Empirical Processes Theory And Applications

Originally published in 1986, this valuable reference provides a detailed treatment of limit theorems and inequalities for empirical processes of real-valued random variables. It also includes applications of the theory to censored data, spacings, rank statistics, quantiles, and many functionals of empirical processes, including a treatment of bootstrap methods, and a summary of inequalities that are useful for proving limit theorems. At the end of the Errata section, the authors have supplied references to solutions for 11 of the 19 Open Questions provided in the book's original edition.

Empirical likelihood provides inferences whose validity does not depend on specifying a parametric model for the data. Because it uses a likelihood, the method has certain inherent advantages over resampling methods: it uses the data to determine the shape of the confidence regions, and it makes it easy to combined data from multiple sources. It also facilitates incorporating side information, and it simplifies accounting for censored, truncated, or biased sampling. One of the first books published on the subject, Empirical Likelihood offers an in-depth treatment of this method for constructing confidence regions and testing hypotheses. The author applies empirical likelihood to a range of problems, from those as simple as setting a confidence region for a univariate mean under IID sampling, to problems defined through smooth functions of means, regression models, generalized linear models, estimating equations, or kernel smooths, and to sampling with non-identically distributed data. Abundant figures offer visual reinforcement of the concepts and techniques. Examples from a variety of disciplines and detailed descriptions of algorithms-also posted on a companion Web site at-illustrate the methods in practice. Exercises help readers to understand and apply the methods. The method of empirical likelihood is now attracting serious attention from researchers in econometrics and biostatistics, as well as from statisticians. This book is your opportunity to explore its foundations, its advantages, and its application to a myriad of practical problems.

High dimensional probability, in the sense that encompasses the topics rep resented in this volume, began about thirty years ago with research in two related areas: limit theorems for sums of independent Banach space valued random vectors and general Gaussian processes. An important feature in these past research studies has been the fact that they highlighted the es sential probabilistic nature of the problems considered. In part, this was because, by working on a general Banach space, one had to discard the extra, and often extraneous, structure imposed by random variables taking values in a Euclidean space, or by processes being indexed by sets in R or Rd. Doing this led to striking advances, particularly in Gaussian process theory. It also led to the creation or introduction of powerful new tools, such as randomization, decoupling, moment and exponential inequalities, chaining, isoperimetry and concentration of measure, which apply to areas well beyond those for which they were created. The general theory of em pirical processes, with its vast applications in statistics, the study of local times of Markov processes, certain problems in harmonic analysis, and the general theory of stochastic processes are just several of the broad areas in which Gaussian process techniques and techniques from probability in Banach spaces have made a substantial impact. Parallel to this work on probability in Banach spaces, classical proba bility and empirical process theory were enriched by the development of powerful results in strong approximations.

Empirical ProcessesTheory and ApplicationsIMSEmpirical ProcessesTheory and Applications ; 22.10 - 28.10.1995Empirical Processes in M-EstimationCambridge University Press

Empirical Processes

Theory of Particulate Processes

Lectures on Empirical Processes

Uniform Central Limit Theorems

A Nonasymptotic Theory of Independence

Theory and Statistical Applications

The purpose of this book is to present results on the subject of weak convergence in function spaces to study invariance principles in statistical applications to dependent random variables, U-statistics, censor data analysis. Different techniques, formerly available only in a broad range of literature, are for the first time presented here in a self-contained fashion. Contents: Weak convergence of stochastic processes Weak convergence in metric spaces Weak convergence on C[0, 1] and D[0,?) Central limit theorem for semi-martingales and applications Central limit theorems for dependent random variables Empirical process Bibliography

Concentration inequalities, which express the fact that certain complicated random variables are almost constant, have proven of utmost importance in many areas of probability and statistics. This volume contains refined versions of these inequalities, and their relationship to many applications particularly in stochastic analysis. The broad range and the high quality of the contributions make this book highly attractive for graduates, postgraduates and researchers in the above areas.

Advanced text; estimation methods in statistics, e.g. least squares; lots of examples; minimal abstraction.

A preeminent expert in the field explores new and exciting methodologies in the ever-growing field of robust statistics Used to develop data analytical methods, which are resistant to outlying observations in the data, while capable of detecting outliers, robust statistics is extremely useful for solving an array of common problems, such as estimating location, scale, and regression parameters. Written by an internationally recognized expert in the field of robust statistics, this book addresses a range of well-established techniques while exploring, in depth, new and exciting methodologies. Local robustness and global robustness are discussed, and problems of non-identifiability and adaptive estimation are considered. Rather than attempt an exhaustive investigation of robustness, the author provides readers with a timely review of many of the most important problems in statistical inference involving robust estimation, along with a brief look at confidence intervals for location. Throughout, the author meticulously links research in maximum likelihood estimation with the more general M-estimation methodology. Specific applications and R and some MATLAB subroutines with accompanying data sets—available both in the text and online—are employed wherever appropriate. Providing invaluable insights and guidance, Robustness Theory and Application: Offers a balanced presentation of theory and applications within each topic-specific discussion Features solved examples throughout which help clarify complex and/or difficult concepts Meticulously links research in maximum likelihood type estimation with the more general M-estimation methodology Delves into new methodologies which have been developed over the past decade without stinting on coverage of “tried-and-true” methodologies Includes R and some MATLAB subroutines with accompanying data sets, which help illustrate the power of the methods described Robustness Theory and Application is an important resource for all statisticians interested in the topic of robust statistics. This book encompasses both past and present research, making it a valuable supplemental text for graduate-level courses in robustness.

Empirical Likelihood

Empirical Process Techniques for Dependent Data

A Non-Asymptotic Viewpoint

Theory, Models, and Applications to Finance, Biology, and Medicine

Empirical Processes with Applications to Statistics

Methods, Theory and Applications

Originally published in 1986, this valuable reference provides a detailed treatment of limit theorems and inequalities for empirical processes of real-valued random variables; applications of the theory to censored data, spacings, rank statistics, quantiles, and many functionals of empirical processes, including a treatment of bootstrap methods; and a summary of inequalities that are useful for proving limit theorems. At the end of the Errata section, the authors have supplied references to solutions for 11 of the 19 Open Questions provided in the book's original edition. Audience: researchers in statistical theory, probability theory, biostatistics, econometrics, and computer science.

It was undoubtedly a necessary task to collect all the results on the concentration of measure during the past years in a monograph. The author did this very successfully and the book is an important contribution to the topic. It will surely influence further research in this area considerably. The book is very well written, and it was a great pleasure for the reviewer to read it. --Mathematical Reviews The observation of the concentration of measure phenomenon is inspired by isoperimetric inequalities. A familiar example is the way the uniform measure on the standard sphere S^n becomes concentrated around the equator as the dimension gets large. This property may be interpreted in terms of functions on the sphere with small oscillations, an idea going back to Levy. The phenomenon also occurs in probability, as a version of the law of large numbers, due to Emile Borel. This book offers the basic techniques and examples of the concentration of measure phenomenon. The concentration of measure phenomenon was put forward in the early seventies by V. Milman in the asymptotic geometry of Banach spaces. It is of powerful interest in applications in various areas, such as geometry, functional analysis and infinite-dimensional integration, discrete mathematics and complexity theory, and probability theory. Particular emphasis is on geometric, functional, and probabilistic tools to reach and describe measure concentration in a number of settings. The book presents concentration functions and inequalities, isoperimetric and functional examples, spectrum and topological applications, product measures, entropic and transportation methods, as well as aspects of M. Talagrand's deep investigation of concentration in product spaces and its application in discrete mathematics and probability theory, supremum of Gaussian and empirical processes, spin glass, random matrices, etc. Prerequisites are a basic background in measure theory, functional analysis, and probability theory.

The purpose of these lecture notes is to provide an introduction to the general theory of empirical risk minimization with an emphasis on excess risk bounds and oracle inequalities in penalized problems. In recent years, there have been new developments in this area motivated by the study of new classes of methods in machine learning such as large margin classification methods (boosting, kernel machines). The main probabilistic tools involved in the analysis of these problems are concentration and deviation inequalities by Talagrand along with other methods of empirical processes theory (symmetrization inequalities, contraction inequality for Rademacher sums, entropy and generic chaining bounds). Sparse recovery based on l_1-type penalization and low rank matrix recovery based on the nuclear norm penalization are other active areas of research, where the main problems can be stated in the framework of penalized empirical risk minimization, and concentration inequalities and empirical processes tools have proved to be very useful.

Bandit Algorithms

From Linear to Fully Nonlinear Theory

Weak Convergence of Stochastic Processes

An Introduction to Continuous-Time Stochastic Processes

Robustness Theory and Application

Convergence of Stochastic Processes

Functionals on stochastic processes; Uniform convergence of empirical measures; Convergence in distribution in euclidean spaces; Convergence in distribution in metric spaces; The uniform metric on space of cadlag functions; The skorohod metric on D [0, oo); Central limit teorems; Martingales.

An accessible account of the rich theory surrounding concentration inequalities in probability theory, with applications from machine learning and statistics to high-dimensional geometry. This book introduces key ideas and presents a detailed summary of the state-of-the-art in the area, making it ideal for independent learning and as a reference.

An integrated package of powerful probabilistic tools and key applications in modern mathematical data science.

Large deviation estimates have proved to be the crucial tool required to handle many questions in statistics, engineering, statistial mechanics, and applied probability. Amir Dembo and Ofer Zeitouni, two of the leading researchers in the field, provide an introduction to the theory of large deviations and applications at a level suitable for graduate students. The mathematics is rigorous and the applications come from a wide range of areas, including electrical engineering and DNA sequences. The second edition, printed in 1998, included new material on concentration inequalities and the metric and weak convergence approaches to large deviations. General statements and applications were sharpened, new exercises added, and the bibliography updated. The present soft cover edition is a corrected printing of the 1998 edition.

Mathematical Statistics Theory and Applications

Large Deviations Techniques and Applications

With Applications to Statistical Limit Theorems

Theory and Applications

Applications of Empirical Process Theory

Analysis and Techniques of Continuous Crystallization

Theory of Particulate Processes: Analysis and Techniques of Continuous Crystallization, Second Edition covers the numerous population balance-based particulate studies. This edition emerged from the notes for an industrial short course on crystallization. This book is divided into 10 chapters and begins with an outline of the methods for representation of particle distributions and a systematic approach to the predictive modeling of processes where there is a need to characterize distributions in time and space and by some identifying property. The succeeding chapters provide a specific and more elementary approach to modeling crystal size distributions, as well as the modeling the kinetics of crystal nucleation and growth rates. Other chapters discuss a wide range of system analysis and design considerations specific to crystallization for both the steady state and unsteady state. The final chapters illustrate the use of a population balance analysis to interpret data from both laboratory and process equipment. These chapters also explore a wide variety of particulate processes and systems for which the population balance analysis is useful. This book is of great value to graduate students with particulate systems course.

This volume provides a systematic in-depth analysis of nonparametric learning. It covers the theoretical limits and the asymptotical optimal algorithms and estimates, such as pattern recognition, nonparametric regression estimation, universal prediction, vector quantization, distribution and density estimation, and genetic programming.

Ces notes sont consacrées aux inégalités et aux théorèmes limites classiques pour les suites de variables aléatoires absolument régulières ou fortement mélangeantes au sens de Rosenblatt. Le but poursuivi est de donner des outils techniques pour l'étude des processus faiblement dépendants aux statisticiens ou aux probabilistes travaillant sur ces processus.

This book provides a systematic and accessible approach to stochastic differential equations, backward stochastic differential equations, and their connection with partial differential equations, as well as the recent development of the fully nonlinear theory, including nonlinear expectation, second order backward stochastic differential equations, and path dependent partial differential equations. Their main applications and numerical algorithms, as well as many exercises, are included. The book focuses on ideas and clarity, with most results having been solved from scratch and most theories being motivated from applications. It can be considered a starting point for junior researchers in the field, and can serve as a textbook for a two-semester graduate course in probability theory and stochastic analysis. It is also accessible for graduate students majoring in financial engineering.

Sintering: From Empirical Observations to Scientific Principles

Backward Stochastic Differential Equations

High-Dimensional Statistics

Theory and Applications ; 22.10 - 28.10.1995

Stochastic Inequalities and Applications

Weak Convergence and Its Applications

Empirical process techniques for independent data have been used for many years in statistics and probability theory. These techniques have proved very useful for studying asymptotic properties of parametric as well as non-parametric statistical procedures. Recently, the need to model the dependence structure in data sets from many different subject areas such as finance, insurance, and telecommunications has led to new developments concerning the empirical distribution function and the empirical process for dependent, mostly stationary sequences. This work gives an introduction to this new theory of empirical process techniques, which has so far been scattered in the statistical and probabilistic literature, and surveys the most recent developments in various related fields. Key features: A thorough and comprehensive introduction to the existing theory of empirical process techniques for dependent data * Accessible surveys by leading experts of the most recent developments in various related fields * Examines empirical process techniques for dependent data, useful for studying parametric and non-parametric statistical procedures * Comprehensive bibliographies * An overview of applications in various fields related to empirical processes: e.g., spectral analysis of time-series, the bootstrap for stationary sequences, extreme value theory, and the empirical process for mixing dependent observations, including the case of strong dependence. To date this book is the only comprehensive treatment of the topic in book literature. It is an ideal introductory text that will serve as a reference or resource for classroom use in the areas of statistics, time-series analysis, extreme value theory, point process theory, and applied probability theory. Contributors: P. Ango Nze, M.A. Arcones, I. Berkes, R. Dahlhaus, J. Dedecker, H.G. Dehling,

Kosorok’s brilliant text provides a self-contained introduction to empirical processes and semiparametric inference. These powerful research techniques are surprisingly useful for developing methods of statistical inference for complex models and in understanding the properties of such methods. This is an authoritative text that covers all the bases, and also a friendly and gradual introduction to the area. The book can be used as research reference and textbook.

This concisely written book is a rigorous and self-contained introduction to the theory of continuous-time stochastic processes. Balancing theory and applications, the authors use stochastic methods and concrete examples to model real-world problems from engineering, biomathematics, biotechnology, and finance. Suitable as a textbook for graduate or advanced undergraduate courses, the work may also be used for self-study or as a reference. The book will be of interest to students, pure and applied mathematicians, and researchers or practitioners in mathematical finance, biomathematics, physics, and engineering.

How does a machine learn a new concept on the basis of examples? This second edition takes account of important new developments in the field. It also deals extensively with the theory of learning control systems, now comparably mature to learning of neural networks.

Oracle Inequalities in Empirical Risk Minimization and Sparse Recovery Problems

The Concentration of Measure Phenomenon

With Applications to Statistics

Introduction to Empirical Processes and Semiparametric Inference

Algebraic Geometry and Statistical Learning Theory

With Applications to Neural Networks

This treatise by an acknowledged expert includes several topics not found in any previous book.

Modern statistics deals with large and complex data sets, and consequently with models containing a large number of parameters. This book presents a detailed account of recently developed approaches, including the Lasso and versions of it for various models, boosting methods, undirected graphical modeling, and procedures controlling false positive selections. A special characteristic of the book is that it contains comprehensive mathematical theory on high-dimensional statistics combined with methodology, algorithms and illustrations with real data examples. This in-depth approach highlights the methods’ great potential and practical applicability in a variety of settings. As such, it is a valuable resource for researchers,

graduate students and experts in statistics, applied mathematics and computer science.

Weak convergence of stochastic processes is one of most important theories in probability theory. Not only probability experts but also more and more statisticians are interested in it. In the study of statistics and econometrics, some problems cannot be solved by the classical method. In this book, we will introduce some recent development of modern weak convergence theory to overcome defects of classical theory.Contents: "The Definition and Basic Properties of Weak Convergence: "Metric SpaceThe Definition of Weak Convergence of Stochastic Processes and Portmanteau TheoremHow to Verify the Weak Convergence?Two Examples of Applications of Weak Convergence"Convergence to the Independent Increment Processes: "The Basic Conditions of Convergence to the Gaussian Independent Increment ProcessesDonsker Invariance PrincipleConvergence of Poisson Point ProcessesTwo Examples of Applications of Point Process Method"Convergence to Semimartingales: "The Conditions of Tightness for Semimartingale SequenceWeak Convergence to SemimartingaleWeak Convergence to Stochastic Integral I: The Martingale Convergence ApproachWeak Convergence to Stochastic Integral II: Kurtz and Protter's ApproachStable Central Limit Theorem for SemimartingalesAn Application to Stochastic Differential EquationsAppendix: The Predictable Characteristics of Semimartingales"Convergence of Empirical Processes: "Classical Weak Convergence of Empirical ProcessesWeak Convergence of Marked Empirical ProcessesWeak Convergence of Function Index Empirical ProcessesWeak Convergence of Empirical Processes Involving Time-Dependent dataTwo Examples of Applications in Statistics Readership: Graduate students and researchers in probability & statistics and econometrics.

A comprehensive and rigorous introduction for graduate students and researchers, with applications in sequential decision-making problems.

Learning and Generalisation

High Dimensional Probability II

Weak Convergence and Empirical Processes

Concentration Inequalities

Asymptotic Theory of Weakly Dependent Random Processes

As sintering applications march toward a $30 billion global business, the models for sintering have progressed, but generally follow behind observation. Documentation of the steps needed to build to a quantitative and predictive theory are often missed. Sintering: From Empirical Observations to Scientific Principles partitions sintering applications and observations to show critical turning points required to establish modern sintering as a predictive science. This book, written by the most cited author in his field, is laced with people, organizations, critical steps, and important formulations in a mixture of history, personalities, and applications. Exploring how insights in seemingly unrelated fields sparked progress, it is also a teaching tool to show where there is success, where there are problems, and how to organize teams to leapfrog to new applications or plateaus of use. Randall German's Sintering: From Empirical Observations to Scientific Principles is a platform for directly addressing the critical control parameters in these new research and development efforts. Shows how the theories and understanding of sintering were developed and improved over time, and how different products were developed, ultimately leading to important knowledge and lessons for solving real sintering problems Covers all the necessary infrastructure of sintering theory and practice, such as atomic theory, surface energy, microstructure, and measurement and observation tools Introduces the history and development of such early sintered products as porcelain, tungsten lamp filaments, bronze bearings, steel automotive components, platinum crucibles and more

This book explores weak convergence theory and empirical processes and their applications to many applications in statistics. Part one reviews stochastic convergence in its various forms. Part two offers the theory of empirical processes in a form accessible to statisticians and probabilists. Part three covers a range of topics demonstrating the applicability of the theory to key questions such as measures of goodness of fit and the bootstrap.

Sure to be influential, Watanabe's book lays the foundations for the use of algebraic geometry in statistical learning theory. Many models/machines are singular: mixture models, neural networks, HMMs, Bayesian networks, stochastic context-free grammars are major examples. The theory achieved here underpins accurate estimation techniques in the presence of singularities.

Concentration inequalities for functions of independent random variables is an area of probability theory that has witnessed a great revolution in the last few decades, and has applications in a wide variety of areas such as machine learning, statistics, discrete mathematics, and high-dimensional geometry. Roughly speaking, if a function of many independent random variables does not depend too much on any of the variables then it is concentrated in the sense that with high probability, it is close to its expected value. This book offers a host of inequalities to illustrate this rich theory in an accessible way by covering the key developments and applications in the field. The authors describe the interplay between the probabilistic structure (independence) and a variety of tools ranging from functional inequalities to transportation arguments to information theory. Applications to the study of empirical processes, random projections, random matrix theory, and threshold phenomena are also presented. A self-contained introduction to concentration inequalities, it includes a survey of concentration of sums of independent random variables, variance bounds, the entropy method, and the transportation method. Deep connections with isoperimetric problems are revealed whilst special attention is paid to applications to the supremum of empirical processes. Written by leading experts in the field and containing extensive exercise sections this book will be an invaluable resource for researchers and graduate students in mathematics, theoretical computer science, and engineering.

An Introduction with Applications in Data Science

Principles of Nonparametric Learning

Theory and Applications : Tagung, Oberwolfach, 22.10-28.10. 1995

Statistics for High-Dimensional Data

Multivariate Empirical Processes

Empirical Processes in M-Estimation