

# Optimization Based Data Mining Theory And Applications Advanced Information And Knowledge Processing

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## **Metaheuristic Clustering** - Swagatam Das 2009-03-24

Cluster analysis means the organization of an unlabeled collection of objects or patterns into separate groups based on their similarity. The task of computerized data clustering has been approached from diverse domains of knowledge like graph theory, multivariate analysis, neural networks, fuzzy set theory, and so on. Clustering is often described as an unsupervised learning method but most of the traditional algorithms require a prior specification of the number of clusters in the data for guiding the partitioning process, thus making it not completely unsupervised. Modern data mining tools that predict future trends and behaviors for allowing businesses to make proactive and knowledge-driven decisions, demand fast and fully automatic clustering of very large datasets with minimal or no user intervention. In this volume, we formulate clustering as an optimization problem, where the best partitioning of a given dataset is achieved by minimizing/maximizing one (single-objective clustering) or more (multi-objective clustering) objective functions. Using several real world applications, we illustrate the performance of several metaheuristics, particularly the Differential Evolution algorithm when applied to both single and multi-objective clustering problems, where the number of clusters is not known beforehand and must be determined on the run. This volume comprises of 7 chapters including an introductory chapter giving the fundamental definitions and the last Chapter provides some important research challenges. Academics, scientists as well as engineers engaged in research, development and application of optimization techniques and data mining will find the comprehensive coverage of this book invaluable.

*Trends in Artificial Intelligence Theory and Applications. Artificial Intelligence Practices* - Hamido Fujita 2020-09-04

This book constitutes the thoroughly refereed proceedings of the 33rd International Conference on Industrial, Engineering and Other Applications of Applied Intelligent Systems, IEA/AIE 2020, held in Kitakyushu, Japan, in September 2020. The 62 full papers and 17 short papers presented were carefully reviewed and selected from 119 submissions. The IEA/AIE 2020 conference will continue the tradition of emphasizing on applications of applied intelligent systems to solve real-life problems in all areas. These areas include are language processing; robotics and drones; knowledge based systems; innovative applications of intelligent systems; industrial applications; networking applications; social network analysis; financial applications and blockchain; medical and health-related applications; anomaly detection and automated diagnosis; decision-support and agent-based systems; multimedia applications; machine learning; data management and data clustering; pattern mining; system control, classification, and fault diagnosis.

*Large-Scale Scientific Computing* - Ivan Lirkov 2020-02-13

This book constitutes revised papers from the 12th International Conference on Large-Scale Scientific Computing, LSSC 2019, held in Sozopol, Bulgaria, in June 2019. The 70 papers presented in this volume were carefully reviewed and selected from 81 submissions. The book also contains two invited talks. The papers were organized in topical sections named as follows: control and optimization of dynamical systems; meshfree and particle methods; fractional diffusion problems: numerical methods, algorithms and applications; pore scale flow and transport simulation; tensors based algorithms and structures in optimization and applications; HPC and big data: algorithms and applications; large-scale models: numerical methods, parallel computations and applications; monte carlo algorithms: innovative applications in conjunctions with other methods; application of metaheuristics to large-scale problems;

large scale machine learning: multiscale algorithms and performance guarantees; and contributed papers.

*Business Intelligence* - Carlo Vercellis 2011-08-10

Business intelligence is a broad category of applications and technologies for gathering, providing access to, and analyzing data for the purpose of helping enterprise users make better business decisions. The term implies having a comprehensive knowledge of all factors that affect a business, such as customers, competitors, business partners, economic environment, and internal operations, therefore enabling optimal decisions to be made. Business Intelligence provides readers with an introduction and practical guide to the mathematical models and analysis methodologies vital to business intelligence. This book: Combines detailed coverage with a practical guide to the mathematical models and analysis methodologies of business intelligence. Covers all the hot topics such as data warehousing, data mining and its applications, machine learning, classification, supply optimization models, decision support systems, and analytical methods for performance evaluation. Is made accessible to readers through the careful definition and introduction of each concept, followed by the extensive use of examples and numerous real-life case studies. Explains how to utilise mathematical models and analysis models to make effective and good quality business decisions. This book is aimed at postgraduate students following data analysis and data mining courses. Researchers looking for a systematic and broad coverage of topics in operations research and mathematical models for decision-making will find this an invaluable guide.

*Nature-Inspired Computation in Data Mining and Machine Learning* - Xin-She Yang 2019-09-03

This book reviews the latest developments in nature-inspired computation, with a focus on the cross-disciplinary applications in data mining and machine learning. Data mining, machine learning and nature-inspired computation are current hot research topics due to their importance in both theory and practical applications. Adopting an application-focused approach, each chapter introduces a specific topic, with detailed descriptions of relevant algorithms, extensive literature reviews and implementation details. Covering topics such as nature-inspired algorithms, swarm intelligence, classification, clustering, feature selection, cybersecurity, learning algorithms over cloud, extreme learning machines, object categorization, particle swarm optimization, flower pollination and firefly algorithms, and neural networks, it also presents case studies and applications, including classifications of crisis-related tweets, extraction of named entities in the Tamil language, performance-based prediction of diseases, and healthcare services. This book is both a valuable a reference resource and a practical guide for students, researchers and professionals in computer science, data and management sciences, artificial intelligence and machine learning.

*Advances in Big Data Analytics* - Yong Shi 2022-01-13

Today, big data affects countless aspects of our daily lives. This book provides a comprehensive and cutting-edge study on big data analytics, based on the research findings and applications developed by the author and his colleagues in related areas. It addresses the concepts of big data analytics and/or data science, multi-criteria optimization for learning, expert and rule-based data analysis, support vector machines for classification, feature selection, data stream analysis, learning analysis, sentiment analysis, link analysis, and evaluation analysis. The book also explores lessons learned in applying big data to business, engineering and healthcare. Lastly, it addresses the advanced topic of intelligence-quotient (IQ) tests for artificial intelligence. /divSince each aspect

mentioned above concerns a specific domain of application, taken together, the algorithms, procedures, analysis and empirical studies presented here offer a general picture of big data developments. Accordingly, the book can not only serve as a textbook for graduates with a fundamental grasp of training in big data analytics, but can also show practitioners how to use the proposed techniques to deal with real-world big data problems.

**Intelligent Technologies--theory and Applications** - Peter Sincak 2002

This volume includes theoretical, as well as applicational, papers in the field of neural networks, fuzzy systems and mainly evolutionary computations in which application potential was increased by enormous progress in computer power. The book presents papers from Japan, USA, Hungary, Poland, Germany, Finland, France, Slovakia, UK, Czech Republic and some other countries. It describes the state of the art in the field and contributes to theory and applications in the field of machine intelligence tools and their wide application potential in current and future technologies within the information society.

**Metaheuristics in Machine Learning: Theory and Applications** - Diego Oliva

This book is a collection of the most recent approaches that combine metaheuristics and machine learning. Some of the methods considered in this book are evolutionary, swarm, machine learning, and deep learning. The chapters were classified based on the content; then, the sections are thematic. Different applications and implementations are included; in this sense, the book provides theory and practical content with novel machine learning and metaheuristic algorithms. The chapters were compiled using a scientific perspective. Accordingly, the book is primarily intended for undergraduate and postgraduate students of Science, Engineering, and Computational Mathematics and is useful in courses on Artificial Intelligence, Advanced Machine Learning, among others. Likewise, the book is useful for research from the evolutionary computation, artificial intelligence, and image processing communities.

**Data Science and Analytics with Python** - Jesus Rogel-Salazar 2018-02-05

Data Science and Analytics with Python is designed for practitioners in data science and data analytics in both academic and business environments. The aim is to present the reader with the main concepts used in data science using tools developed in Python, such as SciKit-learn, Pandas, Numpy, and others. The use of Python is of particular interest, given its recent popularity in the data science community. The book can be used by seasoned programmers and newcomers alike. The book is organized in a way that individual chapters are sufficiently independent from each other so that the reader is comfortable using the contents as a reference. The book discusses what data science and analytics are, from the point of view of the process and results obtained. Important features of Python are also covered, including a Python primer. The basic elements of machine learning, pattern recognition, and artificial intelligence that underpin the algorithms and implementations used in the rest of the book also appear in the first part of the book. Regression analysis using Python, clustering techniques, and classification algorithms are covered in the second part of the book. Hierarchical clustering, decision trees, and ensemble techniques are also explored, along with dimensionality reduction techniques and recommendation systems. The support vector machine algorithm and the Kernel trick are discussed in the last part of the book. About the Author Dr. Jesús Rogel-Salazar is a Lead Data scientist with experience in the field working for companies such as AKQA, IBM Data Science Studio, Dow Jones and others. He is a visiting researcher at the Department of Physics at Imperial College London, UK and a member of the School of Physics, Astronomy and Mathematics at the University of Hertfordshire, UK. He obtained his doctorate in physics at Imperial College London for work on quantum atom optics and ultra-cold matter. He has held a position as senior lecturer in mathematics as well as a consultant in the financial industry since 2006. He is the author of the book Essential Matlab and Octave, also published by CRC Press. His interests include mathematical modelling, data science, and optimization in a wide range of applications including optics, quantum mechanics, data journalism, and finance.

**Data Mining with Decision Trees** - Lior Rokach 2008

This is the first comprehensive book dedicated entirely to the field of decision trees in data mining and covers all aspects of this important technique. Decision trees have become one of the most powerful and popular approaches in knowledge discovery and data mining, the science and technology of exploring large and complex bodies of data in order to discover useful patterns. The area is of great importance because it

enables modeling and knowledge extraction from the abundance of data available. Both theoreticians and practitioners are continually seeking techniques to make the process more efficient, cost-effective and accurate. Decision trees, originally implemented in decision theory and statistics, are highly effective tools in other areas such as data mining, text mining, information extraction, machine learning, and pattern recognition. This book invites readers to explore the many benefits in data mining that decision trees offer: Self-explanatory and easy to follow when compacted Able to handle a variety of input data: nominal, numeric and textual Able to process datasets that may have errors or missing values High predictive performance for a relatively small computational effort Available in many data mining packages over a variety of platforms Useful for various tasks, such as classification, regression, clustering and feature selection

**Intelligent Knowledge** - Yong Shi 2015-05-08

This book is mainly about an innovative and fundamental method called "intelligent knowledge" to bridge the gap between data mining and knowledge management, two important fields recognized by the information technology (IT) community and business analytics (BA) community respectively. The book includes definitions of the "first-order" analytic process, "second-order" analytic process and intelligent knowledge, which have not formally been addressed by either data mining or knowledge management. Based on these concepts, which are especially important in connection with the current Big Data movement, the book describes a framework of domain-driven intelligent knowledge discovery. To illustrate its technical advantages for large-scale data, the book employs established approaches, such as Multiple Criteria Programming, Support Vector Machine and Decision Tree to identify intelligent knowledge incorporated with human knowledge. The book further shows its applicability by means of real-life data analyses in the contexts of internet business and traditional Chinese medicines.

**Information Processing and Management of Uncertainty in Knowledge-Based Systems. Applications** - Jesús Medina 2018-05-29

This three volume set (CCIS 853-855) constitutes the proceedings of the 17th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, IPMU 2017, held in Cádiz, Spain, in June 2018. The 193 revised full papers were carefully reviewed and selected from 383 submissions. The papers are organized in topical sections on advances on explainable artificial intelligence; aggregation operators, fuzzy metrics and applications; belief function theory and its applications; current techniques to model, process and describe time series; discrete models and computational intelligence; formal concept analysis and uncertainty; fuzzy implication functions; fuzzy logic and artificial intelligence problems; fuzzy mathematical analysis and applications; fuzzy methods in data mining and knowledge discovery; fuzzy transforms: theory and applications to data analysis and image processing; imprecise probabilities: foundations and applications; mathematical fuzzy logic, mathematical morphology; measures of comparison and entropies for fuzzy sets and their extensions; new trends in data aggregation; pre-aggregation functions and generalized forms of monotonicity; rough and fuzzy similarity modelling tools; soft computing for decision making in uncertainty; soft computing in information retrieval and sentiment analysis; tri-partitions and uncertainty; decision making modeling and applications; logical methods in mining knowledge from big data; metaheuristics and machine learning; optimization models for modern analytics; uncertainty in medicine; uncertainty in Video/Image Processing (UVIP).

**Nested Partitions Method, Theory and Applications** - Leyuan Shi 2008-10-30

The subject of this book is the nested partitions method (NP), a relatively new optimization method that has been found to be very effective solving discrete optimization problems. Such discrete problems are common in many practical applications and the NP method is thus useful in diverse application areas. It can be applied to both operational and planning problems and has been demonstrated to effectively solve complex problems in both manufacturing and service industries. To illustrate its broad applicability and effectiveness, in this book we will show how the NP method has been successful in solving complex problems in planning and scheduling, logistics and transportation, supply chain design, data mining, and health care. All of these diverse applications have one characteristic in common: they all lead to complex large-scale discrete optimization problems that are intractable using traditional optimization methods.

1.1 Large-Scale Optimization

In developing the NP method we will consider optimization problems that can be stated mathematically in the following generic form:  $\min f(x)$ , (1.1)  $x \in X$

where the solution space or feasible region  $X$  is either a discrete or bounded set of feasible solutions. We denote a solution to this problem  $x$  and the objective function value  $f = f(x)$ .

*Data Mining in Structural Dynamic Analysis* - Yun Lai Zhou 2019-11-22  
This book highlights the applications of data mining technologies in structural dynamic analysis, including structural design, optimization, parameter identification, model updating, damage identification, in civil, mechanical, and aerospace engineering. These engineering applications require precise structural design, fabrication, inspection, and further monitoring to obtain a full life-cycle analysis, and by focusing on data processing, data mining technologies offer another aspect in structural dynamic analysis. Discussing techniques in time/frequency domain, such as Hilbert transforms, wavelet theory, and machine learning for structural dynamic analysis to help in structural monitoring and diagnosis, the book is an essential reference resource for beginners, graduates and industrial professionals in various fields.

**Introduction to Algorithms for Data Mining and Machine Learning** - Xin-She Yang 2019-06-17

Introduction to Algorithms for Data Mining and Machine Learning introduces the essential ideas behind all key algorithms and techniques for data mining and machine learning, along with optimization techniques. Its strong formal mathematical approach, well selected examples, and practical software recommendations help readers develop confidence in their data modeling skills so they can process and interpret data for classification, clustering, curve-fitting and predictions. Masterfully balancing theory and practice, it is especially useful for those who need relevant, well explained, but not rigorous (proofs based) background theory and clear guidelines for working with big data. Presents an informal, theorem-free approach with concise, compact coverage of all fundamental topics Includes worked examples that help users increase confidence in their understanding of key algorithms, thus encouraging self-study Provides algorithms and techniques that can be implemented in any programming language, with each chapter including notes about relevant software packages

**Correlation Clustering** - Francesco Bonchi 2022-03-08

Given a set of objects and a pairwise similarity measure between them, the goal of correlation clustering is to partition the objects in a set of clusters to maximize the similarity of the objects within the same cluster and minimize the similarity of the objects in different clusters. In most of the variants of correlation clustering, the number of clusters is not a given parameter; instead, the optimal number of clusters is automatically determined. Correlation clustering is perhaps the most natural formulation of clustering: as it just needs a definition of similarity, its broad generality makes it applicable to a wide range of problems in different contexts, and, particularly, makes it naturally suitable to clustering structured objects for which feature vectors can be difficult to obtain. Despite its simplicity, generality, and wide applicability, correlation clustering has so far received much more attention from an algorithmic-theory perspective than from the data-mining community. The goal of this lecture is to show how correlation clustering can be a powerful addition to the toolkit of a data-mining researcher and practitioner, and to encourage further research in the area.

**Frontiers in Intelligent Computing: Theory and Applications** - Suresh Chandra Satapathy 2019-10-03

This book presents the proceedings of the 7th International Conference on Frontiers of Intelligent Computing: Theory and Applications (FICTA 2018), held at Duy Tan University, Da Nang, Vietnam. The event brought together researchers, scientists, engineers, and practitioners to exchange new ideas and experiences in the domain of intelligent computing theories with prospective applications in various engineering disciplines. These proceedings are divided into two volumes. Covering broad areas of information and decision sciences, with papers exploring both the theoretical and practical aspects of data-intensive computing, data mining, evolutionary computation, knowledge management and networks, sensor networks, signal processing, wireless networks, protocols and architectures, this volume is a valuable resource for postgraduate students in various engineering disciplines.

*Data Mining: Know It All* - Soumen Chakrabarti 2008-10-31

This book brings all of the elements of data mining together in a single volume, saving the reader the time and expense of making multiple purchases. It consolidates both introductory and advanced topics, thereby covering the gamut of data mining and machine learning tactics from data integration and pre-processing, to fundamental algorithms, to optimization techniques and web mining methodology. The proposed book expertly combines the finest data mining material from the Morgan

Kaufmann portfolio. Individual chapters are derived from a select group of MK books authored by the best and brightest in the field. These chapters are combined into one comprehensive volume in a way that allows it to be used as a reference work for those interested in new and developing aspects of data mining. This book represents a quick and efficient way to unite valuable content from leading data mining experts, thereby creating a definitive, one-stop-shopping opportunity for customers to receive the information they would otherwise need to round up from separate sources. Chapters contributed by various recognized experts in the field let the reader remain up to date and fully informed from multiple viewpoints. Presents multiple methods of analysis and algorithmic problem-solving techniques, enhancing the reader's technical expertise and ability to implement practical solutions. Coverage of both theory and practice brings all of the elements of data mining together in a single volume, saving the reader the time and expense of making multiple purchases.

**Optimization Based Data Mining: Theory and Applications** - Yong Shi 2011-05-16

Optimization techniques have been widely adopted to implement various data mining algorithms. In addition to well-known Support Vector Machines (SVMs) (which are based on quadratic programming), different versions of Multiple Criteria Programming (MCP) have been extensively used in data separations. Since optimization based data mining methods differ from statistics, decision tree induction, and neural networks, their theoretical inspiration has attracted many researchers who are interested in algorithm development of data mining. Optimization based Data Mining: Theory and Applications, mainly focuses on MCP and SVM especially their recent theoretical progress and real-life applications in various fields. These include finance, web services, bio-informatics and petroleum engineering, which has triggered the interest of practitioners who look for new methods to improve the results of data mining for knowledge discovery. Most of the material in this book is directly from the research and application activities that the authors' research group has conducted over the last ten years. Aimed at practitioners and graduates who have a fundamental knowledge in data mining, it demonstrates the basic concepts and foundations on how to use optimization techniques to deal with data mining problems.

*Lectures on Global Optimization* - Thomas Frederick Coleman 2009

A large number of mathematical models in many diverse areas of science and engineering have lead to the formulation of optimization problems where the best solution (globally optimal) is needed. This book covers a small subset of important topics in global optimization with emphasis on theoretical developments and scientific applications.

**Managing Enterprise Information Technology Acquisitions: Assessing Organizational Preparedness** - Misra, Harekrishna 2013-06-30

For organizations operating in a modern business environment, adopting the latest information technologies (IT) is of paramount importance. Organizational decision makers are increasingly interested in IT acquisition, constantly seeking the most advanced solutions in order to give their constituents a distinct competitive advantage. Managing Enterprise Information Technology Acquisitions: Assessing Organizational Preparedness provides leaders and innovators with research and strategies to make the most of their options involving IT and organizational management approaches. This book will serve as a critical resource for leaders, managers, strategists, and other industry professionals who must be prepared to meet the constant changes in the field of information technologies in order to effectively guide their organizations and achieve their respective goals.

**Large-Scale Machine Learning in the Earth Sciences** - Ashok N. Srivastava 2017-08-01

From the Foreword: "While large-scale machine learning and data mining have greatly impacted a range of commercial applications, their use in the field of Earth sciences is still in the early stages. This book, edited by Ashok Srivastava, Ramakrishna Nemani, and Karsten Steinhäuser, serves as an outstanding resource for anyone interested in the opportunities and challenges for the machine learning community in analyzing these data sets to answer questions of urgent societal interest...I hope that this book will inspire more computer scientists to focus on environmental applications, and Earth scientists to seek collaborations with researchers in machine learning and data mining to advance the frontiers in Earth sciences." --Vipin Kumar, University of Minnesota Large-Scale Machine Learning in the Earth Sciences provides researchers and practitioners with a broad overview of some of the key challenges in the intersection of Earth science, computer science, statistics, and related fields. It explores a wide range of topics and

provides a compilation of recent research in the application of machine learning in the field of Earth Science. Making predictions based on observational data is a theme of the book, and the book includes chapters on the use of network science to understand and discover teleconnections in extreme climate and weather events, as well as using structured estimation in high dimensions. The use of ensemble machine learning models to combine predictions of global climate models using information from spatial and temporal patterns is also explored. The second part of the book features a discussion on statistical downscaling in climate with state-of-the-art scalable machine learning, as well as an overview of methods to understand and predict the proliferation of biological species due to changes in environmental conditions. The problem of using large-scale machine learning to study the formation of tornadoes is also explored in depth. The last part of the book covers the use of deep learning algorithms to classify images that have very high resolution, as well as the unmixing of spectral signals in remote sensing images of land cover. The authors also apply long-tail distributions to geoscience resources, in the final chapter of the book.

#### **Extensions of Dynamic Programming for Combinatorial**

#### **Optimization and Data Mining** - Hassan AbouEisha 2018-05-22

Dynamic programming is an efficient technique for solving optimization problems. It is based on breaking the initial problem down into simpler ones and solving these sub-problems, beginning with the simplest ones. A conventional dynamic programming algorithm returns an optimal object from a given set of objects. This book develops extensions of dynamic programming, enabling us to (i) describe the set of objects under consideration; (ii) perform a multi-stage optimization of objects relative to different criteria; (iii) count the number of optimal objects; (iv) find the set of Pareto optimal points for bi-criteria optimization problems; and (v) to study relationships between two criteria. It considers various applications, including optimization of decision trees and decision rule systems as algorithms for problem solving, as ways for knowledge representation, and as classifiers; optimization of element partition trees for rectangular meshes, which are used in finite element methods for solving PDEs; and multi-stage optimization for such classic combinatorial optimization problems as matrix chain multiplication, binary search trees, global sequence alignment, and shortest paths. The results presented are useful for researchers in combinatorial optimization, data mining, knowledge discovery, machine learning, and finite element methods, especially those working in rough set theory, test theory, logical analysis of data, and PDE solvers. This book can be used as the basis for graduate courses.

#### **Data Preparation for Data Mining** - Dorian Pyle 1999-03-22

This book focuses on the importance of clean, well-structured data as the first step to successful data mining. It shows how data should be prepared prior to mining in order to maximize mining performance.

#### **Harmony Search and Nature Inspired Optimization Algorithms** -

Neha Yadav 2018-08-23

The book covers different aspects of real-world applications of optimization algorithms. It provides insights from the Fourth International Conference on Harmony Search, Soft Computing and Applications held at BML Munjal University, Gurgaon, India on February 7-9, 2018. It consists of research articles on novel and newly proposed optimization algorithms; the theoretical study of nature-inspired optimization algorithms; numerically established results of nature-inspired optimization algorithms; and real-world applications of optimization algorithms and synthetic benchmarking of optimization algorithms.

#### **Optimization Techniques and Applications with Examples** - Xin-She Yang 2018-09-19

A guide to modern optimization applications and techniques in newly emerging areas spanning optimization, data science, machine intelligence, engineering, and computer sciences Optimization Techniques and Applications with Examples introduces the fundamentals of all the commonly used techniques in optimization that encompass the broadness and diversity of the methods (traditional and new) and algorithms. The author—a noted expert in the field—covers a wide range of topics including mathematical foundations, optimization formulation, optimality conditions, algorithmic complexity, linear programming, convex optimization, and integer programming. In addition, the book discusses artificial neural network, clustering and classifications, constraint-handling, queueing theory, support vector machine and multi-objective optimization, evolutionary computation, nature-inspired algorithms and many other topics. Designed as a practical resource, all topics are explained in detail with step-by-step examples to show how

each method works. The book's exercises test the acquired knowledge that can be potentially applied to real problem solving. By taking an informal approach to the subject, the author helps readers to rapidly acquire the basic knowledge in optimization, operational research, and applied data mining. This important resource: Offers an accessible and state-of-the-art introduction to the main optimization techniques Contains both traditional optimization techniques and the most current algorithms and swarm intelligence-based techniques Presents a balance of theory, algorithms, and implementation Includes more than 100 worked examples with step-by-step explanations Written for upper undergraduates and graduates in a standard course on optimization, operations research and data mining, Optimization Techniques and Applications with Examples is a highly accessible guide to understanding the fundamentals of all the commonly used techniques in optimization.

#### **Encyclopedia of Optimization** - Christodoulos A. Floudas 2008-09-04

The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research, the richness of ideas, and the breadth of applications that has come from this field. The second edition builds on the success of the former edition with more than 150 completely new entries, designed to ensure that the reference addresses recent areas where optimization theories and techniques have advanced. Particularly heavy attention resulted in health science and transportation, with entries such as "Algorithms for Genomics", "Optimization and Radiotherapy Treatment Design", and "Crew Scheduling".

#### **Data Mining with R** - Luis Torgo 2016-11-30

Data Mining with R: Learning with Case Studies, Second Edition uses practical examples to illustrate the power of R and data mining. Providing an extensive update to the best-selling first edition, this new edition is divided into two parts. The first part will feature introductory material, including a new chapter that provides an introduction to data mining, to complement the already existing introduction to R. The second part includes case studies, and the new edition strongly revises the R code of the case studies making it more up-to-date with recent packages that have emerged in R. The book does not assume any prior knowledge about R. Readers who are new to R and data mining should be able to follow the case studies, and they are designed to be self-contained so the reader can start anywhere in the document. The book is accompanied by a set of freely available R source files that can be obtained at the book's web site. These files include all the code used in the case studies, and they facilitate the "do-it-yourself" approach followed in the book.

Designed for users of data analysis tools, as well as researchers and developers, the book should be useful for anyone interested in entering the "world" of R and data mining. About the Author Luís Torgo is an associate professor in the Department of Computer Science at the University of Porto in Portugal. He teaches Data Mining in R in the NYU Stern School of Business' MS in Business Analytics program. An active researcher in machine learning and data mining for more than 20 years, Dr. Torgo is also a researcher in the Laboratory of Artificial Intelligence and Data Analysis (LIAAD) of INESC Porto LA.

#### **Data Science: New Issues, Challenges and Applications** - Gintautas Dzemyda 2020-02-13

This book contains 16 chapters by researchers working in various fields of data science. They focus on theory and applications in language technologies, optimization, computational thinking, intelligent decision support systems, decomposition of signals, model-driven development methodologies, interoperability of enterprise applications, anomaly detection in financial markets, 3D virtual reality, monitoring of environmental data, convolutional neural networks, knowledge storage, data stream classification, and security in social networking. The respective papers highlight a wealth of issues in, and applications of, data science. Modern technologies allow us to store and transfer large amounts of data quickly. They can be very diverse - images, numbers, streaming, related to human behavior and physiological parameters, etc. Whether the data is just raw numbers, crude images, or will help solve current problems and predict future developments, depends on whether we can effectively process and analyze it. Data science is evolving rapidly. However, it is still a very young field. In particular, data science is concerned with visualizations, statistics, pattern recognition, neurocomputing, image analysis, machine learning, artificial intelligence, databases and data processing, data mining, big data analytics, and knowledge discovery in databases. It also has many interfaces with optimization, block chaining, cyber-social and cyber-physical systems, Internet of Things (IoT), social computing, high-performance computing, in-memory key-value stores, cloud computing, social computing, data

feeds, overlay networks, cognitive computing, crowdsourcing analysis, log analysis, container-based virtualization, and lifetime value modeling. Again, all of these areas are highly interrelated. In addition, data science is now expanding to new fields of application: chemical engineering, biotechnology, building energy management, materials microscopy, geographic research, learning analytics, radiology, metal design, ecosystem homeostasis investigation, and many others.

**Optimization Theory with Applications** - Donald A. Pierre 2012-07-12  
Broad-spectrum approach to important topic. Explores the classic theory of minima and maxima, classical calculus of variations, simplex technique and linear programming, optimality and dynamic programming, more. 1969 edition.

**DATA MINING** - K. P. SOMAN 2006-01-01

Data Mining is an emerging technology that has made its way into science, engineering, commerce and industry as many existing inference methods are obsolete for dealing with massive datasets that get accumulated in data warehouses. This comprehensive and up-to-date text aims at providing the reader with sufficient information about data mining methods and algorithms so that they can make use of these methods for solving real-world problems. The authors have taken care to include most of the widely used methods in data mining with simple examples so as to make the text ideal for classroom learning. To make the theory more comprehensible to the students, many illustrations have been used, and this in turn explains how certain parameters of interest change as the algorithm proceeds. Designed as a textbook for the undergraduate and postgraduate students of computer science, information technology, and master of computer applications, the book can also be used for MBA courses in Data Mining in Business, Business Intelligence, Marketing Research, and Health Care Management. Students of Bioinformatics will also find the text extremely useful. CD-ROM INCLUDE' The accompanying CD contains Large collection of datasets. Animation on how to use WEKA and ExcelMiner to do data mining.

**Agent and Multi-Agent Systems: Technologies and Applications** - Gordan Jezic 2012-06-16

This book constitutes the refereed proceedings of the 6th KES International Conference on Agent and Multi-Agent Systems, KES-AMSTA 2012, held in Dubrovnik, Croatia, in June 2012. The conference attracted a substantial number of researchers and practitioners from all over the world who submitted their papers for ten main tracks covering the methodology and applications of agent and multi-agent systems, one workshop (TRUMAS 2012) and five special sessions on specific topics within the field. The 66 revised papers presented were carefully reviewed and selected for inclusion in the book. The papers are organized in topical sections on virtual organizations, knowledge and learning agents, intelligent workflow, cloud computing and intelligent systems, self-organization, ICT-based alternative and augmentative communication, multi-agent systems, mental and holonic models, assessment methodologies in multi-agent and other paradigms, business processing agents, Trumas 2012 (first international workshop), conversational agents and agent teams, digital economy, and multi-agent systems in distributed environments.

**Support Vector Machines** - Naiyang Deng 2012-12-17

Support Vector Machines: Optimization Based Theory, Algorithms, and Extensions presents an accessible treatment of the two main components of support vector machines (SVMs)—classification problems and regression problems. The book emphasizes the close connection between optimization theory and SVMs since optimization is one of the pillars on which SVMs are built. The authors share insight on many of their research achievements. They give a precise interpretation of statistical learning theory for C-support vector classification. They also discuss regularized twin SVMs for binary classification problems, SVMs for solving multi-classification problems based on ordinal regression, SVMs for semi-supervised problems, and SVMs for problems with perturbations. To improve readability, concepts, methods, and results are introduced graphically and with clear explanations. For important concepts and algorithms, such as the Crammer-Singer SVM for multi-class classification problems, the text provides geometric interpretations that are not depicted in current literature. Enabling a sound understanding of SVMs, this book gives beginners as well as more experienced researchers and engineers the tools to solve real-world problems using SVMs.

**Handbook of Statistical Analysis and Data Mining Applications** - Robert Nisbet 2017-11-09

Handbook of Statistical Analysis and Data Mining Applications, Second

Edition, is a comprehensive professional reference book that guides business analysts, scientists, engineers and researchers, both academic and industrial, through all stages of data analysis, model building and implementation. The handbook helps users discern technical and business problems, understand the strengths and weaknesses of modern data mining algorithms and employ the right statistical methods for practical application. This book is an ideal reference for users who want to address massive and complex datasets with novel statistical approaches and be able to objectively evaluate analyses and solutions. It has clear, intuitive explanations of the principles and tools for solving problems using modern analytic techniques and discusses their application to real problems in ways accessible and beneficial to practitioners across several areas—from science and engineering, to medicine, academia and commerce. Includes input by practitioners for practitioners Includes tutorials in numerous fields of study that provide step-by-step instruction on how to use supplied tools to build models Contains practical advice from successful real-world implementations Brings together, in a single resource, all the information a beginner needs to understand the tools and issues in data mining to build successful data mining solutions Features clear, intuitive explanations of novel analytical tools and techniques, and their practical applications  
**Data Mining and Knowledge Discovery via Logic-Based Methods** - Evangelos Triantaphyllou 2010-06-17

The importance of having efficient and effective methods for data mining and knowledge discovery (DM&KD), to which the present book is devoted, grows every day and numerous such methods have been developed in recent decades. There exists a great variety of different settings for the main problem studied by data mining and knowledge discovery, and it seems that a very popular one is formulated in terms of binary attributes. In this setting, states of nature of the application area under consideration are described by Boolean vectors defined on some attributes. That is, by data points defined in the Boolean space of the attributes. It is postulated that there exists a partition of this space into two classes, which should be inferred as patterns on the attributes when only several data points are known, the so-called positive and negative training examples. The main problem in DM&KD is defined as finding rules for recognizing (classifying) new data points of unknown class, i. e., deciding which of them are positive and which are negative. In other words, to infer the binary value of one more attribute, called the goal or class attribute. To solve this problem, some methods have been suggested which construct a Boolean function separating the two given sets of positive and negative training data points.

**Computational Intelligent Data Analysis for Sustainable Development** - Ting Yu 2016-04-19

Going beyond performing simple analyses, researchers involved in the highly dynamic field of computational intelligent data analysis design algorithms that solve increasingly complex data problems in changing environments, including economic, environmental, and social data. Computational Intelligent Data Analysis for Sustainable Development present

**Advances in Multiple Criteria Decision Making and Human Systems Management** - Milan Zeleny 2007

Edited as a Festschrift in honor of Prof Milan Zeleny, this volume reflects and emulates his unmistakable legacy: the essential multidimensionality of human and social affairs. It contains papers dealing with: Multiple Criteria Decision Making; Social and Human System Management; and Information, Knowledge and Wisdom Management.

**Practical Graph Mining with R** - Nagiza F. Samatova 2013-07-15

Discover Novel and Insightful Knowledge from Data Represented as a Graph Practical Graph Mining with R presents a "do-it-yourself" approach to extracting interesting patterns from graph data. It covers many basic and advanced techniques for the identification of anomalous or frequently recurring patterns in a graph, the discovery of groups or clusters

**Advanced Control Systems - Theory and Applications** - Yuriy P. Kondratenko 2021-07-08

Advanced Control Systems: Theory and Applications provides an overview of advanced research lines in control systems as well as in design, development and implementation methodologies for perspective control systems and their components in different areas of industrial and special applications. It consists of extended versions of the selected papers presented at the XXV International Conference on Automatic Control "Automatics 2018" (September 18-19, 2018, Lviv, Ukraine) which is the main Ukrainian Control Conference organized by Ukrainian Association on Automatic Control (National member organization of

IFAC) and Lviv National University "Lvivska Politechnica." More than 100 papers were presented at the conference with topics including: mathematical problems of control, optimization and game theory; control and identification under uncertainty; automated control of technical, technological and biotechnical objects; controlling the aerospace craft, marine vessels and other moving objects; intelligent control and information processing; mechatronics and robotics; information measuring technologies in automation; automation and IT training of personnel; the Internet of things and the latest technologies. The book is divided into two main parts, the first concerning theory (7 chapters) and the second concerning applications (7 chapters) of advanced control systems. The first part "Advances in Theoretical Research on Automatic Control" consists of theoretical research results which deal with descriptor control impulsive delay systems, motion control in condition of conflict, inverse dynamic models, invariant relations in optimal control, robust adaptive control, bio-inspired algorithms, optimization of fuzzy control systems, and extremal routing problem with constraints and complicated cost functions. The second part "Advances in Control Systems Applications" is based on the chapters which consider different aspects of practical implementation of advanced control systems, in particular, special cases in determining the spacecraft position and attitude using computer vision system, the spacecraft orientation by information from a system of stellar sensors, control synthesis of rotational and spatial spacecraft motion at approaching stage of docking, intelligent algorithms for the automation of complex biotechnical objects, an automatic control system for the slow pyrolysis of organic substances with variable composition, simulation complex of hierarchical systems based on the foresight and cognitive modelling, and advanced identification of impulse processes in cognitive maps. The chapters have been structured to provide an easy-to-follow introduction to the topics that are addressed, including the most relevant references, so that anyone interested in this field can get started in the area. This book may

be useful for researchers and students who are interested in advanced control systems.

**Graph-Based Social Media Analysis** - Ioannis Pitas 2016-04-19

Focused on the mathematical foundations of social media analysis, Graph-Based Social Media Analysis provides a comprehensive introduction to the use of graph analysis in the study of social and digital media. It addresses an important scientific and technological challenge, namely the confluence of graph analysis and network theory with linear algebra, digital media, machine learning, big data analysis, and signal processing. Supplying an overview of graph-based social media analysis, the book provides readers with a clear understanding of social media structure. It uses graph theory, particularly the algebraic description and analysis of graphs, in social media studies. The book emphasizes the big data aspects of social and digital media. It presents various approaches to storing vast amounts of data online and retrieving that data in real-time. It demystifies complex social media phenomena, such as information diffusion, marketing and recommendation systems in social media, and evolving systems. It also covers emerging trends, such as big data analysis and social media evolution. Describing how to conduct proper analysis of the social and digital media markets, the book provides insights into processing, storing, and visualizing big social media data and social graphs. It includes coverage of graphs in social and digital media, graph and hyper-graph fundamentals, mathematical foundations coming from linear algebra, algebraic graph analysis, graph clustering, community detection, graph matching, web search based on ranking, label propagation and diffusion in social media, graph-based pattern recognition and machine learning, graph-based pattern classification and dimensionality reduction, and much more. This book is an ideal reference for scientists and engineers working in social media and digital media production and distribution. It is also suitable for use as a textbook in undergraduate or graduate courses on digital media, social media, or social networks.