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Ripple-Down Rules - Paul Compton 2021-05-30

Machine learning algorithms hold extraordinary promise, but the reality is that their success depends entirely on the suitability of the data available. This book is about Ripple-Down Rules (RDR), an alternative manual technique for rapidly building AI systems. With a human in the loop, RDR is much better able to deal with the limitations of data. *Ripple-Down Rules: The Alternative to Machine Learning* starts by reviewing the problems with data quality and the problems with conventional approaches to incorporating expert human knowledge into AI systems. It suggests that problems with knowledge acquisition arise because of mistaken philosophical assumptions about knowledge. It argues people never really explain how they reach a conclusion, rather they justify their conclusion by differentiating between cases in a context. RDR is based on this more situated understanding of knowledge. The central features of a RDR

approach are explained, and detailed worked examples are presented for different types of RDR, based on freely available software developed for this book. The examples ensure developers have a clear idea of the simple yet counter-intuitive RDR algorithms to easily build their own RDR systems. It has been proven in industrial applications that it takes only a minute or two per rule to build RDR systems with perhaps thousands of rules. The industrial uses of RDR have ranged from medical diagnosis through data cleansing to chatbots in cars. RDR can be used on its own or to improve the performance of machine learning or other methods.

Healthcare Data Analytics - Chandan K. Reddy 2015-06-23

At the intersection of computer science and healthcare, data analytics has emerged as a promising tool for solving problems across many healthcare-related disciplines. Supplying a comprehensive overview of recent healthcare analytics research, *Healthcare Data Analytics* provides a clear

understanding of the analytical techniques currently available to solve healthcare problems. The book details novel techniques for acquiring, handling, retrieving, and making best use of healthcare data. It analyzes recent developments in healthcare computing and discusses emerging technologies that can help improve the health and well-being of patients. Written by prominent researchers and experts working in the healthcare domain, the book sheds light on many of the computational challenges in the field of medical informatics. Each chapter in the book is structured as a "survey-style" article discussing the prominent research issues and the advances made on that research topic. The book is divided into three major categories: Healthcare Data Sources and Basic Analytics - details the various healthcare data sources and analytical techniques used in the processing and analysis of such data Advanced Data Analytics for Healthcare - covers

advanced analytical methods, including clinical prediction models, temporal pattern mining methods, and visual analytics Applications and Practical Systems for Healthcare - covers the applications of data analytics to pervasive healthcare, fraud detection, and drug discovery along with systems for medical imaging and decision support Computer scientists are usually not trained in domain-specific medical concepts, whereas medical practitioners and researchers have limited exposure to the data analytics area. The contents of this book will help to bring together these diverse communities by carefully and comprehensively discussing the most relevant contributions from each domain.

[Introduction to Data Science](#) - Rafael A. Irizarry 2019-11-20 Introduction to Data Science: Data Analysis and Prediction Algorithms with R introduces concepts and skills that can help you tackle real-world data analysis challenges. It covers concepts from probability,

statistical inference, linear regression, and machine learning. It also helps you develop skills such as R programming, data wrangling, data visualization, predictive algorithm building, file organization with UNIX/Linux shell, version control with Git and GitHub, and reproducible document preparation. This book is a textbook for a first course in data science. No previous knowledge of R is necessary, although some experience with programming may be helpful. The book is divided into six parts: R, data visualization, statistics with R, data wrangling, machine learning, and productivity tools. Each part has several chapters meant to be presented as one lecture. The author uses motivating case studies that realistically mimic a data scientist's experience. He starts by asking specific questions and answers these through data analysis so concepts are learned as a means to answering the questions. Examples of the case studies included are: US

murder rates by state, self-reported student heights, trends in world health and economics, the impact of vaccines on infectious disease rates, the financial crisis of 2007-2008, election forecasting, building a baseball team, image processing of hand-written digits, and movie recommendation systems. The statistical concepts used to answer the case study questions are only briefly introduced, so complementing with a probability and statistics textbook is highly recommended for in-depth understanding of these concepts. If you read and understand the chapters and complete the exercises, you will be prepared to learn the more advanced concepts and skills needed to become an expert.

Time Series Clustering and Classification - Elizabeth Ann Maharaj 2019-03-19

The beginning of the age of artificial intelligence and machine learning has created new challenges and opportunities for data analysts,

statisticians, mathematicians, econometricians, computer scientists and many others. At the root of these techniques are algorithms and methods for clustering and classifying different types of large datasets, including time series data. Time Series Clustering and Classification includes relevant developments on observation-based, feature-based and model-based traditional and fuzzy clustering methods, feature-based and model-based classification methods, and machine learning methods. It presents a broad and self-contained overview of techniques for both researchers and students. Features Provides an overview of the methods and applications of pattern recognition of time series Covers a wide range of techniques, including unsupervised and supervised approaches Includes a range of real examples from medicine, finance, environmental science, and more R and MATLAB code, and relevant data sets are available on a supplementary

website

[A Computational Approach to Statistical Learning](#) - Taylor Arnold 2019-01-23

A Computational Approach to Statistical Learning gives a novel introduction to predictive modeling by focusing on the algorithmic and numeric motivations behind popular statistical methods. The text contains annotated code to over 80 original reference functions. These functions provide minimal working implementations of common statistical learning algorithms. Every chapter concludes with a fully worked out application that illustrates predictive modeling tasks using a real-world dataset. The text begins with a detailed analysis of linear models and ordinary least squares. Subsequent chapters explore extensions such as ridge regression, generalized linear models, and additive models. The second half focuses on the use of general-purpose algorithms for convex optimization and their application to tasks in statistical learning. Models

covered include the elastic net, dense neural networks, convolutional neural networks (CNNs), and spectral clustering. A unifying theme throughout the text is the use of optimization theory in the description of predictive models, with a particular focus on the singular value decomposition (SVD). Through this theme, the computational approach motivates and clarifies the relationships between various predictive models. Taylor Arnold is an assistant professor of statistics at the University of Richmond. His work at the intersection of computer vision, natural language processing, and digital humanities has been supported by multiple grants from the National Endowment for the Humanities (NEH) and the American Council of Learned Societies (ACLS). His first book, *Humanities Data in R*, was published in 2015. Michael Kane is an assistant professor of biostatistics at Yale University. He is the recipient of grants from the National Institutes of Health

(NIH), DARPA, and the Bill and Melinda Gates Foundation. His R package *bigmemory* won the Chamber's prize for statistical software in 2010. Bryan Lewis is an applied mathematician and author of many popular R packages, including *irlba*, *doRedis*, and *threejs*.

Data Clustering - Charu C. Aggarwal 2013-08-21

Research on the problem of clustering tends to be fragmented across the pattern recognition, database, data mining, and machine learning communities. Addressing this problem in a unified way, *Data Clustering: Algorithms and Applications* provides complete coverage of the entire area of clustering, from basic methods to more refined and complex data clustering approaches. It pays special attention to recent issues in graphs, social networks, and other domains. The book focuses on three primary aspects of data clustering: Methods, describing key techniques commonly used for clustering, such as feature selection, agglomerative clustering, partitional

clustering, density-based clustering, probabilistic clustering, grid-based clustering, spectral clustering, and nonnegative matrix factorization Domains, covering methods used for different domains of data, such as categorical data, text data, multimedia data, graph data, biological data, stream data, uncertain data, time series clustering, high-dimensional clustering, and big data Variations and Insights, discussing important variations of the clustering process, such as semisupervised clustering, interactive clustering, multiview clustering, cluster ensembles, and cluster validation In this book, top researchers from around the world explore the characteristics of clustering problems in a variety of application areas. They also explain how to glean detailed insight from the clustering process—including how to verify the quality of the underlying clusters—through supervision, human intervention, or the automated

generation of alternative clusters.

[The Beauty of Mathematics in Computer Science](#) - Jun Wu
2018-11-20

The Beauty of Mathematics in Computer Science explains the mathematical fundamentals of information technology products and services we use every day, from Google Web Search to GPS Navigation, and from speech recognition to CDMA mobile services. The book was published in Chinese in 2011 and has sold more than 600,000 copies. Readers were surprised to find that many daily-used IT technologies were so tightly tied to mathematical principles. For example, the automatic classification of news articles uses the cosine law taught in high school. The book covers many topics related to computer applications and applied mathematics including: Natural language processing Speech recognition and machine translation Statistical language modeling Quantitative measurement of information Graph theory and web crawler

Pagerank for web search
Matrix operation and document
classification Mathematical
background of big data Neural
networks and Google's deep
learning Jun Wu was a staff
research scientist in Google
who invented Google's
Chinese, Japanese, and Korean
Web Search Algorithms and
was responsible for many
Google machine learning
projects. He wrote official
blogs introducing Google
technologies behind its
products in very simple
languages for Chinese Internet
users from 2006-2010. The
blogs had more than 2 million
followers. Wu received PhD in
computer science from Johns
Hopkins University and has
been working on speech
recognition and natural
language processing for more
than 20 years. He was one of
the earliest engineers of
Google, managed many
products of the company, and
was awarded 19 US patents
during his 10-year tenure
there. Wu became a full-time
VC investor and co-founded
Amino Capital in Palo Alto in

2014 and is the author of eight
books.

Text Mining - Ashok N.

Srivastava 2009-06-15

The Definitive Resource on
Text Mining Theory and
Applications from Foremost
Researchers in the Field Giving
a broad perspective of the field
from numerous vantage points,
Text Mining: Classification,
Clustering, and Applications
focuses on statistical methods
for text mining and analysis. It
examines methods to
automatically cluster and
classify text documents and
applies these methods in a
variety of areas, including
adaptive information filtering,
information distillation, and
text search. The book begins
with chapters on the
classification of documents into
predefined categories. It
presents state-of-the-art
algorithms and their use in
practice. The next chapters
describe novel methods for
clustering documents into
groups that are not predefined.
These methods seek to
automatically determine topical
structures that may exist in a

document corpus. The book concludes by discussing various text mining applications that have significant implications for future research and industrial use. There is no doubt that text mining will continue to play a critical role in the development of future information systems and advances in research will be instrumental to their success. This book captures the technical depth and immense practical potential of text mining, guiding readers to a sound appreciation of this burgeoning field.

Content-Based Image Classification - Rik Das

2020-12-22

Content-Based Image Classification: Efficient Machine Learning Using Robust Feature Extraction Techniques is a comprehensive guide to research with invaluable image data. Social Science Research Network has revealed that 65% of people are visual learners. Research data provided by Hyerle (2000) has clearly shown 90% of information in the human brain

is visual. Thus, it is no wonder that visual information processing in the brain is 60,000 times faster than text-based information (3M Corporation, 2001). Recently, we have witnessed a significant surge in conversing with images due to the popularity of social networking platforms. The other reason for embracing usage of image data is the mass availability of high-resolution cellphone cameras. Wide usage of image data in diversified application areas including medical science, media, sports, remote sensing, and so on, has spurred the need for further research in optimizing archival, maintenance, and retrieval of appropriate image content to leverage data-driven decision-making. This book demonstrates several techniques of image processing to represent image data in a desired format for information identification. It discusses the application of machine learning and deep learning for identifying and categorizing appropriate image data helpful

in designing automated decision support systems. The book offers comprehensive coverage of the most essential topics, including: Image feature extraction with novel handcrafted techniques (traditional feature extraction) Image feature extraction with automated techniques (representation learning with CNNs) Significance of fusion-based approaches in enhancing classification accuracy MATLAB® codes for implementing the techniques Use of the Open Access data mining tool WEKA for multiple tasks The book is intended for budding researchers, technocrats, engineering students, and machine learning/deep learning enthusiasts who are willing to start their computer vision journey with content-based image recognition. The readers will get a clear picture of the essentials for transforming the image data into valuable means for insight generation. Readers will learn coding techniques necessary to propose novel mechanisms and disruptive

approaches. The WEKA guide provided is beneficial for those uncomfortable coding for machine learning algorithms. The WEKA tool assists the learner in implementing machine learning algorithms with the click of a button. Thus, this book will be a stepping-stone for your machine learning journey. Please visit the author's website for any further guidance at <https://www.rikdas.com/>

A First Course in Machine Learning - Simon Rogers
2016-10-14

"A First Course in Machine Learning by Simon Rogers and Mark Girolami is the best introductory book for ML currently available. It combines rigor and precision with accessibility, starts from a detailed explanation of the basic foundations of Bayesian analysis in the simplest of settings, and goes all the way to the frontiers of the subject such as infinite mixture models, GPs, and MCMC."
—Devdatt Dubhashi, Professor, Department of Computer Science and Engineering,

Chalmers University, Sweden
"This textbook manages to be easier to read than other comparable books in the subject while retaining all the rigorous treatment needed. The new chapters put it at the forefront of the field by covering topics that have become mainstream in machine learning over the last decade." —Daniel Barbara, George Mason University, Fairfax, Virginia, USA
"The new edition of *A First Course in Machine Learning* by Rogers and Girolami is an excellent introduction to the use of statistical methods in machine learning. The book introduces concepts such as mathematical modeling, inference, and prediction, providing 'just in time' the essential background on linear algebra, calculus, and probability theory that the reader needs to understand these concepts." —Daniel Ortiz-Arroyo, Associate Professor, Aalborg University Esbjerg, Denmark
"I was impressed by how closely the material aligns with the needs of an introductory course on

machine learning, which is its greatest strength...Overall, this is a pragmatic and helpful book, which is well-aligned to the needs of an introductory course and one that I will be looking at for my own students in coming months." —David Clifton, University of Oxford, UK
"The first edition of this book was already an excellent introductory text on machine learning for an advanced undergraduate or taught masters level course, or indeed for anybody who wants to learn about an interesting and important field of computer science. The additional chapters of advanced material on Gaussian process, MCMC and mixture modeling provide an ideal basis for practical projects, without disturbing the very clear and readable exposition of the basics contained in the first part of the book." —Gavin Cawley, Senior Lecturer, School of Computing Sciences, University of East Anglia, UK
"This book could be used for junior/senior undergraduate students or first-year graduate

students, as well as individuals who want to explore the field of machine learning...The book introduces not only the concepts but the underlying ideas on algorithm implementation from a critical thinking perspective."

—Guangzhi Qu, Oakland University, Rochester, Michigan, USA

Statistical Regression and Classification - Norman

Matloff 2017-09-19

Statistical Regression and Classification: From Linear Models to Machine Learning takes an innovative look at the traditional statistical regression course, presenting a contemporary treatment in line with today's applications and users. The text takes a modern look at regression: * A thorough treatment of classical linear and generalized linear models, supplemented with introductory material on machine learning methods. * Since classification is the focus of many contemporary applications, the book covers this topic in detail, especially the multiclass case. * In view of

the voluminous nature of many modern datasets, there is a chapter on Big Data. * Has special Mathematical and Computational Complements sections at ends of chapters, and exercises are partitioned into Data, Math and Complements problems. * Instructors can tailor coverage for specific audiences such as majors in Statistics, Computer Science, or Economics. * More than 75 examples using real data. The book treats classical regression methods in an innovative, contemporary manner. Though some statistical learning methods are introduced, the primary methodology used is linear and generalized linear parametric models, covering both the Description and Prediction goals of regression methods. The author is just as interested in Description applications of regression, such as measuring the gender wage gap in Silicon Valley, as in forecasting tomorrow's demand for bike rentals. An entire chapter is devoted to measuring such effects, including discussion of

Simpson's Paradox, multiple inference, and causation issues. Similarly, there is an entire chapter of parametric model fit, making use of both residual analysis and assessment via nonparametric analysis. Norman Matloff is a professor of computer science at the University of California, Davis, and was a founder of the Statistics Department at that institution. His current research focus is on recommender systems, and applications of regression methods to small area estimation and bias reduction in observational studies. He is on the editorial boards of the Journal of Statistical Computation and the R Journal. An award-winning teacher, he is the author of *The Art of R Programming and Parallel Computation in Data Science: With Examples in R, C++ and CUDA*.

Data Clustering: Theory, Algorithms, and Applications, Second Edition - Guojun Gan
2020-11-10

Data clustering, also known as cluster analysis, is an

unsupervised process that divides a set of objects into homogeneous groups. Since the publication of the first edition of this monograph in 2007, development in the area has exploded, especially in clustering algorithms for big data and open-source software for cluster analysis. This second edition reflects these new developments, covers the basics of data clustering, includes a list of popular clustering algorithms, and provides program code that helps users implement clustering algorithms. *Data Clustering: Theory, Algorithms and Applications, Second Edition* will be of interest to researchers, practitioners, and data scientists as well as undergraduate and graduate students.

Machine Learning - Stephen Marsland 2011-03-23
Traditional books on machine learning can be divided into two groups- those aimed at advanced undergraduates or early postgraduates with reasonable mathematical knowledge and those that are

primers on how to code algorithms. The field is ready for a text that not only demonstrates how to use the algorithms that make up machine learning methods, but [A Concise Introduction to Machine Learning](#) - A.C. Faul
2019-08-01

The emphasis of the book is on the question of Why - only if why an algorithm is successful is understood, can it be properly applied, and the results trusted. Algorithms are often taught side by side without showing the similarities and differences between them. This book addresses the commonalities, and aims to give a thorough and in-depth treatment and develop intuition, while remaining concise. This useful reference should be an essential on the bookshelves of anyone employing machine learning techniques.

Music Data Mining - Tao Li
2011-07-12

The research area of music information retrieval has gradually evolved to address the challenges of effectively

accessing and interacting large collections of music and associated data, such as styles, artists, lyrics, and reviews. Bringing together an interdisciplinary array of top researchers, Music Data Mining presents a variety of approaches to successfully employ data mining techniques for the purpose of music processing. The book first covers music data mining tasks and algorithms and audio feature extraction, providing a framework for subsequent chapters. With a focus on data classification, it then describes a computational approach inspired by human auditory perception and examines instrument recognition, the effects of music on moods and emotions, and the connections between power laws and music aesthetics. Given the importance of social aspects in understanding music, the text addresses the use of the Web and peer-to-peer networks for both music data mining and evaluating music mining tasks and algorithms. It also discusses indexing with tags

and explains how data can be collected using online human computation games. The final chapters offer a balanced exploration of hit song science as well as a look at symbolic musicology and data mining. The multifaceted nature of music information often requires algorithms and systems using sophisticated signal processing and machine learning techniques to better extract useful information. An excellent introduction to the field, this volume presents state-of-the-art techniques in music data mining and information retrieval to create novel ways of interacting with large music collections.

Advances in Machine Learning and Data Mining for Astronomy

- Michael J. Way 2012-03-29
Advances in Machine Learning and Data Mining for Astronomy documents numerous successful collaborations among computer scientists, statisticians, and astronomers who illustrate the application of state-of-the-art machine learning and data mining techniques in astronomy. Due

to the massive amount and complexity of data in most scientific disciplines

Event Mining - Tao Li
2015-10-15

Event mining encompasses techniques for automatically and efficiently extracting valuable knowledge from historical event/log data. The field, therefore, plays an important role in data-driven system management. Event Mining: Algorithms and Applications presents state-of-the-art event mining approaches and applications with a focus on computing system management. The book first explains how to transform log data in disparate formats and contents into a canonical form as well as how to optimize system monitoring. It then shows how to extract useful knowledge from data. It describes intelligent and efficient methods and algorithms to perform data-driven pattern discovery and problem determination for managing complex systems. The book also discusses data-driven approaches for the

detailed diagnosis of a system issue and addresses the application of event summarization in Twitter messages (tweets). Understanding the interdisciplinary field of event mining can be challenging as it requires familiarity with several research areas and the relevant literature is scattered in diverse publications. This book makes it easier to explore the field by providing both a good starting point for readers not familiar with the topics and a comprehensive reference for those already working in this area.

Data Science and Data

Analytics - Amit Kumar Tyagi
2021-09-22

Data science is a multi-disciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured (labeled) and unstructured (unlabeled) data. It is the future of Artificial Intelligence (AI) and a necessity of the future to make things easier and more productive. In simple terms,

data science is the discovery of data or uncovering hidden patterns (such as complex behaviors, trends, and inferences) from data. Moreover, Big Data analytics/data analytics are the analysis mechanisms used in data science by data scientists. Several tools, such as Hadoop, R, etc., are used to analyze this large amount of data to predict valuable information and for decision-making. Note that structured data can be easily analyzed by efficient (available) business intelligence tools, while most of the data (80% of data by 2020) is in an unstructured form that requires advanced analytics tools. But while analyzing this data, we face several concerns, such as complexity, scalability, privacy leaks, and trust issues. Data science helps us to extract meaningful information or insights from unstructured or complex or large amounts of data (available or stored virtually in the cloud). **Data Science and Data Analytics: Opportunities and Challenges** covers all possible areas,

applications with arising serious concerns, and challenges in this emerging field in detail with a comparative analysis/taxonomy. FEATURES Gives the concept of data science, tools, and algorithms that exist for many useful applications Provides many challenges and opportunities in data science and data analytics that help researchers to identify research gaps or problems Identifies many areas and uses of data science in the smart era Applies data science to agriculture, healthcare, graph mining, education, security, etc. Academicians, data scientists, and stockbrokers from industry/business will find this book useful for designing optimal strategies to enhance their firm's productivity. *RapidMiner* - Markus Hofmann 2016-04-19 Powerful, Flexible Tools for a Data-Driven World As the data deluge continues in today's world, the need to master data mining, predictive analytics, and business analytics has

never been greater. These techniques and tools provide unprecedented insights into data, enabling better decision making and forecasting, and ultimately the solution of increasingly complex problems. Learn from the Creators of the RapidMiner Software Written by leaders in the data mining community, including the developers of the RapidMiner software, *RapidMiner: Data Mining Use Cases and Business Analytics Applications* provides an in-depth introduction to the application of data mining and business analytics techniques and tools in scientific research, medicine, industry, commerce, and diverse other sectors. It presents the most powerful and flexible open source software solutions: RapidMiner and RapidAnalytics. The software and their extensions can be freely downloaded at www.RapidMiner.com. Understand Each Stage of the Data Mining Process The book and software tools cover all relevant steps of the data mining process, from data loading, transformation,

integration, aggregation, and visualization to automated feature selection, automated parameter and process optimization, and integration with other tools, such as R packages or your IT infrastructure via web services. The book and software also extensively discuss the analysis of unstructured data, including text and image mining. Easily Implement Analytics Approaches Using RapidMiner and RapidAnalytics Each chapter describes an application, how to approach it with data mining methods, and how to implement it with RapidMiner and RapidAnalytics. These application-oriented chapters give you not only the necessary analytics to solve problems and tasks, but also reproducible, step-by-step descriptions of using RapidMiner and RapidAnalytics. The case studies serve as blueprints for your own data mining applications, enabling you to effectively solve similar problems.

Data Science and Machine

Learning - Dirk P. Kroese
2019-11-20

"This textbook is a well-rounded, rigorous, and informative work presenting the mathematics behind modern machine learning techniques. It hits all the right notes: the choice of topics is up-to-date and perfect for a course on data science for mathematics students at the advanced undergraduate or early graduate level. This book fills a sorely-needed gap in the existing literature by not sacrificing depth for breadth, presenting proofs of major theorems and subsequent derivations, as well as providing a copious amount of Python code. I only wish a book like this had been around when I first began my journey!" - Nicholas Hoell, University of Toronto "This is a well-written book that provides a deeper dive into data-scientific methods than many introductory texts. The writing is clear, and the text logically builds up regularization, classification, and decision trees. Compared to its probable

competitors, it carves out a unique niche. -Adam Loy, Carleton College

The purpose of *Data Science and Machine Learning: Mathematical and Statistical Methods* is to provide an accessible, yet comprehensive textbook intended for students interested in gaining a better understanding of the mathematics and statistics that underpin the rich variety of ideas and machine learning algorithms in data science.

Key Features: Focuses on mathematical understanding. Presentation is self-contained, accessible, and comprehensive. Extensive list of exercises and worked-out examples. Many concrete algorithms with Python code. Full color throughout.

The Authors: Dirk P. Kroese, PhD, is a Professor of Mathematics and Statistics at The University of Queensland. He has published over 120 articles and five books in a wide range of areas in mathematics, statistics, data science, machine learning, and Monte Carlo methods. He is a pioneer of the well-known

Cross-Entropy method—an adaptive Monte Carlo technique, which is being used around the world to help solve difficult estimation and optimization problems in science, engineering, and finance. Zdravko Botev, PhD, is an Australian Mathematical Science Institute Lecturer in Data Science and Machine Learning with an appointment at the University of New South Wales in Sydney, Australia. He is the recipient of the 2018 Christopher Heyde Medal of the Australian Academy of Science for distinguished research in the Mathematical Sciences. Thomas Taimre, PhD, is a Senior Lecturer of Mathematics and Statistics at The University of Queensland. His research interests range from applied probability and Monte Carlo methods to applied physics and the remarkably universal self-mixing effect in lasers. He has published over 100 articles, holds a patent, and is the coauthor of *Handbook of Monte Carlo Methods* (Wiley). Radislav Vaisman, PhD, is a

Lecturer of Mathematics and Statistics at The University of Queensland. His research interests lie at the intersection of applied probability, machine learning, and computer science. He has published over 20 articles and two books.

Multivariate Kernel Smoothing and Its

Applications - José E. Chacón
2018-05-08

Kernel smoothing has greatly evolved since its inception to become an essential methodology in the data science tool kit for the 21st century. Its widespread adoption is due to its fundamental role for multivariate exploratory data analysis, as well as the crucial role it plays in composite solutions to complex data challenges. Multivariate Kernel Smoothing and Its Applications offers a comprehensive overview of both aspects. It begins with a thorough exposition of the approaches to achieve the two basic goals of estimating probability density functions and their derivatives. The focus then turns to the

applications of these approaches to more complex data analysis goals, many with a geometric/topological flavour, such as level set estimation, clustering (unsupervised learning), principal curves, and feature significance. Other topics, while not direct applications of density (derivative) estimation but sharing many commonalities with the previous settings, include classification (supervised learning), nearest neighbour estimation, and deconvolution for data observed with error. For a data scientist, each chapter contains illustrative Open data examples that are analysed by the most appropriate kernel smoothing method. The emphasis is always placed on an intuitive understanding of the data provided by the accompanying statistical visualisations. For a reader wishing to investigate further the details of their underlying statistical reasoning, a graduated exposition to a unified theoretical framework is

provided. The algorithms for efficient software implementation are also discussed. José E. Chacón is an associate professor at the Department of Mathematics of the Universidad de Extremadura in Spain. Tarn Duong is a Senior Data Scientist for a start-up which provides short distance carpooling services in France. Both authors have made important contributions to kernel smoothing research over the last couple of decades.

Multi-Label Dimensionality Reduction - Liang Sun

2016-04-19

Similar to other data mining and machine learning tasks, multi-label learning suffers from dimensionality. An effective way to mitigate this problem is through dimensionality reduction, which extracts a small number of features by removing irrelevant, redundant, and noisy information. The data mining and machine learning literature currently lacks a unified treatment of multi-label dimensionality reduction that

incorporates both algorithmic developments and applications. Addressing this shortfall, Multi-Label Dimensionality Reduction covers the methodological developments, theoretical properties, computational aspects, and applications of many multi-label dimensionality reduction algorithms. It explores numerous research questions, including: How to fully exploit label correlations for effective dimensionality reduction How to scale dimensionality reduction algorithms to large-scale problems How to effectively combine dimensionality reduction with classification How to derive sparse dimensionality reduction algorithms to enhance model interpretability How to perform multi-label dimensionality reduction effectively in practical applications The authors emphasize their extensive work on dimensionality reduction for multi-label learning. Using a case study of *Drosophila* gene expression pattern image annotation, they demonstrate

how to apply multi-label dimensionality reduction algorithms to solve real-world problems. A supplementary website provides a MATLAB® package for implementing popular dimensionality reduction algorithms.

Data Classification - Charu C. Aggarwal 2014-07-25

Comprehensive Coverage of the Entire Area of Classification Research on the problem of classification tends to be fragmented across such areas as pattern recognition, database, data mining, and machine learning. Addressing the work of these different communities in a unified way, *Data Classification: Algorithms and Applications* explores the underlying algorithms of classification as well as applications of classification in a variety of problem domains, including text, multimedia, social network, and biological data. This comprehensive book focuses on three primary aspects of data classification: Methods-The book first describes common techniques used for classification,

including probabilistic methods, decision trees, rule-based methods, instance-based methods, support vector machine methods, and neural networks. Domains-The book then examines specific methods used for data domains such as multimedia, text, time-series, network, discrete sequence, and uncertain data. It also covers large data sets and data streams due to the recent importance of the big data paradigm. Variations-The book concludes with insight on variations of the classification process. It discusses ensembles, rare-class learning, distance function learning, active learning, visual learning, transfer learning, and semi-supervised learning as well as evaluation aspects of classifiers.

Pattern Recognition Algorithms for Data Mining - Sankar K. Pal 2004-05-27

Pattern Recognition Algorithms for Data Mining addresses different pattern recognition (PR) tasks in a unified framework with both theoretical and experimental

results. Tasks covered include data condensation, feature selection, case generation, clustering/classification, and rule generation and evaluation. This volume presents various theories, methodologies, and algorithms, using both classical approaches and hybrid paradigms. The authors emphasize large datasets with overlapping, intractable, or nonlinear boundary classes, and datasets that demonstrate granular computing in soft frameworks. Organized into eight chapters, the book begins with an introduction to PR, data mining, and knowledge discovery concepts. The authors analyze the tasks of multi-scale data condensation and dimensionality reduction, then explore the problem of learning with support vector machine (SVM). They conclude by highlighting the significance of granular computing for different mining tasks in a soft paradigm.

Statistical Foundations of Data Science - Jianqing Fan

2020-09-21

Statistical Foundations of Data

Science gives a thorough introduction to commonly used statistical models, contemporary statistical machine learning techniques and algorithms, along with their mathematical insights and statistical theories. It aims to serve as a graduate-level textbook and a research monograph on high-dimensional statistics, sparsity and covariance learning, machine learning, and statistical inference. It includes ample exercises that involve both theoretical studies as well as empirical applications. The book begins with an introduction to the stylized features of big data and their impacts on statistical analysis. It then introduces multiple linear regression and expands the techniques of model building via nonparametric regression and kernel tricks. It provides a comprehensive account on sparsity explorations and model selections for multiple regression, generalized linear models, quantile regression, robust regression, hazards

regression, among others. High-dimensional inference is also thoroughly addressed and so is feature screening. The book also provides a comprehensive account on high-dimensional covariance estimation, learning latent factors and hidden structures, as well as their applications to statistical estimation, inference, prediction and machine learning problems. It also introduces thoroughly statistical machine learning theory and methods for classification, clustering, and prediction. These include CART, random forests, boosting, support vector machines, clustering algorithms, sparse PCA, and deep learning.

Clustering and Classification - Phipps Arabie 1996

At a moderately advanced level, this book seeks to cover the areas of clustering and related methods of data analysis where major advances are being made. Topics include: hierarchical clustering, variable selection and weighting, additive trees

and other network models, relevance of neural network models to clustering, the role of computational complexity in cluster analysis, latent class approaches to cluster analysis, theory and method with applications of a hierarchical classes model in psychology and psychopathology, combinatorial data analysis, clusterwise aggregation of relations, review of the Japanese-language results on clustering, review of the Russian-language results on clustering and multidimensional scaling, practical advances, and significance tests.

Data Mining - Richard J. Roiger 2017-01-06

Data Mining: A Tutorial-Based Primer, Second Edition provides a comprehensive introduction to data mining with a focus on model building and testing, as well as on interpreting and validating results. The text guides students to understand how data mining can be employed to solve real problems and recognize whether a data

mining solution is a feasible alternative for a specific problem. Fundamental data mining strategies, techniques, and evaluation methods are presented and implemented with the help of two well-known software tools. Several new topics have been added to the second edition including an introduction to Big Data and data analytics, ROC curves, Pareto lift charts, methods for handling large-sized, streaming and imbalanced data, support vector machines, and extended coverage of textual data mining. The second edition contains tutorials for attribute selection, dealing with imbalanced data, outlier analysis, time series analysis, mining textual data, and more. The text provides in-depth coverage of RapidMiner Studio and Weka's Explorer interface. Both software tools are used for stepping students through the tutorials depicting the knowledge discovery process. This allows the reader maximum flexibility for their hands-on data mining experience.

Statistical and Machine-Learning Data Mining: -

Bruce Ratner 2017-07-12
Interest in predictive analytics of big data has grown exponentially in the four years since the publication of *Statistical and Machine-Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data, Second Edition*. In the third edition of this bestseller, the author has completely revised, reorganized, and repositioned the original chapters and produced 13 new chapters of creative and useful machine-learning data mining techniques. In sum, the 43 chapters of simple yet insightful quantitative techniques make this book unique in the field of data mining literature. What is new in the Third Edition: The current chapters have been completely rewritten. The core content has been extended with strategies and methods for problems drawn from the top predictive analytics conference and statistical

modeling workshops. Adds thirteen new chapters including coverage of data science and its rise, market share estimation, share of wallet modeling without survey data, latent market segmentation, statistical regression modeling that deals with incomplete data, decile analysis assessment in terms of the predictive power of the data, and a user-friendly version of text mining, not requiring an advanced background in natural language processing (NLP). Includes SAS subroutines which can be easily converted to other languages. As in the previous edition, this book offers detailed background, discussion, and illustration of specific methods for solving the most commonly experienced problems in predictive modeling and analysis of big data. The author addresses each methodology and assigns its application to a specific type of problem. To better ground readers, the book provides an in-depth discussion of the basic methodologies of predictive

modeling and analysis. While this type of overview has been attempted before, this approach offers a truly nitty-gritty, step-by-step method that both tyros and experts in the field can enjoy playing with.

Handbook of Data Structures and Applications

- Dinesh P. Mehta 2018-02-21

The Handbook of Data Structures and Applications was first published over a decade ago. This second edition aims to update the first by focusing on areas of research in data structures that have seen significant progress. While the discipline of data structures has not matured as rapidly as other areas of computer science, the book aims to update those areas that have seen advances. Retaining the seven-part structure of the first edition, the handbook begins with a review of introductory material, followed by a discussion of well-known classes of data structures, Priority Queues, Dictionary Structures, and Multidimensional structures.

The editors next analyze miscellaneous data structures, which are well-known structures that elude easy classification. The book then addresses mechanisms and tools that were developed to facilitate the use of data structures in real programs. It concludes with an examination of the applications of data structures. Four new chapters have been added on Bloom Filters, Binary Decision Diagrams, Data Structures for Cheminformatics, and Data Structures for Big Data Stores, and updates have been made to other chapters that appeared in the first edition. The Handbook is invaluable for suggesting new ideas for research in data structures, and for revealing application contexts in which they can be deployed. Practitioners devising algorithms will gain insight into organizing data, allowing them to solve algorithmic problems more efficiently.

Hands-On Machine Learning with R - Brad Boehmke
2019-11-07

Hands-on Machine Learning with R provides a practical and applied approach to learning and developing intuition into today's most popular machine learning methods. This book serves as a practitioner's guide to the machine learning process and is meant to help the reader learn to apply the machine learning stack within R, which includes using various R packages such as glmnet, h2o, ranger, xgboost, keras, and others to effectively model and gain insight from their data. The book favors a hands-on approach, providing an intuitive understanding of machine learning concepts through concrete examples and just a little bit of theory. Throughout this book, the reader will be exposed to the entire machine learning process including feature engineering, resampling, hyperparameter tuning, model evaluation, and interpretation. The reader will be exposed to powerful algorithms such as regularized regression, random forests, gradient boosting machines, deep learning,

generalized low rank models, and more! By favoring a hands-on approach and using real word data, the reader will gain an intuitive understanding of the architectures and engines that drive these algorithms and packages, understand when and how to tune the various hyperparameters, and be able to interpret model results. By the end of this book, the reader should have a firm grasp of R's machine learning stack and be able to implement a systematic approach for producing high quality modeling results.

Features:

- Offers a practical and applied introduction to the most popular machine learning methods.
- Topics covered include feature engineering, resampling, deep learning and more.
- Uses a hands-on approach and real world data.

Data Clustering - Charu C.

Aggarwal 2016-04-08

Research on the problem of clustering tends to be fragmented across the pattern recognition, database, data mining, and machine learning communities. Addressing this problem in a unified way, Data

Clustering: Algorithms and Applications provides complete coverage of the entire area of clustering, from basic methods to more refined and complex data clustering approaches. It pays special attention to recent issues in graphs, social networks, and other domains. The book focuses on three primary aspects of data clustering: Methods, describing key techniques commonly used for clustering, such as feature selection, agglomerative clustering, partitional clustering, density-based clustering, probabilistic clustering, grid-based clustering, spectral clustering, and nonnegative matrix factorization Domains, covering methods used for different domains of data, such as categorical data, text data, multimedia data, graph data, biological data, stream data, uncertain data, time series clustering, high-dimensional clustering, and big data Variations and Insights, discussing important variations of the clustering process, such as semisupervised clustering,

interactive clustering, multiview clustering, cluster ensembles, and cluster validation In this book, top researchers from around the world explore the characteristics of clustering problems in a variety of application areas. They also explain how to glean detailed insight from the clustering process—including how to verify the quality of the underlying clusters—through supervision, human intervention, or the automated generation of alternative clusters.

[Spectral Feature Selection for Data Mining \(Open Access\)](#) - Zheng Alan Zhao 2011-12-14 Spectral Feature Selection for Data Mining introduces a novel feature selection technique that establishes a general platform for studying existing feature selection algorithms and developing new algorithms for emerging problems in real-world applications. This technique represents a unified framework for supervised, unsupervised, and semisupervised

The Top Ten Algorithms in Data Mining - Xindong Wu

2009-04-09

Identifying some of the most influential algorithms that are widely used in the data mining community, *The Top Ten Algorithms in Data Mining* provides a description of each algorithm, discusses its impact, and reviews current and future research. Thoroughly evaluated by independent reviewers, each chapter focuses on a particular algorithm and is written by either the original authors of the algorithm or world-class researchers who have extensively studied the respective algorithm. The book concentrates on the following important algorithms: C4.5, k-Means, SVM, Apriori, EM, PageRank, AdaBoost, kNN, Naive Bayes, and CART. Examples illustrate how each algorithm works and highlight its overall performance in a real-world application. The text covers key topics—including classification, clustering, statistical learning, association analysis, and link mining—in data mining research and

development as well as in data mining, machine learning, and artificial intelligence courses. By naming the leading algorithms in this field, this book encourages the use of data mining techniques in a broader realm of real-world applications. It should inspire more data mining researchers to further explore the impact and novel research issues of these algorithms.

Ensemble Methods - Zhi-Hua Zhou 2012-06-06

An up-to-date, self-contained introduction to a state-of-the-art machine learning approach, *Ensemble Methods: Foundations and Algorithms*

shows how these accurate methods are used in real-world tasks. It gives you the necessary groundwork to carry out further research in this evolving field. After presenting background and terminology, the book covers the main algorithms and theories, including Boosting, Bagging, Random Forest, averaging and voting schemes, the Stacking method, mixture of experts, and diversity measures. It also

discusses multiclass extension, noise tolerance, error-ambiguity and bias-variance decompositions, and recent progress in information theoretic diversity. Moving on to more advanced topics, the author explains how to achieve better performance through ensemble pruning and how to generate better clustering results by combining multiple clusterings. In addition, he describes developments of ensemble methods in semi-supervised learning, active learning, cost-sensitive learning, class-imbalance learning, and comprehensibility enhancement.

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.

Supervised Machine Learning for Text Analysis in R - Emil Hvitfeldt 2021-10-22

Text data is important for many domains, from healthcare to marketing to the digital humanities, but specialized approaches are necessary to create features for machine learning from language.

Supervised Machine Learning for Text Analysis in R explains how to preprocess text data for modeling, train models, and evaluate model performance using tools from the tidyverse and tidymodels ecosystem.

Models like these can be used to make predictions for new observations, to understand what natural language features or characteristics contribute to differences in the output, and more. If you are already familiar with the basics of predictive modeling, use the comprehensive, detailed examples in this book to extend your skills to the domain of natural language processing.

This book provides practical guidance and directly applicable knowledge for data scientists and analysts who want to integrate unstructured text data into their modeling pipelines. Learn how to use text data for both regression and classification tasks, and how to apply more straightforward algorithms like regularized regression or support vector machines as well as deep learning approaches. Natural language must be dramatically transformed to be ready for computation, so we explore typical text preprocessing and feature engineering steps like tokenization and word embeddings from the ground up. These steps influence model results in ways we can measure, both in terms of model metrics and other tangible consequences such as how fair or appropriate model results are.

Temporal Data Mining - Theophano Mitsa 2010-03-10
Temporal data mining deals with the harvesting of useful information from temporal

data. New initiatives in health care and business organizations have increased the importance of temporal information in data today. From basic data mining concepts to state-of-the-art advances, *Temporal Data Mining* covers the theory of this subject as well as its application in a variety of fields. It discusses the incorporation of temporality in databases as well as temporal data representation, similarity computation, data classification, clustering, pattern discovery, and prediction. The book also explores the use of temporal data mining in medicine and biomedical informatics, business and industrial applications, web usage mining, and spatiotemporal data mining. Along with various state-of-the-art algorithms, each chapter includes detailed references and short descriptions of relevant algorithms and techniques described in other references. In the appendices, the author explains how data

mining fits the overall goal of an organization and how these data can be interpreted for the purpose of characterizing a population. She also provides programs written in the Java language that implement some of the algorithms presented in the first chapter. Check out the author's blog at

<http://theophanomitsa.wordpress.com/>

[Computational Methods of Feature Selection](#) - Huan Liu
2007-10-29

Due to increasing demands for dimensionality reduction, research on feature selection has deeply and widely expanded into many fields, including computational statistics, pattern recognition, machine learning, data mining, and knowledge discovery. Highlighting current research issues, *Computational Methods of Feature Selection* introduces the basic concepts and principles, state-of-the-art algorithms, and novel applications of this tool. The book begins by exploring unsupervised, randomized, and causal feature selection. It then

reports on some recent results of empowering feature selection, including active feature selection, decision-border estimate, the use of ensembles with independent probes, and incremental feature selection. This is followed by discussions of weighting and local methods, such as the ReliefF family, k-means clustering, local feature relevance, and a new interpretation of Relief. The book subsequently covers text classification, a new feature selection score, and both constraint-guided and aggressive feature selection. The final section examines applications of feature selection in bioinformatics, including feature construction as well as redundancy-, ensemble-, and penalty-based feature selection. Through a clear, concise, and coherent presentation of topics, this volume systematically covers the key concepts, underlying principles, and inventive applications of feature selection, illustrating how this powerful tool can efficiently

harness massive, high-dimensional data and turn it into valuable, reliable information.

Contrast Data Mining - Guozhu Dong 2012-09-07

A Fruitful Field for Researching Data Mining Methodology and for Solving Real-Life Problems Contrast Data Mining: Concepts, Algorithms, and Applications collects recent results from this specialized area of data mining that have previously been scattered in the literature, making them more accessible to researchers and developers in data mining and other fields. The book not only presents concepts and techniques for contrast data mining, but also explores the use of contrast mining to solve challenging problems in various scientific, medical, and business domains. Learn from Real Case Studies of Contrast Mining Applications In this volume, researchers from around the world specializing in architecture engineering, bioinformatics, computer science, medicine, and systems

engineering focus on the mining and use of contrast patterns. They demonstrate many useful and powerful capabilities of a variety of contrast mining techniques and algorithms, including tree-based structures, zero-suppressed binary decision diagrams, data cube representations, and clustering algorithms. They also examine how contrast mining is used in leukemia characterization, discriminative gene transfer and microarray analysis, computational toxicology, spatial and image data classification, voting analysis, heart disease prediction, crime analysis, understanding customer behavior, genetic algorithms, and network security.

Contrast Data Mining - Guozhu Dong 2016-04-19

A Fruitful Field for Researching Data Mining Methodology and for Solving Real-Life Problems Contrast Data Mining: Concepts, Algorithms, and Applications collects recent results from this specialized area of data mining

that have previously been scattered in the literature, making them more accessible to researchers and developers in data mining and other fields. The book not only presents concepts and techniques for contrast data mining, but also explores the use of contrast mining to solve challenging problems in various scientific, medical, and business domains. Learn from Real Case Studies of Contrast Mining Applications In this volume, researchers from around the world specializing in architecture engineering, bioinformatics, computer science, medicine, and systems engineering focus on the mining and use of contrast patterns. They demonstrate many useful and powerful capabilities of a variety of contrast mining techniques and algorithms, including tree-based structures, zero-suppressed binary decision diagrams, data cube representations, and clustering algorithms. They also examine how contrast mining is used in leukemia characterization,

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and microarray analysis,
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classification, voting analysis,

heart disease prediction, crime
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security.