Causal Inference Monographs On Statistics And App

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Causal Inference Monographs On Statistics And App *2023-11-01*

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Observation and Experiment John Wiley & Sons The twenty-first century has seen a breathtaking expansion of statistical methodology, both in scope and in influence. 'Big

data', 'data science', and 'machine learning' have become familiar terms in the news, as statistical methods are brought to bear upon the enormous data sets of modern science and commerce. How did we get here? And where are we going? This book takes us on an exhilarating journey through the revolution in data analysis following the introduction of electronic computation in the 1950s. Beginning with classical inferential theories - Bayesian, frequentist, Fisherian - individual chapters take up a series of influential topics: survival analysis, logistic regression, empirical Bayes, the jackknife and bootstrap, random forests, neural networks, Markov chain Monte Carlo, inference after model selection, and dozens more. The distinctly modern approach integrates methodology and algorithms with statistical inference. The book ends with speculation on the future direction of statistics and data science.

Causal Inference in Statistics CRC Press

This textbook is for graduate students and research workers in social statistics and related subject areas. It follows a novel curriculum developed around the basic

statistical activities: sampling, measurement and inference. The monograph aims to prepare the reader for the career of an independent social statistician and to serve as a reference for methods, ideas for and ways of studying of human populations. Elementary linear algebra and calculus are prerequisites, although the exposition is quite forgiving. Familiarity with statistical software at the outset is an advantage, but it can be developed while reading the first few chapters. Theory of Factorial Design John Wiley & Sons This paper summarizes recent advances in causal inference and underscores the paradigmatic shifts that must be undertaken in moving from traditional statistical analysis to causal analysis of multivariate data. Special emphasis is placed on the assumptions that underly all causal inferences, the languages used in formulating those assumptions, the conditional nature of all causal and counterfactual claims, and the methods that have been developed for the assessment of such claims. These advances are illustrated using a general theory of causation based on the

Structural Causal Model (SCM) described in Pearl (2000a), which subsumes and unifies other approaches to causation, and provides a coherent mathematical foundation for the analysis of causes and counterfactuals. In particular, the paper surveys the development of mathematical tools for inferring (from a combination of data and assumptions) answers to three types of causal queries: (1) queries about the effects of potential interventions, (also called "causal effects" or "policy evaluation") (2) queries about probabilities of counterfactuals, (including assessment of "regret," "attribution" or "causes of effects") and (3) queries about direct and indirect effects (also known as "mediation"). Finally, the paper defines the formal and conceptual relationships between the structural and potential-outcome frameworks and presents tools for a symbiotic analysis that uses the strong features of both. The tools are demonstrated in the analyses of mediation, causes of effects, and probabilities of causation. -- p. 1.

Replication and Evidence Factors in Observational Studies

CRC Press

Bayesian Nonparametri

cs for Causal Inference and Missing Data provides an overview of flexible Bayesian nonparametric (BNP) methods for modeling joint or conditional distributions and functional relationships, and their interplay with causal inference and missing data. This book emphasizes the importance of making untestable assumptions to identify estimands of interest, such as missing at random assumption for missing data and unconfounded ness for causal inference in observational studies. Unlike parametric methods, the BNP approach can account for possible violations of assumptions and minimize concerns about model misspecificatio n. The overall strategy is to first specify BNP models for observed data and then to specify additional uncheckable assumptions to identify estimands of interest. The book is divided into three parts. Part I develops the key concepts in causal inference and missing data and reviews relevant concepts in Bayesian inference. Part II introduces the fundamental BNP tools required to address causal inference and missing data problems. Part III shows how the BNP approach can be applied in a variety of case studies. The datasets in

the case studies come from electronic health records data, survey data, cohort studies, and randomized clinical trials. Features • Thorough discussion of both BNP and its interplay with causal inference and missing data • How to use BNP and g-computation for causal inference and non-ignorable missingness • How to derive and calibrate sensitivity parameters to assess sensitivity to deviations from uncheckable causal and/or missingness assumptions • Detailed case studies illustrating the application of BNP methods to causal inference and missing data • R code and/or packages to implement BNP in causal inference and missing data problems The book is primarily aimed at researchers and graduate students from statistics and biostatistics. It will also serve as a useful practical reference for mathematically sophisticated epidemiologists and medical researchers.

Studying Human Populations

Cambridge University Press

Bayesian Nonparametrics for Causal Inference and Missing Data provides an overview of flexible Bayesian nonparametric (BNP) methods for modeling joint or conditional distributions and functional relationships, and their interplay with causal

inference and missing data. This book emphasizes the importance of making untestable assumptions to identify estimands of interest, such as missing at random assumption for missing data and unconfounded ness for causal inference in observational studies. Unlike parametric methods, the BNP approach can account for possible violations of assumptions and minimize concerns about model misspecificatio n. The overall strategy is to first specify BNP models for observed data and then to specify additional uncheckable assumptions to identify estimands of interest. The book is divided into three parts. Part I develops the key concepts in causal inference and missing data and reviews relevant concepts in Bayesian inference. Part II introduces the fundamental BNP tools required to address causal inference and missing data problems. Part III shows how the BNP approach can be applied in a variety of case studies. The datasets in the case studies come from electronic health records data, survey data, cohort studies, and randomized clinical trials. Features Thorough discussion of both BNP and its interplay with causal inference and missing data

How to use BNP and g-computation for causal inference and non-ignorable missingness How to derive and calibrate sensitivity parameters to assess sensitivity to deviations from uncheckable causal and/or missingness assumptions Detailed case studies illustrating the application of BNP methods to causal inference and missing data R code and/or packages to implement BNP in causal inference and missing data problems The book is primarily aimed at researchers and graduate students from statistics and biostatistics. It will also serve as a useful practical reference for mathematicall y sophisticated epidemiologist s and medical researchers. Tensor Methods in Statistics CRC Press Causality offers the first comprehensiv e coverage of causal analysis in many sciences, including recent advances using graphical methods. Pearl presents a unified account of the probabilistic, manipulative, counterfactual and structural approaches to causation, and devises simple mathematical tools for analyzing the relationships between causal connections, statistical associations, actions and observations. The book will open the way for including causal analysis in the

standard curriculum of statistics, artificial intelligence ... *Bayesian Nonparametrics for Causal Inference and Missing Data* Cambridge University Press This book goes beyond the truism that 'correlation does not imply causation' and explores the logical and methodological relationships between correlation and causation. It presents a series of statistical methods that can test, and potentially discover, cause-effect relationships between variables in situations in which it is not possible to conduct randomised or experimentally controlled experiments. Many of these methods are quite new and most are generally unknown to biologists. In addition to describing how to conduct these statistical tests, the book also puts the methods into historical context and explains when they can and cannot justifiably be used to test or discover causal claims. Written in a conversational style that minimises technical jargon, the book is aimed at practising biologists and advanced students, and assumes only a very basic knowledge of introductory statistics. **Foundations of Bayesianism** SAGE Causal inference is an important but controversial topic in the social

sciences in that it is difficult to statistically control for all possible confounding variables. To address this concern, this monograph introduces a reference distribution of the confounding that is the product of two dependent correlation coefficients and illustrates how to use the reference distribution to investigate the robustness of a cause inference to the impact of a confounding variable. The methodology discussed in this monograph would also allow for multiple partial causes in the complex social phenomena under study, so as to inform causal inferences in the social sciences from statistical linear models. *Dynamic Treatment Regimes* LAP Lambert Academic Publishing Covers the fundamentals of case-control studies including important recent developments, with a focus on statistical analysis. **Causality** MIT Press This book compiles and presents new developments in statistical causal inference. The accompanying data and computer programs are publicly available so readers may replicate the model development and data analysis presented in each chapter. In this way, methodology is taught so that readers

may implement it directly. The book brings together experts engaged in causal inference research to present and discuss recent issues in causal inference methodological development. This is also a timely look at causal inference applied to scenarios that range from clinical trials to mediation and public health research more broadly. In an academic setting, this book will serve as a reference and guide to a course in causal inference at the graduate level (Master's or Doctorate). It is particularly relevant for students pursuing degrees in statistics, biostatistics, and computational biology. Researchers and data analysts in public health and biomedical research will also find this book to be an important reference. Multivariate Dependencies MIT Press Developed from celebrated Harvard statistics lectures, Introduction to Probability provides essential language and tools for understanding statistics, randomness, and uncertainty. The book explores a wide variety of applications and examples, ranging from coincidences and paradoxes to Google PageRank and Markov chain

Monte Carlo (MCMC). Additional application areas explored include genetics, medicine, computer science, and information theory. The authors present the material in an accessible style and motivate concepts using real-world examples. Throughout, they use stories to uncover connections between the fundamental distributions in statistics and conditioning to reduce complicated problems to manageable pieces. The book includes many intuitive explanations, diagrams, and practice problems. Each chapter ends with a section showing how to perform relevant simulations and calculations in R, a free statistical software environment. The second edition adds many new examples, exercises, and explanations, to deepen understanding of the ideas, clarify subtle concepts, and respond to feedback from many students and readers. New supplementary online resources have been developed, including animations and interactive visualizations, and the book has been updated to dovetail with these resources. Supplementary material is available on Joseph Blitzstein's website www.

stat110.net. The supplements include: Solutions to selected exercises Additional practice problems Handouts including review material and sample exams Animations and interactive visualizations created in connection with the edX online version of Stat 110. Links to lecture videos available on ITunes U and YouTube There is also a complete instructor's solutions manual available to instructors who require the book for a course. *Replication and Evidence Factors in Observational Studies* CRC Press This textbook for graduate students in statistics, data science, and public health deals with the practical challenges that come with big, complex, and dynamic data. It presents a scientific roadmap to translate real-world data science applications into formal statistical estimation problems by using the general template of targeted maximum likelihood estimators. These targeted machine learning algorithms estimate quantities of interest while still providing valid inference. Targeted learning methods within data science area critical component for solving scientific

problems in the modern age. The techniques can answer complex questions including optimal rules for assigning treatment based on longitudinal data with time-dependent confounding, as well as other estimands in dependent data structures, such as networks. Included in Targeted Learning in Data Science are demonstrations with software packages and real data sets that present a case that targeted learning is crucial for the next generation of statisticians and data scientists. This book is a sequel to the first textbook on machine learning for causal inference, Targeted Learning, published in 2011. Mark van der Laan, PhD, is Jiann-Ping Hsu/Karl E. Peace Professor of Biostatistics and Statistics at UC Berkeley. His research interests include statistical methods in genomics, survival analysis, censored data, machine learning, semiparametric models, causal inference, and targeted learning. Dr. van der Laan received the 2004 Mortimer Spiegelman Award, the 2005 Van Dantzig Award, the 2005 COPSS Snedecor Award, the 2005 COPSS Presidential Award, and

has graduated over 40 PhD students in biostatistics and statistics. Sherri Rose, PhD, is Associate Professor of Health Care Policy (Biostatistics) at Harvard Medical School. Her work is centered on developing and integrating innovative statistical approaches to advance human health. Dr. Rose's methodological research focuses on nonparametric machine learning for causal inference and prediction. She co-leads the Health Policy Data Science Lab and currently serves as an associate editor for the Journal of the American Statistical Association and Biostatistics. *Handbook of Causal Analysis for Social Research* CRC Press Discover New Methods for Dealing with High-Dimensional DataA sparse statistical model has only a small number of nonzero parameters or weights; therefore, it is much easier to estimate and interpret than a dense model. Statistical Learning with Sparsity: The Lasso and Generalizations presents methods that exploit sparsity to help recover the underl **Doing Research in Political Science** Cengage Learning Outside of randomized experiments, association does not imply

causation, and yet there is nothing defective about our knowledge that smoking causes lung cancer, a conclusion reached in the absence of randomized experimentation with humans. How is that possible? If observed associations do not identify causal effects in observational studies, how can a sequence of such associations become decisive? Two or more associations may each be susceptible to unmeasured biases, yet not susceptible to the same biases. An observational study has two evidence factors if it provides two comparisons susceptible to different biases that may be combined as if from independent studies of different data by different investigators, despite using the same data twice. If the two factors concur, then they may exhibit greater insensitivity to unmeasured biases than either factor exhibits on its own. Replication and Evidence Factors in Observational Studies includes four parts: A concise introduction to causal inference, making the book self-contained Practical examples of evidence factors from the health and social sciences with analyses in R The theory of evidence factors Study design with

evidence factors A companion R package evident is available from CRAN.

Targeted Learning in Data Science Cambridge University Press

Probabilistic Foundations of Statistical Network Analysis presents a fresh and insightful perspective on the fundamental tenets and major challenges of modern network analysis. Its lucid exposition provides necessary background for understanding the essential ideas behind exchangeable and dynamic network models, network sampling, and network statistics such as sparsity and power law, all of which play a central role in contemporary data science and machine learning applications. The book rewards readers with a clear and intuitive understanding of the subtle interplay between basic principles of statistical inference, empirical properties of network data, and technical concepts from probability theory. Its mathematicall y rigorous, yet non-technical, exposition makes the book accessible to professional data scientists, statisticians, and computer scientists as well as practitioners and researchers in substantive fields. Newcomers

and non-quantitative researchers will find its conceptual approach invaluable for developing intuition about technical ideas from statistics and probability, while experts and graduate students will find the book a handy reference for a wide range of new topics, including edge exchangeability, relative exchangeability, graphon and graphex models, and graph-valued Levy process and rewiring models for dynamic networks. The author's incisive commentary supplements these core concepts, challenging the reader to push beyond the current limitations of this emerging discipline. With an approachable exposition and more than 50 open research problems and exercises with solutions, this book is ideal for advanced undergraduate and graduate students interested in modern network analysis, data science, machine learning, and statistics. Harry Crane is Associate Professor and Co-Director of the Graduate Program in Statistics and Biostatistics and an Associate Member of the Graduate Faculty in Philosophy at Rutgers University. Professor Crane's research interests cover a range of mathematical and applied topics in network science,

probability theory, statistical inference, and mathematical logic. In addition to his technical work on edge and relational exchangeability, relative exchangeability, and graph-valued Markov processes, Prof. Crane's methods have been applied to domain-specific cybersecurity and counterterrorism problems at the Foreign Policy Research Institute and RAND's Project AIR FORCE.

ITF Roundtable Reports Ex-Post Assessment of Transport Investments and Policy Interventions Courier Dover Publications
A pioneering monograph on tensor methods applied to distributional problems arising in statistics, this work begins with the study of multivariate moments and cumulants. An invaluable reference for graduate students and professional statisticians. 1987 edition.

Probabilistic Foundations of Statistical Network Analysis Springer
This is an authoritative collection of papers addressing the key challenges that face the Bayesian interpretation of probability today. The volume includes important criticisms of Bayesian reasoning and gives an insight into some of the points of disagreement amongst advocates of the Bayesian

approach. It will be of interest to graduate students, researchers, those involved with the applications of Bayesian reasoning, and philosophers.

Missing Data in Longitudinal Studies

Routledge

A new approach for defining causality and such related notions as degree of responsibility, degrees of blame, and causal explanation. Causality plays a central role in the way people structure the world; we constantly seek causal explanations for our observations. But what does it even mean that an event C "actually caused" event E? The problem of defining actual causation goes beyond mere philosophical speculation. For example, in many legal arguments, it is precisely what needs to be established in order to determine responsibility. The philosophy literature has been struggling with the problem of defining causality since Hume. In this book, Joseph Halpern explores actual causality, and such related notions as degree of responsibility, degree of blame, and causal explanation. The goal is to arrive at a definition of causality that matches our natural language usage and is helpful, for example, to a

jury deciding a legal case, a programmer looking for the line of code that cause some software to fail, or an economist trying to determine whether austerity caused a subsequent depression. Halpern applies and expands an approach to causality that he and Judea Pearl developed, based on structural equations. He carefully formulates a definition of causality, and building on this, defines degree of responsibility, degree of blame, and causal explanation. He concludes by discussing how these ideas can be applied to such practical problems as accountability and program verification. Technical details are generally confined to the final section of each chapter and can be skipped by non-mathematical readers.

Causal Learning

Springer Statistics is a subject of many uses and surprisingly few effective practitioners. The traditional road to statistical knowledge is blocked, for most, by a formidable wall of mathematics. The approach in An Introduction to the Bootstrap avoids that wall. It arms scientists and engineers, as well as statisticians, with the computational techniques they need to analyze and understand

complicated data sets. Statistical Inference as Severe Testing Cambridge University Press Large observational studies involving research questions that require the measurement of several features on each individual arise in many fields including the social and medical sciences. This book sets out both the general concepts and the more technical statistical issues involved in analysis and interpretation. Numerous illustrative examples are described in outline and four studies are discussed in some detail. The use of graphical representations of dependencies and independencies among the features under study is stressed, both to incorporate available knowledge at the planning stage of an analysis and to summarize aspects important for interpretation after detailed statistical analysis is complete. This book is aimed at research workers using statistical methods as well as statisticians involved in empirical research.