Luc Devroye
Gábor Lugosi

Combinatorial Methods in Density Estimation

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Chao Zhang

Combinatorial Methods In Density Estimation:

Combinatorial Methods in Density Estimation Luc Devroye,Gabor Lugosi,2001-01-12 Density estimation has evolved enormously since the days of bar plots and histograms but researchers and users are still struggling with the problem of the selection of the bin widths This text explores a new paradigm for the data based or automatic selection of the free parameters of density estimates in general so that the expected error is within a given constant multiple of the best possible error The paradigm can be used in nearly all density estimates and for most model selection problems both parametric and nonparametric It is the first book on this topic The text is intended for first year graduate students in statistics and learning theory and offers a host of opportunities for further research and thesis topics Each chapter corresponds roughly to one lecture and is supplemented with many classroom exercises A one year course in probability theory at the level of Feller s Volume 1 should be more than adequate preparation Gabor Lugosi is Professor at Universitat Pompeu Fabra in Barcelona and Luc Debroye is Professor at McGill University in Montreal In 1996 the authors together with L szlo Gy rfi published the successful text A Probabilistic Theory of Pattern Recognition with Springer Verlag Both authors have made many contributions in the area of nonparametric estimation   *Combinatorial Methods in Density Estimation* Luc Devroye,Gabor Lugosi,2012-09-14 Density estimation has evolved enormously since the days of bar plots and histograms but researchers and users are still struggling with the problem of the selection of the bin widths This book is the first to explore a new paradigm for the data based or automatic selection of the free parameters of density estimates in general so that the expected error is within a given constant multiple of the best possible error The paradigm can be used in nearly all density estimates and for most model selection problems both parametric and nonparametric   Combinatorial Methods in Density Estimation Luc Devroye,Gabor Lugosi,2011-04-26 Density estimation has evolved enormously since the days of bar plots and histograms but researchers and users are still struggling with the problem of the selection of the bin widths This book is the first to explore a new paradigm for the data based or automatic selection of the free parameters of density estimates in general so that the expected error is within a given constant multiple of the best possible error The paradigm can be used in nearly all density estimates and for most model selection problems both parametric and nonparametric   A Course in Density Estimation Luc Devroye,1987   **Asymptotic Theory of Statistics and Probability** Anirban DasGupta,2008-02-06 This book developed out of my year long course on asymptotic theory at Purdue University To some extent the topics coincide with what I cover in that course There are already a number of well known books on asy totics This book is quite different It covers more topics in one source than areavailableinanyothersinglebookonasymptotictheory Numeroustopics covered in this book are available in the literature in a scattered manner and they are brought together under one umbrella in this book Asymptotic theory is a central unifying theme in probability and statistics My main goal in writing this book is to give its readers a feel for the incredible scope and reach of asymptotics I have tried to write this book in a way that is accessible and to make the reader

appreciate the beauty of theory and the insights that only theory can provide Essentially every theorem in the book comes with at least one reference preceding or following the statement of the theorem In addition I have p vided a separate theorem by theorem reference as an entry on its own in the front of the book to make it extremely convenient for the reader to nd a proof that was not provided in the text Also particularly worth mentioning is a collection of nearly 300 practically useful inequalities that I have c lected together from numerous sources This is appended at the very end of the book

Introduction to Nonparametric Estimation Alexandre B. Tsybakov,2008-10-22 Developed from lecture notes and ready to be used for a course on the graduate level this concise text aims to introduce the fundamental concepts of nonparametric estimation theory while maintaining the exposition suitable for a first approach in the field   *Stochastic Models, Statistics and Their Applications* Ansgar Steland,Ewaryst Rafajłowicz,Krzysztof Szajowski,2015-02-04 This volume presents the latest advances and trends in stochastic models and related statistical procedures Selected peer reviewed contributions focus on statistical inference quality control change point analysis and detection empirical processes time series analysis survival analysis and reliability statistics for stochastic processes big data in technology and the sciences statistical genetics experiment design and stochastic models in engineering Stochastic models and related statistical procedures play an important part in furthering our understanding of the challenging problems currently arising in areas of application such as the natural sciences information technology engineering image analysis genetics energy and finance to name but a few This collection arises from the 12th Workshop on Stochastic Models Statistics and Their Applications Wroclaw Poland   Stream Data Mining: Algorithms and Their Probabilistic Properties Leszek Rutkowski,Maciej Jaworski,Piotr Duda,2019-03-16 This book presents a unique approach to stream data mining Unlike the vast majority of previous approaches which are largely based on heuristics it highlights methods and algorithms that are mathematically justified First it describes how to adapt static decision trees to accommodate data streams in this regard new splitting criteria are developed to guarantee that they are asymptotically equivalent to the classical batch tree Moreover new decision trees are designed leading to the original concept of hybrid trees In turn nonparametric techniques based on Parzen kernels and orthogonal series are employed to address concept drift in the problem of non stationary regressions and classification in a time varying environment Lastly an extremely challenging problem that involves designing ensembles and automatically choosing their sizes is described and solved Given its scope the book is intended for a professional audience of researchers and practitioners who dealwith stream data e g in telecommunication banking and sensor networks   Data Mining and Data Visualization ,2005-05-02 Data Mining and Data Visualization focuses on dealing with large scale data a field commonly referred to as data mining The book is divided into three sections The first deals with an introduction to statistical aspects of data mining and machine learning and includes applications to text analysis computer intrusion detection and hiding of information in digital files The second section focuses on a variety of statistical methodologies that have proven to be effective in data mining applications These

include clustering classification multivariate density estimation tree based methods pattern recognition outlier detection genetic algorithms and dimensionality reduction The third section focuses on data visualization and covers issues of visualization of high dimensional data novel graphical techniques with a focus on human factors interactive graphics and data visualization using virtual reality This book represents a thorough cross section of internationally renowned thinkers who are inventing methods for dealing with a new data paradigm Distinguished contributors who are international experts in aspects of data mining Includes data mining approaches to non numerical data mining including text data Internet traffic data and geographic data Highly topical discussions reflecting current thinking on contemporary technical issues e g streaming data Discusses taxonomy of dataset sizes computational complexity and scalability usually ignored in most discussions Thorough discussion of data visualization issues blending statistical human factors and computational insights

Combinatorial Methods in Statistics Paxton Mark Turner,2021 This thesis explores combinatorial methods in random vector balancing nonparametric estimation and network inference First motivated by problems from controlled experiments we study random vector balancing from the perspective of discrepancy theory a classical topic in combinatorics and give sharp statistical results along with improved algorithmic guarantees Next we focus on the problem of density estimation and investigate the fundamental statistical limits of coresets a popular framework for obtaining algorithmic speedups by replacing a large dataset with a representative subset In the following chapter motivated by the problem of fast evaluation of kernel density estimators we demonstrate how a multivariate interpolation scheme from finite element theory based on the combinatorial geometric properties of a certain mesh can be used to significantly improve the storage and query time of a nonparametric estimator while also preserving its accuracy Our final chapter focuses on pedigree reconstruction a combinatorial inference task of recovering the latent network of familial relationships of a population from its extant genetic data **Directional Statistics for Innovative Applications** Ashis SenGupta,Barry C. Arnold,2022-06-15 In commemoration of the bicentennial of the birth of the lady who gave the rose diagram to us this special contributed book pays a statistical tribute to Florence Nightingale This book presents recent phenomenal developments both in rigorous theory as well as in emerging methods for applications in directional statistics in 25 chapters with contributions from 65 renowned researchers from 25 countries With the advent of modern techniques in statistical paradigms and statistical machine learning directional statistics has become an indispensable tool Ranging from data on circles to that on the spheres tori and cylinders this book includes solutions to problems on exploratory data analysis probability distributions on manifolds maximum entropy directional regression analysis spatio directional time series optimal inference simulation statistical machine learning with big data and more with their innovative applications to emerging real life problems in astro statistics bioinformatics crystallography optimal transport statistical process control and so on *High Dimensional Probability VII* Christian Houdré,David M. Mason,Patricia Reynaud-Bouret,Jan Rosiński,2016-09-21 This volume collects selected papers

from the 7th High Dimensional Probability meeting held at the Institut d tudes Scientifiques de Carg se IESC in Corsica France High Dimensional Probability HDP is an area of mathematics that includes the study of probability distributions and limit theorems in infinite dimensional spaces such as Hilbert spaces and Banach spaces The most remarkable feature of this area is that it has resulted in the creation of powerful new tools and perspectives whose range of application has led to interactions with other subfields of mathematics statistics and computer science These include random matrices nonparametric statistics empirical processes statistical learning theory concentration of measure phenomena strong and weak approximations functional estimation combinatorial optimization and random graphs The contributions in this volume show that HDP theory continues to thrive and develop new tools methods techniques and perspectives to analyze random phenomena <u>Proceedings of the Third SIAM International Conference on Data Mining</u> Daniel Barbara,Chandrika Kamath,2003-01-01 The third SIAM International Conference on Data Mining provided an open forum for the presentation discussion and development of innovative algorithms software and theories for data mining applications and data intensive computation This volume includes 21 research papers *A Combinatorial Method for Bandwidth Selection in Kernel Density Estimation* ,2002 **Estimating the Density of a Conditional Expectation** Samuel George Steckley,2006 **Stochastic Programming** RUSZCZYNSK,Alexander Shapiro,2003-10-09 Brings together leading in the most important sub fields of stochastic programming to present a rigourous overview of basic models methods and applications of stochastic programming The text is intended for researchers students engineers and economists who encounter in their work optimization problems involving uncertainty *Nonparametric Set Estimation Problems in Statistical Inference and Learning* Aarti Singh,2008 **Advanced Lectures on Machine Learning** ,2003 **Journal of Economic Literature** ,2001 **Annales de L'I.H.P.** ,2006

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