Probabilistic Networks And Expert Systems Exact Computational Methods For Bayesian Networks Information Science And Statistics

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Innovations in Bayesian Networks - Dawn E. Holmes 2008-10-02
Bayesian networks currently provide one of the most rapidly growing areas of research in computer science and statistics. In compiling this volume we have brought together

contributions from some of the most prestigious researchers in this field. Each of the twelve chapters is self-contained. Both theoreticians and application scientists/engineers in the broad area of artificial intelligence will find this volume valuable. It also provides a useful sourcebook for Graduate students since it shows the direction of current research.

Handbook on Neural Information Processi-ng Monica Bianchini 2013-04-12

This handbook presents some of the most recent topics in neural information processing, covering both theoretical concepts and practical applications. The contributions include: Deep architectures Recurrent, recursive, and graph neural networks Cellular neural networks Bayesian networks Approximation capabilities of neural networks Semi-supervised learning Statistical relational learning Kernel methods for structured data Multiple classifier systems Self organisation and modal learning Applications to content-based image retrieval, text mining in large document collections, and bioinformatics This book is thought particularly for graduate students, researchers and practitioners, willing to deepen their knowledge on more advanced connectionist models and related learning paradigms.

Proceedings - Lawrence C. Kingsland 1989

Resilience Engineering - Nii O. Attoh-Okine 2016-04-04

Along with case studies, this book presents a step-by-step approach to formulating the resilience of civil infrastructure and energy systems.

Bayesian Networks and Decision Graphs Thomas Dyhre Nielsen 2009-03-17

This is a brand new edition of an essential work on Bayesian networks and decision graphs. It is an introduction to probabilistic graphical models including Bayesian networks and influence diagrams. The reader is guided through the two types of frameworks with examples and

exercises, which also give instruction on how to build these models. Structured in two parts, the first section focuses on probabilistic graphical models, while the second part deals with decision graphs, and in addition to the frameworks described in the previous edition, it also introduces Markov decision process and partially ordered decision problems.

Transactions on Large-Scale Data- and Knowledge-Centered Systems XLVI - Abdelkader Hameurlain 2020-11-20

The LNCS journal Transactions on Large-Scale Data- and Knowledge-Centered Systems focuses on data management, knowledge discovery, and knowledge processing, which are core and hot topics in computer science. Since the 1990s, the Internet has become the main driving force behind application development in all domains. An increase in the demand for resource sharing (e.g., computing resources, services, metadata, data sources) across different sites connected through networks has led to an evolution of data- and knowledge-management systems from centralized systems to decentralized systems enabling large-scale distributed applications providing high scalability. This, the 46th issue of Transactions on Large-Scale Data- and Knowledge-Centered Systems, contains six fully revised selected regular papers. Topics covered include an elastic framework for genomic data management, medical data cloud federations, temporal pattern mining, scalable schema discovery, load shedding, and selectivity estimation using linked Bayesian networks.

Business Intelligence: Concepts, Methodologies, Tools, and Applications - Management Association, Information Resources 2015-12-29

Data analysis is an important part of modern business administration, as efficient compilation of information allows managers and business leaders to make the best decisions for the financial solvency of their organizations. Understanding the use of analytics, reporting, and data mining in everyday business

environments is imperative to the success of modern businesses. Business Intelligence: Concepts, Methodologies, Tools, and Applications presents a comprehensive examination of business data analytics along with case studies and practical applications for businesses in a variety of fields and corporate arenas. Focusing on topics and issues such as critical success factors, technology adaptation, agile development approaches, fuzzy logic tools, and best practices in business process management, this multivolume reference is of particular use to business analysts, investors, corporate managers, and entrepreneurs in a variety of prominent industries.

Pattern Recognition and Neural Networks - Brian D. Ripley 2007

This 1996 book explains the statistical framework for pattern recognition and machine learning, now in paperback.

Journal of the Japanese Society of Computational Statistics - 1997

Advances in Artificial Intelligence - Canadian Society for Computational Studies of Intelligence. Conference 2006-06-06

This book constitutes the refereed proceedings of the 19th Conference of the Canadian Society for Computational Studies of Intelligence, Canadian AI 2006, held in Québec City, Québec, Canada in June 2006. The 47 revised full papers presented were carefully reviewed and selected from 220 submissions. The papers are organized in topical sections on agents, bioinformatics, constraint satisfaction and distributed search, knowledge representation and reasoning, natural language, reinforcement learning and, supervised and unsupervised learning.

Probabilistic Networks and Expert Systems - Robert G. Cowell 2007-07-16

The work reviewed in this book represents the synthesis of two important developments in modelling of complex stochastic phenomena. The book gives a thorough and rigorous mathematical treatment of the underlying ideas,

structures, and algorithms.

Graphical Models, Exponential Families, and Variational Inference - Martin J. Wainwright 2008

The core of this paper is a general set of variational principles for the problems of computing marginal probabilities and modes, applicable to multivariate statistical models in the exponential family.

Expert Systems and Probabilistic Network Models - Enrique Castillo 2012-12-06

Artificial intelligence and expert systems have seen a great deal of research in recent years, much of which has been devoted to methods for incorporating uncertainty into models. This book is devoted to providing a thorough and up-to-date survey of this field for researchers and students.

An Introduction to Expert Systems - Bryan S. Todd 1992

Abstract: "This monograph provides an introduction to the theory of expert systems. The task of medical diagnosis is used as a unifying theme throughout. A broad perspective is taken, ranging from the role of diagnostic programs to methods of evaluation. While much emphasis is placed on probability theory, other calculi of uncertainty are given due consideration."

Proceedings of the ... ACM Great Lakes Symposium on VLSI . - 2007

Learning Bayesian Networks - Richard E. Neapolitan 2004

This book serves as a textbook or reference for anyone with an interest in probabilistic modeling in the fields of computer science, computer engineering, and electrical engineering. This text is also a resource for courses on expert systems, machine learning, and artificial intelligence. Beginning with a basic theoretical introduction, the author then provides a discussion of inference, methods of learning, and applications based on Bayesian networks and beyond.

The Norm Chronicles - Michael Blastland 2014-06-03
A statistician and a journalist reveal the real story behind the statistics on risk, chance, and choice
Foundations of Probabilistic Programming - Gilles Barthe 2020-12-03
This book provides an overview of the theoretical underpinnings of modern probabilistic programming and presents applications in e.g., machine learning, security, and approximate computing. Comprehensive survey chapters make the material accessible to graduate students and non-experts. This title is also available as Open Access on Cambridge Core.
The BUGS Book - David Lunn 2012-10-02
Bayesian statistical methods have become widely used for data analysis and modelling in recent years, and the BUGS software has become the most popular software for Bayesian analysis worldwide. Authored by the team that originally developed this software, The BUGS Book provides a practical introduction to this program and its use. The text presents complete coverage of all the functionalities of BUGS, including prediction, missing data, model criticism, and prior sensitivity. It also features a large number of worked examples and a wide range of applications from various disciplines. The book introduces regression models, techniques for criticism and comparison, and a wide range of modelling issues before going into the vital area of hierarchical models, one of the most common applications of Bayesian methods. It deals with essentials of modelling without getting bogged down in complexity. The book emphasises model criticism, model comparison, sensitivity analysis to alternative priors, and thoughtful choice of prior distributions—all those aspects of the "art" of modelling that are easily overlooked in more theoretical expositions. More pragmatic than ideological, the authors systematically work through the large range of "tricks" that reveal

the real power of the BUGS software, for example, dealing with missing data, censoring, grouped data, prediction, ranking, parameter constraints, and so on. Many of the examples are biostatistical, but they do not require domain knowledge and are generalisable to a wide range of other application areas. Full code and data for examples, exercises, and some solutions can be found on the book's website.

Advances in Probabilistic Graphical Models - Peter Lucas 2007-06-12

This book brings together important topics of current research in probabilistic graphical modeling, learning from data and probabilistic inference. Coverage includes such topics as the characterization of conditional independence, the learning of graphical models with latent variables, and extensions to the influence diagram formalism as well as important application fields, such as the control of vehicles, bioinformatics and medicine.

Advances in Secure Computing, Internet Services, and Applications - Tripathy, B.K. 2013-12-31

Technological advancements have extracted a vast amount of useful knowledge and information for applications and services. These developments have evoked intelligent solutions that have been utilized in efforts to secure this data and avoid potential complex problems. Advances in Secure Computing, Internet Services, and Applications presents current research on the applications of computational intelligence in order to focus on the challenge humans face when securing knowledge and data. This book is a vital reference source for researchers, lecturers, professors, students, and developers, who have interest in secure computing and recent advanced in real life applications.

Amstat News - American Statistical Association 2002

Artificial Intelligence - Thomas L. Dean 1995

This book provides a detailed understanding of the broad issues in artificial intelligence and a survey of current AI technology. The author delivers broad coverage of innovative representational techniques, including neural networks, image processing and probabilistic reasoning, alongside the traditional methods of symbolic reasoning. The work is intended for students in artificial intelligence, researchers and LISP programmers.

Interactive Collaborative Information Systems - Robert Babuška 2010-03-22

The increasing complexity of our world demands new perspectives on the role of technology in decision making. Human decision making has its li- tations in terms of information-processing capacity. We need new technology to cope with the increasingly complex and information-rich nature of our modern society. This is particularly true for critical environments such as crisis management and tra?c management, where humans need to engage in close collaborations with arti?cial systems to observe and understand the situation and respond in a sensible way. We believe that close collaborations between humans and arti?cial systems will become essential and that the importance of research into Interactive Collaborative Information Systems (ICIS) is self-evident. Developments in information and communication technology have ra- cally changed our working environments. The vast amount of information available nowadays and the wirelessly networked nature of our modern so- ety open up new opportunities to handle di?cult decision-making situations such as computer-supported situation assessment and distributed decision making. To make good use of these new possibilities, we need to update our traditional views on the role and capabilities of information systems. The aim of the Interactive Collaborative Information Systems project is to develop techniques that support humans in complex information en- ronments and that facilitate distributed decision-making

capabilities. ICIS emphasizes the importance of building actor-agent communities: close c- laborations between human and arti?cial actors that highlight their comp- mentary capabilities, and in which task distribution is ?exible and adaptive.

In Silico Toxicology Mark Cronin 2010-10-28

In Silico methods to predict toxicity have become increasingly important recently, particularly in light of European legislation such as REACH and the Cosmetics Regulation. They are also being used extensively worldwide e.g. in the USA, Canada, Japan and Australia. In assessing the risk that a chemical may pose to human health or to the environment, focus is now being directed towards exploitation of in silico methods to replace in vivo or in vitro techniques. A prediction of potential toxicity requires several stages: 1) Collation and organisation of data available for the compound, or if this is not available, information for related compounds. 2) An assessment of the quality of the data. 3) Generation of additional information about the compound using computational techniques at various levels of complexity - calculation of physico-chemical properties, 2-D, 3-D / MO descriptors and specific receptor modelling / interaction. 4) Use of an appropriate strategy to predict toxicity - ie a statistically valid method which makes best use of all available information (mechanism of action, activity for related compounds, extrapolation across species and endpoints, likely exposure scenario amounts over time etc). 5) Consideration then needs to be given to how this information is used in the real world ie use of expert systems / tools as relevant to assessors (if sufficiently different to previous) - weight of evidence approaches. 6) Finally evidence should be presented from case studies within this area. No other publication brings together information on all of these areas in one book and this publication is unique in that it provides a logical progression through every one of these key

stages and defines the use of computational approaches to predict the environmental toxicity and human health effects of organic chemicals. The volume is aimed at the developers and users of in silico toxicology and provides an analysis of all aspects required for in silico prediction of toxicology, including data collation, quality assessment and computational approaches. The contributions from recognised leaders in each of these areas include evidence of the use and applicability of approaches using real world case studies concerning both environmental and human health effects. The book provides a very useful single source reference for people working in this area including academics, professionals, under- and post-graduate students as well as Governmental Regulatory Scientists involved in chemical risk assessment and REACH.

Bayesian Inference and Maximum Entropy Methods in Science and Engineering - Kevin H. Knuth 2005-12-06

All papers were peer-reviewed. For over 25 years the MaxEnt workshops have explored Bayesian and Maximum Entropy methods in scientific, engineering, and signal processing applications. This proceedings volume covers all aspects of probabilistic inference such as techniques, applications, and foundations. Applications include physics, space science, earth science, biology, imaging, graphical models and source separation.

Robotics - Bruno Siciliano 2010-08-20

Based on the successful Modelling and Control of Robot Manipulators by Sciavicco and Siciliano (Springer, 2000), Robotics provides the basic know-how on the foundations of robotics: modelling, planning and control. It has been expanded to include coverage of mobile robots, visual control and motion planning. A variety of problems is raised throughout, and the proper tools to find engineering-oriented solutions are introduced and explained. The text includes coverage of fundamental topics like kinematics,

and trajectory planning and related technological aspects including actuators and sensors. To impart practical skill, examples and case studies are carefully worked out and interwoven through the text, with frequent resort to simulation. In addition, end-of-chapter exercises are proposed, and the book is accompanied by an electronic solutions manual containing the MATLAB® code for computer problems; this is available free of charge to those adopting this volume as a textbook for courses.

Learning in Graphical Models M.I. Jordan 2012-12-06

In the past decade, a number of different research communities within the computational sciences have studied learning in networks, starting from a number of different points of view. There has been substantial progress in these different communities and surprising convergence has developed between the formalisms. The awareness of this convergence and the growing interest of researchers in understanding the essential unity of the subject underlies the current volume. Two research communities which have used graphical or network formalisms to particular advantage are the belief network community and the neural network community. Belief networks arose within computer science and statistics and were developed with an emphasis on prior knowledge and exact probabilistic calculations. Neural networks arose within electrical engineering, physics and neuroscience and have emphasised pattern recognition and systems modelling problems. This volume draws together researchers from these two communities and presents both kinds of networks as instances of a general unified graphical formalism. The book focuses on probabilistic methods for learning and inference in graphical models, algorithm analysis and design, theory and applications. Exact methods, sampling methods and variational methods are discussed in detail.

Audience: A wide cross-section of computationally oriented researchers, including computer scientists, statisticians, electrical engineers, physicists and neuroscientists.

Mathematica with Vision - Veikko Keränen 1995

The International Mathematica Symposium (IMS '95) is the first of a series of conferences devoted to applications of Mathematica to mathematics, statistics, physical science, education and economics. IMS '95 was held in Southampton, UK, in July 1995. The book contains some 50 papers covering a range of applications including pure mathematics, engineering, quantum physics, reliability, quality analysis, geometry, graphics and education. The book should be of interest to those involved with using Mathematica. The papers in this volume are printed in alphabetical order of first author, to reflect the uniform high quality of the contents.

Probabilistic Reasoning in Expert Systems - Richard E. Neapolitan 1990-03-16

Addresses the use probability theory as a tool for designing with and implementing uncertainity reasoning. Provides many concrete algorithms, explores techniques for solving multimembership classification problems not based directly on causal networks, and offers practical recommendations, matching specific methods with sample expert systems.

Bayesian Reasoning and Machine Learning - David Barber 2012-02-02

A practical introduction perfect for final-year undergraduate and graduate students without a solid background in linear algebra and calculus.

Bayesian Networks - Olivier Pourret 2008-04-30

Bayesian Networks, the result of the convergence of artificial intelligence with statistics, are growing in popularity. Their versatility and modelling power is now employed across a variety of fields for the purposes of analysis, simulation, prediction and diagnosis. This book provides a general introduction to

Bayesian networks, defining and illustrating the basic concepts with pedagogical examples and twenty real-life case studies drawn from a range of fields including medicine, computing, natural sciences and engineering. Designed to help analysts, engineers, scientists and professionals taking part in complex decision processes to successfully implement Bayesian networks, this book equips readers with proven methods to generate, calibrate, evaluate and validate Bayesian networks. The book: Provides the tools to overcome common practical challenges such as the treatment of missing input data, interaction with experts and decision makers, determination of the optimal granularity and size of the model. Highlights the strengths of Bayesian networks whilst also presenting a discussion of their limitations. Compares Bayesian networks with other modelling techniques such as neural networks, fuzzy logic and fault trees. Describes, for ease of comparison, the main features of the major Bayesian network software packages: Netica, Hugin, Elvira and Discoverer, from the point of view of the user. Offers a historical perspective on the subject and analyses future directions for research. Written by leading experts with practical experience of applying Bayesian networks in finance, banking, medicine, robotics, civil engineering, geology, geography, genetics, forensic science, ecology, and industry, the book has much to offer both practitioners and researchers involved in statistical analysis or modelling in any of these fields.

Probabilistic Similarity Networks - David E. Heckerman 1991

In this remarkable blend of formal theory and practical application, David Heckerman develops methods for building normative expert systems—expert systems that encode knowledge in a decision-theoretic framework. Heckerman introduces the similarity network and partition, two extensions to the influence diagram representation. He uses the new representations

to construct Pathfinder, a large, normative expert system for the diagnosis of lymph-node diseases. Heckerman shows that such expert systems can be built efficiently, and that the use of a normative theory as the framework for representing knowledge can dramatically improve the quality of expertise that is delivered to the user. He concludes with a formal evaluation of the power of his methods for building normative expert systems. David Heckerman is Assistant Professor of Computer Science at the University of Southern California. He received his doctoral degree in Medical Information Sciences from Stanford University. Contents: Introduction. Similarity Networks and Partitions: A Simple Example. Theory of Similarity Networks. Pathfinder: A Case Study. An Evaluation of Pathfinder. Conclusions and Future Work.

Cornell University Courses of Study - Cornell University 2007

Modeling and Reasoning with Bayesian Networks - Adnan Darwiche 2009-04-06

This book provides a thorough introduction to the formal foundations and practical applications of Bayesian networks. It provides an extensive discussion of techniques for building Bayesian networks that model real-world situations, including techniques for synthesizing models from design, learning models from data, and debugging models using sensitivity analysis. It also treats exact and approximate inference algorithms at both theoretical and practical levels. The author assumes very little background on the covered subjects, supplying in-depth discussions for theoretically inclined readers and enough practical details to provide an algorithmic cookbook for the system developer.

Probabilistic Graphical Models for Genetics, Genomics and Postgenomics - Christine Sinoquet 2014

At the crossroads between statistics and

machine learning, probabilistic graphical models (PGMs) provide a powerful formal framework to model complex data. An expanding volume of biological data of various types, the so-called 'omics', is in need of accurate and efficient methods for modelling and PGMs are expected to have a prominent role to play. This book provides an overview of the applications of PGMs to genetics, genomics and postgenomics to meet this increased interest.

Advanced Statistical Methods for the Analysis of Large Data-Sets - Agostino Di Ciaccio 2012-03-05

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.”

Uncertainty in Artificial Intelligence - L.N. Kanal 2014-06-28

How to deal with uncertainty is a subject of much controversy in Artificial Intelligence. This volume brings together a wide range of perspectives on uncertainty, many of the contributors being the principal proponents in the controversy. Some of the notable issues which emerge from these papers revolve around an interval-based calculus of uncertainty, the Dempster-Shafer Theory, and probability as the best numeric model for uncertainty. There remain strong dissenting opinions not only about probability but even about the utility of any numeric method in this context.

Bayesian Networks - Marco Scutari 2021-07-22 Bayesian Networks: With Examples in R, Second Edition introduces Bayesian networks using a hands-on approach. Simple yet meaningful examples illustrate each step of the modelling process and discuss side by side the underlying theory and its application using R code. The examples start from the simplest notions and gradually increase in complexity. In particular, this new edition contains significant new material on topics from modern machine-learning practice: dynamic networks, networks with heterogeneous variables, and model validation. The first three chapters explain the whole process of Bayesian network modelling, from structure learning to parameter learning to inference. These chapters cover discrete, Gaussian, and conditional Gaussian Bayesian networks. The following two chapters delve into dynamic networks (to model temporal data) and into networks including arbitrary random variables (using Stan). The book then gives a concise but rigorous treatment of the fundamentals of Bayesian networks and offers an introduction to causal Bayesian networks. It also presents an overview of R packages and other software implementing Bayesian networks. The final chapter evaluates two real-world examples: a landmark causal protein-signalling network published in Science and a probabilistic graphical model for predicting the composition of different body parts. Covering theoretical and practical aspects of Bayesian networks, this book provides you with an introductory overview of the field. It gives you a clear, practical understanding of the key points behind this modelling approach and, at the same time, it makes you familiar with the most relevant packages used to implement real-world analyses in R. The examples covered in the book span several application fields, data-driven models and expert systems, probabilistic and causal perspectives, thus giving you a starting point to work in a variety of scenarios. Online

supplementary materials include the data sets and the code used in the book, which will all be made available from https://www.bnlearn.com/book-crc-2ed/

Bayesian Networks and Influence Diagrams: A Guide to Construction and Analysis - Uffe B. Kjærulff 2012-11-30

Bayesian Networks and Influence Diagrams: A Guide to Construction and Analysis, Second Edition, provides a comprehensive guide for practitioners who wish to understand, construct, and analyze intelligent systems for decision support based on probabilistic networks. This new edition contains six new sections, in addition to fully-updated examples, tables, figures, and a revised appendix. Intended primarily for practitioners, this book does not require sophisticated mathematical skills or deep understanding of the underlying theory and methods nor does it discuss alternative technologies for reasoning under uncertainty. The theory and methods presented are illustrated through more than 140 examples, and exercises are included for the reader to check his or her level of understanding. The techniques and methods presented for knowledge elicitation, model construction and verification, modeling techniques and tricks, learning models from data, and analyses of models have all been developed and refined on the basis of numerous courses that the authors have held for practitioners worldwide.