysis

Statistical Shape Analysis Ian L. Dryden, Kanti V. Mardia, 2016-09-06 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 Offers a detailed yet accessible treatment of statistical methods for shape analysis Includes numerous examples and applications from many disciplines Provides R code for implementing the examples Covers a wide variety of recent developments in shape analysis 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 morphometics and image analysis Parametric and Nonparametric Inference for Statistical Dynamic Shape Analysis with Applications Chiara Brombin, Luigi Salmaso, Lara Fontanella, Luigi Ippoliti, Caterina Fusilli, 2016-02-11 This book considers specific inferential issues arising from the analysis of dynamic shapes with the attempt to solve the problems at hand using probability models and nonparametric tests The models are simple to understand and interpret and provide a useful tool to describe the global dynamics of the landmark

configurations However because of the non Euclidean nature of shape spaces distributions in shape spaces are not straightforward to obtain The book explores the use of the Gaussian distribution in the configuration space with similarity transformations integrated out Specifically it works with the offset normal shape distribution as a probability model for statistical inference on a sample of a temporal sequence of landmark configurations This enables inference for Gaussian processes from configurations onto the shape space The book is divided in two parts with the first three chapters covering material on the offset normal shape distribution and the remaining chapters covering the theory of NonParametric Combination NPC tests The chapters offer a collection of applications which are bound together by the theme of this book They refer to the analysis of data from the FG NET Face and Gesture Recognition Research Network database with facial expressions For these data it may be desirable to provide a description of the dynamics of the expressions or testing whether there is a difference between the dynamics of two facial expressions or testing which of the landmarks are more informative in explaining the pattern of an expression Permutation Tests Phillip Good, 2013-04-17 In 1982 I published several issues of a samdizat scholarly journal called Random ization with the aid of an 8 bit I MH personal computer with 48K of memory upgraded to 64K later that year and floppy disks that held 400 Kbytes A decade later working on the first edition of this text I used a 16 bit 33 MH computer with 1 Mb of memory and a 20 Mb hard disk This preface to the second edition comes to you via a 32 bit 300 MH computer with 64 Mb memory and a 4 Gb hard disk And yes I paid a tenth of what I paid for my first computer This relationship between low cost readily available computing power and the rising popularity of permutation tests is no coincidence Simply put it is faster today to compute an exact p value than to look up an approximation in a table of the not quite appropriate statistic As a result more and more researchers are using Permutation Tests to analyze their data Of course some of the increased usage has also come about through the increased availability of and improvements in off the shelf software as can be seen in the revisions in this edition to Chapter 12 Publishing Your Results and Chapter 13 Increasing <u>Permutation Tests</u> Phillip I. Good, 1994 Permutation tests permit us to choose the test statistic Computation Efficiency best suited to the task at hand This freedom of choice opens up a thousand practical applications including many which are beyond the reach of conventional parametric sta tistics Flexible robust in the face of missing data and violations of assump tions the permutation test is among the most powerful of statistical proce dures Through sample size reduction permutation tests can reduce the costs of experiments and surveys This text on the application of permutation tests in biology medicine science and engineering may be used as a step by step self guiding reference manual by research workers and as an intermediate text for undergraduates and graduates in statistics and the applied sciences with a first course in statistics and probability under their belts Research workers in the applied sciences are advised to read through Chapters 1 and 2 once guickly before proceeding to Chapters 3 through 8 which cover the principal applications they are likely to encounter in practice Chapter 9 is a must for the practitioner with advice for coping with real life emergencies such as missing or

censored data after the fact covariates and outliers Chapter 10 uses practical applications in archeology biology climatology education and social science to show the research worker how to develop new permutation statistics to meet the needs of specific applications. The practitioner will find Chapter 10 a source of inspiration as well as a practical guide to the development of new and novel statistics Permutation Tests for Complex Data Luigi Salmaso, Fortunato Pesarin, 2025-09-09 Timely update of a popular edition on permutation testing with numerous case studies included throughout The newly revised and updated Second Edition of Permutation Tests for Complex Data describes permutation tests from the point of view of experimental design with methodological details and illustrating the process of devising an appropriate permutation test through case studies In addition to the text this book includes two open source packages for permutation tests in Python and R which include a comprehensive code base to implement common permutation tests as well as code to implement each of the book s case studies The focus of this book is the permutation approach to a variety of univariate and multivariate problems of hypothesis testing in a typical nonparametric framework. The book examines the most up to date methodologies of univariate and multivariate permutation testing includes real case studies from both experimental and observational studies and presents and discusses solutions to the most important and frequently encountered real problems in multivariate analyses Written by two highly qualified authors in the field of nonparametrics and applied statistics Permutation Tests for Complex Data includes information on sample topics including Theory of one dimensional and multi dimensional permutation tests covering test statistics arguments for selecting permutation tests and examples of one sample and multi sample problems Multiplicity control and closed testing covering raw and adjusted p values the MinP Bonferroni Holm procedure and weighted methods for controlling FWE and FDR Multivariate categorical variables covering stochastic ordering tests on moments for ordered variables and heterogeneity comparisons NPC tests for survival analysis and shape analysis covering analysis of PERC data and analysis with correlated landmarks Presenting a thorough overview of permutation testing with both formal description and proofs Permutation Tests for Complex Data is an excellent introduction to permutation tests for graduate level statistics or data science courses and will be ideal as a handbook for researchers hoping to use the open source code <u>Permutation Methods</u> Paul W. Mielke (jr.), Kenneth J. Berry, 2001 The introduction of permutation tests by R A Fisher relaxed the paramet ric structure requirement of a test statistic For example the structure of the test statistic is no longer required if the assumption of normality is removed The between object distance function of classical test statis tics based on the assumption of normality is squared Euclidean distance Because squared Euclidean distance is not a metric i e the triangle in equality is not satisfied it is not at all surprising that classical tests are severely affected by an extreme measurement of a single object A major purpose of this book is to take advantage of the relaxation of the struc ture of a statistic allowed by permutation tests While a variety of distance functions are valid for permutation tests a natural choice possessing many desirable properties is ordinary i e non

squared Euclidean distance Sim ulation studies show that permutation tests based on ordinary Euclidean distance are exceedingly robust in detecting location shifts of heavy tailed distributions. These tests depend on a metric distance function and are reasonably powerful for a broad spectrum of univariate and multivariate distributions. Least sum of absolute deviations LAD regression linked with a per mutation test based on ordinary Euclidean distance yields a linear model analysis which controls for type I error

A Nonparametric Permutation Approach to Statistical Shape Analysis Chiara Brombin, 2009

Bootstrap Methods and Permutation Tests, 2003

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