

Introduction Of The Radial Basis Function Rbf Networks

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Spherical Radial Basis Functions, Theory and Applications - Simon Hubbert 2015-05-13

This book is the first to be devoted to the theory and applications of spherical (radial) basis functions (SBFs), which is rapidly emerging as one of the most promising techniques for solving problems where approximations are needed on the surface of a sphere. The aim of the book is to provide enough theoretical and practical details for the reader to be able to implement the SBF methods to solve real world problems. The authors stress the close connection between the theory of SBFs and that of the more well-known family of radial basis functions (RBFs), which are well-established tools for solving approximation theory problems on more general domains. The unique solvability of the SBF interpolation method for data fitting problems is established and an in-depth investigation of its accuracy is provided. Two chapters are devoted to partial differential equations (PDEs). One deals with the practical implementation of an SBF-based solution to an elliptic PDE and another which describes an SBF approach for solving a parabolic time-dependent PDE, complete with error analysis. The theory developed is illuminated with numerical experiments throughout. Spherical Radial Basis Functions, Theory and Applications will be of interest to graduate students and researchers in mathematics and related fields such as the geophysical sciences and statistics.

Self-Organizing Neural Networks - Udo Seiffert 2013-11-11

The Self-Organizing Map (SOM) is one of the most frequently used architectures for unsupervised artificial neural networks. Introduced by Teuvo Kohonen in the 1980s, SOMs have been developed as a very powerful method for visualization and unsupervised classification tasks by an active and innovative community of international researchers. A number of extensions and modifications have been developed during the last two decades. The reason is surely not that the original algorithm was imperfect or inadequate. It is rather the universal applicability and easy handling of the SOM. Compared to many other network paradigms, only a few parameters need to be arranged and thus also for a beginner the network leads to useful and reliable results. Nevertheless there is scope for improvements and sophisticated new developments as this book impressively demonstrates. The number of published applications utilizing the SOM appears to be unending. As the title of this book indicates, the reader will benefit from some of the latest theoretical developments and will become acquainted with a number of challenging real-world applications. Our aim in producing this book has been to provide an up-to-date treatment of the field of self-organizing neural networks, which will be accessible to researchers, practitioners and graduated students from diverse disciplines in academics and industry. We are very grateful to the father of the SOMs, Professor Teuvo Kohonen for supporting this book and contributing the first chapter.

Radial Basis Function Networks 2 - 2001

Neural Information Processing - Long Cheng 2018-12-03

The seven-volume set of LNCS 11301-11307, constitutes the proceedings of the 25th International Conference on Neural Information Processing, ICONIP 2018, held in Siem Reap, Cambodia, in December 2018. The 401 full papers presented were carefully reviewed and selected from 575 submissions. The papers address the emerging topics of theoretical research, empirical studies, and applications of neural information processing techniques across different domains. The second volume, LNCS 11302, is organized in topical sections on other neural network models, stability analysis, optimization, and supervised learning.

Learning from Data - Yaser S. Abu-Mostafa 2012-01-01

Radial Basis Function Networks 1 - Robert J. Howlett 2001-03-27

The Radial Basis Function (RBF) neural network has gained in popularity over recent years because of its rapid training and its desirable properties in classification and functional approximation applications. RBF network research has focused on enhanced training algorithms and variations on the basic architecture to improve the performance of the network. In addition, the RBF network is proving to be a valuable tool in a diverse range of application areas, for example, robotics, biomedical engineering, and the financial sector. The two volumes provide a comprehensive survey of the latest developments in this area. Volume 1 covers advances in training algorithms, variations on the architecture and function of the basis neurons, and hybrid paradigms, for example RBF learning using genetic algorithms. Both volumes will prove extremely useful to practitioners in the field, engineers, researchers and technically accomplished managers.

Computational Science - ICCS 2020 - Valeria V. Krzhizhanovskaya 2020-06-19

The seven-volume set LNCS 12137, 12138, 12139, 12140, 12141, 12142, and 12143 constitutes the proceedings of the 20th International Conference on Computational Science, ICCS 2020, held in Amsterdam, The Netherlands, in June 2020.* The total of 101 papers and 248 workshop papers presented in this book set were carefully reviewed and selected from 719 submissions (230 submissions to the main track and 489 submissions to the workshops). The papers were organized in topical sections named: Part I: ICCS Main Track Part II: ICCS Main Track Part III: Advances in High-Performance Computational Earth Sciences: Applications and Frameworks; Agent-Based Simulations, Adaptive Algorithms and Solvers; Applications of Computational Methods in Artificial Intelligence and Machine Learning; Biomedical and Bioinformatics Challenges for Computer Science Part IV: Classifier Learning from Difficult Data; Complex Social Systems through the Lens of Computational Science; Computational Health; Computational Methods for Emerging Problems in (Dis-)Information Analysis Part V: Computational Optimization, Modelling and Simulation; Computational Science in IoT and Smart Systems; Computer Graphics, Image Processing and Artificial Intelligence Part VI: Data Driven Computational Sciences; Machine Learning and Data Assimilation for Dynamical Systems; Meshfree Methods in Computational Sciences; Multiscale Modelling and Simulation; Quantum Computing Workshop Part VII: Simulations of Flow and Transport: Modeling, Algorithms and Computation; Smart Systems: Bringing Together Computer Vision, Sensor Networks and Machine Learning; Software Engineering for Computational Science; Solving Problems with Uncertainties; Teaching Computational Science; UNCertainty QUantification for Computational models *The conference was canceled due to the COVID-19 pandemic.

Handbook of Neural Computation - Pijush Samui 2017-07-18

Handbook of Neural Computation explores neural computation applications, ranging from conventional fields of mechanical and civil engineering, to electronics, electrical engineering and computer science. This book covers the numerous applications of artificial and deep neural networks and their uses in learning machines, including image and speech recognition, natural language processing and risk analysis. Edited by renowned authorities in this field, this work is comprised of articles from reputable industry and academic scholars and experts from around the world. Each contributor presents a specific research issue with its recent and future trends. As the demand rises in the engineering and medical industries for neural networks and other machine learning methods to solve different types of operations, such as data prediction, classification of images, analysis of big data, and intelligent decision-making, this book provides readers with the latest, cutting-edge research in one comprehensive text. Features high-quality research articles on multivariate

adaptive regression splines, the minimax probability machine, and more Discusses machine learning techniques, including classification, clustering, regression, web mining, information retrieval and natural language processing Covers supervised, unsupervised, reinforced, ensemble, and nature-inspired learning methods

Radial Basis Functions - Martin D. Buhmann 2003-07-03

In many areas of mathematics, science and engineering, from computer graphics to inverse methods to signal processing, it is necessary to estimate parameters, usually multidimensional, by approximation and interpolation. Radial basis functions are a powerful tool which work well in very general circumstances and so are becoming of widespread use as the limitations of other methods, such as least squares, polynomial interpolation or wavelet-based, become apparent. The author's aim is to give a thorough treatment from both the theoretical and practical implementation viewpoints. For example, he emphasises the many positive features of radial basis functions such as the unique solvability of the interpolation problem, the computation of interpolants, their smoothness and convergence and provides a careful classification of the radial basis functions into types that have different convergence. A comprehensive bibliography rounds off what will prove a very valuable work.

Numerical Methods for the Solution of Ill-Posed Problems - A.N. Tikhonov 2013-03-09

Many problems in science, technology and engineering are posed in the form of operator equations of the first kind, with the operator and RHS approximately known. But such problems often turn out to be ill-posed, having no solution, or a non-unique solution, and/or an unstable solution. Non-existence and non-uniqueness can usually be overcome by settling for 'generalised' solutions, leading to the need to develop regularising algorithms. The theory of ill-posed problems has advanced greatly since A. N. Tikhonov laid its foundations, the Russian original of this book (1990) rapidly becoming a classical monograph on the topic. The present edition has been completely updated to consider linear ill-posed problems with or without a priori constraints (non-negativity, monotonicity, convexity, etc.). Besides the theoretical material, the book also contains a FORTRAN program library. Audience: Postgraduate students of physics, mathematics, chemistry, economics, engineering. Engineers and scientists interested in data processing and the theory of ill-posed problems.

Artificial Neural Networks in Hydrology - R.S. Govindaraju 2013-03-09

R. S. GOVINDARAJU and ARAMACHANDRA RAO School of Civil Engineering Purdue University West Lafayette, IN. , USA Background and Motivation The basic notion of artificial neural networks (ANNs), as we understand them today, was perhaps first formalized by McCulloch and Pitts (1943) in their model of an artificial neuron. Research in this field remained somewhat dormant in the early years, perhaps because of the limited capabilities of this method and because there was no clear indication of its potential uses. However, interest in this area picked up momentum in a dramatic fashion with the works of Hopfield (1982) and Rumelhart et al. (1986). Not only did these studies place artificial neural networks on a firmer mathematical footing, but also opened the door to a host of potential applications for this computational tool. Consequently, neural network computing has progressed rapidly along all fronts: theoretical development of different learning algorithms, computing capabilities, and applications to diverse areas from neurophysiology to the stock market. Initial studies on artificial neural networks were prompted by a desire to have computers mimic human learning. As a result, the jargon associated with the technical literature on this subject is replete with expressions such as excitation and inhibition of neurons, strength of synaptic connections, learning rates, training, and network experience. ANNs have also been referred to as neurocomputers by people who want to preserve this analogy.

Adaptive and Natural Computing Algorithms - Bartłomiej Beliczynski 2007-07-03

The two volume set LNCS 4431 and LNCS 4432 constitutes the refereed proceedings of the 8th International Conference on Adaptive and Natural Computing Algorithms, ICANNGA 2007, held in Warsaw, Poland, in April 2007. The 178 revised full papers presented were carefully reviewed and selected from a total of 474 submissions.

Least-squares Approximation - Open University. Linear Mathematics Course Team 1972

A Primer on Radial Basis Functions with Applications to the Geosciences - Bengt Fornberg 2015-09-30

Adapted from a series of lectures given by the authors, this monograph focuses on radial basis functions (RBFs), a powerful numerical methodology for solving PDEs to high accuracy in any number of dimensions. This method applies to problems across a wide range of PDEs arising in fluid mechanics, wave motions, astro- and geosciences, mathematical biology, and other areas and has lately been shown to compete successfully against the very best previous approaches on some large benchmark problems. Using examples and heuristic explanations to create a practical and intuitive perspective, the authors address how, when, and why RBF-based methods work. The authors trace the algorithmic evolution of RBFs, starting with brief introductions to finite difference (FD) and pseudospectral (PS) methods and following a logical progression to global RBFs and then to RBF-generated FD (RBF-FD) methods. The RBF-FD method, conceived in 2000, has proven to be a leading candidate for numerical simulations in an increasingly wide range of applications, including seismic exploration for oil and gas, weather and climate modeling, and electromagnetics, among others. This is the first survey in book format of the RBF-FD methodology and is suitable as the text for a one-semester first-year graduate class.

An Introduction to Neural Network Methods for Differential Equations - Neha Yadav 2015-02-26

This book introduces a variety of neural network methods for solving differential equations arising in science and engineering. The emphasis is placed on a deep understanding of the neural network techniques, which has been presented in a mostly heuristic and intuitive manner. This approach will enable the reader to understand the working, efficiency and shortcomings of each neural network technique for solving differential equations. The objective of this book is to provide the reader with a sound understanding of the foundations of neural networks and a comprehensive introduction to neural network methods for solving differential equations together with recent developments in the techniques and their applications. The book comprises four major sections. Section I consists of a brief overview of differential equations and the relevant physical problems arising in science and engineering. Section II illustrates the history of neural networks starting from their beginnings in the 1940s through to the renewed interest of the 1980s. A general introduction to neural networks and learning technologies is presented in Section III. This section also includes the description of the multilayer perceptron and its learning methods. In Section IV, the different neural network methods for solving differential equations are introduced, including discussion of the most recent developments in the field. Advanced students and researchers in mathematics, computer science and various disciplines in science and engineering will find this book a valuable reference source.

Introduction to Environmental Data Science - William W. Hsieh 2022-12-31

Statistical and machine learning methods have many applications in the environmental sciences, including prediction and data analysis in meteorology, hydrology and oceanography, pattern recognition for satellite images from remote sensing, management of agriculture and forests, assessment of climate change, and much more. With rapid advances in machine learning in the last decade, this book provides an urgently needed, comprehensive guide to machine learning and statistics for students and researchers interested in environmental data science. It includes intuitive explanations covering the relevant background mathematics, with examples drawn from the environmental sciences. A broad range of topics are covered, including correlation, regression, classification, clustering, neural networks, random forests, boosting, kernel methods, evolutionary algorithms, and deep learning, as well as the recent merging of machine learning and physics. End-of-chapter exercises allow readers to develop their problem-solving skills and online data sets allow readers to practise analysis of real data.

Progress on Meshless Methods - A. J. M. Ferreira 2008-11-23

In recent years meshless/meshfree methods have gained considerable attention in engineering and applied mathematics. The variety of problems that are now being addressed by these techniques continues to expand and the quality of the results obtained demonstrates the effectiveness of many of the methods currently available. The book presents a significant sample of the state of the art in the field with methods that have reached a certain level of maturity while also addressing many open issues. The book collects extended original contributions presented at the Second ECCOMAS Conference on Meshless Methods held in 2007 in Porto. The list of contributors reveals a fortunate mix of highly distinguished authors as well as quite young but very active and promising researchers, thus giving the reader an interesting and updated view of different meshless approximation methods and their range of applications. The material presented is

appropriate for researchers, engineers, physicists, applied mathematicians and graduate students interested in this active research area.

Computer Vision - ECCV 2020 - Andrea Vedaldi 2020-11-12

The 30-volume set, comprising the LNCS books 12346 until 12375, constitutes the refereed proceedings of the 16th European Conference on Computer Vision, ECCV 2020, which was planned to be held in Glasgow, UK, during August 23-28, 2020. The conference was held virtually due to the COVID-19 pandemic. The 1360 revised papers presented in these proceedings were carefully reviewed and selected from a total of 5025 submissions. The papers deal with topics such as computer vision; machine learning; deep neural networks; reinforcement learning; object recognition; image classification; image processing; object detection; semantic segmentation; human pose estimation; 3d reconstruction; stereo vision; computational photography; neural networks; image coding; image reconstruction; object recognition; motion estimation.

Recent Advances in Radial Basis Function Collocation Methods - Wen Chen 2013-11-09

This book surveys the latest advances in radial basis function (RBF) meshless collocation methods which emphasize on recent novel kernel RBFs and new numerical schemes for solving partial differential equations. The RBF collocation methods are inherently free of integration and mesh, and avoid tedious mesh generation involved in standard finite element and boundary element methods. This book focuses primarily on the numerical algorithms, engineering applications, and highlights a large class of novel boundary-type RBF meshless collocation methods. These methods have shown a clear edge over the traditional numerical techniques especially for problems involving infinite domain, moving boundary, thin-walled structures, and inverse problems. Due to the rapid development in RBF meshless collocation methods, there is a need to summarize all these new materials so that they are available to scientists, engineers, and graduate students who are interested to apply these newly developed methods for solving real world's problems. This book is intended to meet this need. Prof. Wen Chen and Dr. Zhuo-Jia Fu work at Hohai University. Prof. C.S. Chen works at the University of Southern Mississippi.

Fractal Analysis - Fernando Brambila 2017-06-14

Fractal analysis has entered a new era. The applications to different areas of knowledge have been surprising. Let us begin with the fractional calculus-fractal geometry relationship, which allows for modeling with extreme precision of phenomena such as diffusion in porous media with fractional partial differential equations in fractal objects. Where the order of the equation is the same as the fractal dimension, this allows us to make calculations with enormous precision in diffusion phenomena-particularly in the oil industry, for new spillage prevention. Main applications to industry, design of fractal antennas to receive all frequencies and that is used in all cell phones, spacecraft, radars, image processing, measure, porosity, turbulence, scattering theory. Benoit Mandelbrot, creator of fractal geometry, would have been surprised by the use of fractal analysis presented in this book: "Part I: Petroleum Industry and Numerical Analysis"; "Part II: Fractal Antennas, Spacecraft, Radars, Image Processing, and Measure"; and "Part III: Scattering Theory, Porosity, and Turbulence." It's impossible to picture today's research without fractal analysis.

Computer Recognition Systems 4 - Robert Burduk 2011-04-21

The computer recognition systems are nowadays one of the most promising directions in artificial intelligence. This book is the most comprehensive study of this field. It contains a collection of 78 carefully selected articles contributed by experts of pattern recognition. It reports on current research with respect to both methodology and applications. In particular, it includes the following sections: Biometrics, Features, learning and classifiers, Image processing and computer vision, Knowledge acquisition based on reasoning methods Medical applications, Miscellaneous applications, This book is a great reference tool for scientists who deal with the problems of designing computer pattern recognition systems. Its target readers can be as well researchers as students of computer science, artificial intelligence or robotics.

From Statistics to Neural Networks - Vladimir Cherkassky 2012-12-06

The NATO Advanced Study Institute From Statistics to Neural Networks, Theory and Pattern Recognition Applications took place in Les Arcs, Bourg Saint Maurice, France, from June 21 through July 2, 1993. The meeting brought together over 100 participants (including 19 invited lecturers) from 20 countries. The invited lecturers whose contributions appear in this volume are: L. Almeida (INESC, Portugal), G. Carpenter (Boston, USA), V. Cherkassky (Minnesota, USA), F. Fogelman Soulie (LRI, France), W. Freeman (Berkeley,

USA), J. Friedman (Stanford, USA), F. Girosi (MIT, USA and IRST, Italy), S. Grossberg (Boston, USA), T. Hastie (AT&T, USA), J. Kittler (Surrey, UK), R. Lippmann (MIT Lincoln Lab, USA), J. Moody (OGI, USA), G. Palm (U1m, Germany), B. Ripley (Oxford, UK), R. Tibshirani (Toronto, Canada), H. Wechsler (GMU, USA), C. Wellekens (Eurecom, France) and H. White (San Diego, USA). The ASI consisted of lectures overviewing major aspects of statistical and neural network learning, their links to biological learning and non-linear dynamics (chaos), and real-life examples of pattern recognition applications. As a result of lively interactions between the participants, the following topics emerged as major themes of the meeting: (1) Unified framework for the study of Predictive Learning in Statistics and Artificial Neural Networks (ANNs); (2) Differences and similarities between statistical and ANN methods for non parametric estimation from examples (learning); (3) Fundamental connections between artificial learning systems and biological learning systems.

Meshfree Approximation Methods with Matlab - Gregory E Fasshauer 2007-04-17

Meshfree approximation methods are a relatively new area of research, and there are only a few books covering it at present. Whereas other works focus almost entirely on theoretical aspects or applications in the engineering field, this book provides the salient theoretical results needed for a basic understanding of meshfree approximation methods. The emphasis here is on a hands-on approach that includes MATLAB routines for all basic operations. Meshfree approximation methods, such as radial basis function and moving least squares method, are discussed from a scattered data approximation and partial differential equations point of view. A good balance is supplied between the necessary theory and implementation in terms of many MATLAB programs, with examples and applications to illustrate key points. Used as class notes for graduate courses at Northwestern University, Illinois Institute of Technology, and Vanderbilt University, this book will appeal to both mathematics and engineering graduate students.

Advanced Computing, Networking and Informatics- Volume 1 - Malay Kumar Kundu 2014-05-26

Advanced Computing, Networking and Informatics are three distinct and mutually exclusive disciplines of knowledge with no apparent sharing/overlap among them. However, their convergence is observed in many real world applications, including cyber-security, internet banking, healthcare, sensor networks, cognitive radio, pervasive computing amidst many others. This two-volume proceedings explore the combined use of Advanced Computing and Informatics in the next generation wireless networks and security, signal and image processing, ontology and human-computer interfaces (HCI). The two volumes together include 148 scholarly papers, which have been accepted for presentation from over 640 submissions in the second International Conference on Advanced Computing, Networking and Informatics, 2014, held in Kolkata, India during June 24-26, 2014. The first volume includes innovative computing techniques and relevant research results in informatics with selective applications in pattern recognition, signal/image processing and HCI. The second volume on the other hand demonstrates the possible scope of the computing techniques and informatics in wireless communications, networking and security.

Algorithms for Approximation - J. C. Mason 1987

The term "approximation" here refers to the approximation of functions and data by simple functions. Emphasizing the development of useful algorithms and practical applications in defense and industry, the papers cover topics such as multivariate interpolation, optimization methods, constrained problems, spline fitting, data modelling, and applications in microwave measurement, isotropic antennas, sound measurement, and digitized contours. Includes a substantial catalog of existing algorithms. No index. Annotation copyrighted by Book News, Inc., Portland, OR

Fast Radial Basis Functions for Engineering Applications - Marco Evangelos Biancolini 2018-03-29

This book presents the first "How To" guide to the use of radial basis functions (RBF). It provides a clear vision of their potential, an overview of ready-for-use computational tools and precise guidelines to implement new engineering applications of RBF. Radial basis functions (RBF) are a mathematical tool mature enough for useful engineering applications. Their mathematical foundation is well established and the tool has proven to be effective in many fields, as the mathematical framework can be adapted in several ways. A candidate application can be faced considering the features of RBF: multidimensional space (including 2D and 3D), numerous radial functions available, global and compact support, interpolation/regression. This great flexibility makes RBF attractive - and their great potential has only been partially discovered. This is because of the difficulty in taking a first step toward RBF as they are not commonly part of engineers'

cultural background, but also due to the numerical complexity of RBF problems that scales up very quickly with the number of RBF centers. Fast RBF algorithms are available to alleviate this and high-performance computing (HPC) can provide further aid. Nevertheless, a consolidated tradition in using RBF in engineering applications is still missing and the beginner can be confused by the literature, which in many cases is presented with language and symbolisms familiar to mathematicians but which can be cryptic for engineers. The book is divided in two main sections. The first covers the foundations of RBF, the tools available for their quick implementation and guidelines for facing new challenges; the second part is a collection of practical RBF applications in engineering, covering several topics, including response surface interpolation in n-dimensional spaces, mapping of magnetic loads, mapping of pressure loads, up-scaling of flow fields, stress/strain analysis by experimental displacement fields, implicit surfaces, mesh to cad deformation, mesh morphing for crack propagation in 3D, ice and snow accretion using computational fluid dynamics (CFD) data, shape optimization for external aerodynamics, and use of adjoint data for surface sculpting. For each application, the complete path is clearly and consistently exposed using the systematic approach defined in the first section.

Radial Basis Function Methods For Large-Scale Wave Propagation - Jun-Pu Li 2021-12-24

This book details the development of techniques and ideas from the radial basis function. It begins with a mathematical description of the basic concept of radial function method with chapters progressively delving into the derivation and construction of radial basis functions for large-scale wave propagation problems including singularity problems, high-frequency wave problems and large-scale computation problems. This reference, written by experts in numerical analysis, demonstrates how the functions arise naturally in mathematical analyses of structures responding to external loads. Readers are also equipped with mathematical knowledge about the radial basis function for understanding key algorithms required for practical solutions. Key features: - Introduces basic concepts of radial basis function methods - Provides detailed derivations of several radial basis functions - Explains complex problems using simple language - Contains a wide range of numerical examples to demonstrate applications of relevant functions - Combines the radial basis function with other known numerical methods (boundary element methods and differential equations). - Includes references and appropriate chapter appendices - Includes MATLAB codes for origin intensity factors and nearly singular factors for radial basis calculations The book is designed to make information about radial basis function methods more accessible to research scientists, professional engineers and postgraduate students, with a specific focus on large-scale wave propagation problems.

EEG Brain Signal Classification for Epileptic Seizure Disorder Detection - Sandeep Kumar Satapathy 2019-02-10

EEG Brain Signal Classification for Epileptic Seizure Disorder Detection provides the knowledge necessary to classify EEG brain signals to detect epileptic seizures using machine learning techniques. Chapters present an overview of machine learning techniques and the tools available, discuss previous studies, present empirical studies on the performance of the NN and SVM classifiers, discuss RBF neural networks trained with an improved PSO algorithm for epilepsy identification, and cover ABC algorithm optimized RBFNN for classification of EEG signal. Final chapter present future developments in the field. This book is a valuable source for bioinformaticians, medical doctors and other members of the biomedical field who need the most recent and promising automated techniques for EEG classification. Explores machine learning techniques that have been modified and validated for the purpose of EEG signal classification using Discrete Wavelet Transform for the identification of epileptic seizures Encompasses machine learning techniques, providing an easily understood resource for both non-specialized readers and biomedical researchers Provides a number of experimental analyses, with their results discussed and appropriately validated

Neural Information Processing - Derong Liu 2017-11-07

The six volume set LNCS 10634, LNCS 10635, LNCS 10636, LNCS 10637, LNCS 10638, and LNCS 10639 constitutes the proceedings of the 24rd International Conference on Neural Information Processing, ICONIP 2017, held in Guangzhou, China, in November 2017. The 563 full papers presented were carefully reviewed and selected from 856 submissions. The 6 volumes are organized in topical sections on Machine Learning, Reinforcement Learning, Big Data Analysis, Deep Learning, Brain-Computer Interface, Computational Finance, Computer Vision, Neurodynamics, Sensory Perception and Decision Making, Computational

Intelligence, Neural Data Analysis, Biomedical Engineering, Emotion and Bayesian Networks, Data Mining, Time-Series Analysis, Social Networks, Bioinformatics, Information Security and Social Cognition, Robotics and Control, Pattern Recognition, Neuromorphic Hardware and Speech Processing.

Neural Networks and Deep Learning - Charu C. Aggarwal 2018-08-25

This book covers both classical and modern models in deep learning. The primary focus is on the theory and algorithms of deep learning. The theory and algorithms of neural networks are particularly important for understanding important concepts, so that one can understand the important design concepts of neural architectures in different applications. Why do neural networks work? When do they work better than off-the-shelf machine-learning models? When is depth useful? Why is training neural networks so hard? What are the pitfalls? The book is also rich in discussing different applications in order to give the practitioner a flavor of how neural architectures are designed for different types of problems. Applications associated with many different areas like recommender systems, machine translation, image captioning, image classification, reinforcement-learning based gaming, and text analytics are covered. The chapters of this book span three categories: The basics of neural networks: Many traditional machine learning models can be understood as special cases of neural networks. An emphasis is placed in the first two chapters on understanding the relationship between traditional machine learning and neural networks. Support vector machines, linear/logistic regression, singular value decomposition, matrix factorization, and recommender systems are shown to be special cases of neural networks. These methods are studied together with recent feature engineering methods like word2vec. Fundamentals of neural networks: A detailed discussion of training and regularization is provided in Chapters 3 and 4. Chapters 5 and 6 present radial-basis function (RBF) networks and restricted Boltzmann machines. Advanced topics in neural networks: Chapters 7 and 8 discuss recurrent neural networks and convolutional neural networks. Several advanced topics like deep reinforcement learning, neural Turing machines, Kohonen self-organizing maps, and generative adversarial networks are introduced in Chapters 9 and 10. The book is written for graduate students, researchers, and practitioners. Numerous exercises are available along with a solution manual to aid in classroom teaching. Where possible, an application-centric view is highlighted in order to provide an understanding of the practical uses of each class of techniques.

Advances in Computational Mathematics - Zhongying Chen 1998-09-10

This volume presents the refereed proceedings of the Guangzhou International Symposium on Computational Mathematics, held at the Zhongshan University, People's Republic of China. Nearly 90 international mathematicians examine numerical optimization methods, wavelet analysis, computational approximation, numerical solutions of differential and integral equations, numerical linear algebra, inverse and ill-posed problems, geometric modelling, and signal and image processing and their applications.

Developments in Applied Artificial Intelligence - International conference on industrial and engineering applications of artificial intelligence and expert systems (15th : 2002 : Cairns, Qld.) 2002-06-03

This book constitutes the refereed proceedings of the 15th International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, IEA/AIE 2002, held in Cairns, Australia, in June 2002. The 79 revised full papers presented were carefully reviewed and selected from more than 150 submissions. The papers are organized in topical sections on neural computation, image and speech processing, evolutionary and genetic algorithms, autonomous agents, Internet applications, expert systems, AI applications, knowledge processing, model-based reasoning, and adaptive systems.

Kernel Methods in Computational Biology - Bernhard Schölkopf 2004

A detailed overview of current research in kernel methods and their application to computational biology.

Foundations of Computational Intelligence Volume 5 - Ajith Abraham 2009-06-30

Foundations of Computational Intelligence Volume 5: Function Approximation and Classification

Approximation theory is that area of analysis which is concerned with the ability to approximate functions by simpler and more easily calculated functions. It is an area which, like many other fields of analysis, has its primary roots in the mathematics. The need for function approximation and classification arises in many branches of applied mathematics, computer science and data mining in particular. This edited volume comprises of 14 chapters, including several overview Chapters, which provides an up-to-date and state-of-the-art research covering the theory and algorithms of function approximation and classification. Besides

research articles and expository papers on theory and algorithms of function approximation and classification, papers on numerical experiments and real world applications were also encouraged. The Volume is divided into 2 parts: Part-I: Function Approximation and Classification – Theoretical Foundations Part-II: Function Approximation and Classification – Success Stories and Real World Applications Part I on Function Approximation and Classification – Theoretical Foundations contains six chapters that describe several approaches Feature Selection, the use Decomposition of Correlation Integral, Some Issues on Extensions of Information and Dynamic Information System and a Probabilistic Approach to the Evaluation and Combination of Preferences Chapter 1 “Feature Selection for Partial Least Square Based Dimension Reduction” by Li and Zeng investigate a systematic feature reduction framework by combing dimension reduction with feature selection. To evaluate the proposed framework authors used four typical data sets.

Neural Networks and Statistical Learning - Ke-Lin Du 2013-12-09

Providing a broad but in-depth introduction to neural network and machine learning in a statistical framework, this book provides a single, comprehensive resource for study and further research. All the major popular neural network models and statistical learning approaches are covered with examples and exercises in every chapter to develop a practical working understanding of the content. Each of the twenty-five chapters includes state-of-the-art descriptions and important research results on the respective topics. The broad coverage includes the multilayer perceptron, the Hopfield network, associative memory models, clustering models and algorithms, the radial basis function network, recurrent neural networks, principal component analysis, nonnegative matrix factorization, independent component analysis, discriminant analysis, support vector machines, kernel methods, reinforcement learning, probabilistic and Bayesian networks, data fusion and ensemble learning, fuzzy sets and logic, neurofuzzy models, hardware implementations, and some machine learning topics. Applications to biometric/bioinformatics and data mining are also included. Focusing on the prominent accomplishments and their practical aspects, academic and technical staff, graduate students and researchers will find that this provides a solid foundation and encompassing reference for the fields of neural networks, pattern recognition, signal processing, machine learning, computational intelligence, and data mining.

Radial Basis Function (RBF) Neural Network Control for Mechanical Systems - Jinkun Liu 2013-01-26

Radial Basis Function (RBF) Neural Network Control for Mechanical Systems is motivated by the need for systematic design approaches to stable adaptive control system design using neural network approximation-based techniques. The main objectives of the book are to introduce the concrete design methods and MATLAB simulation of stable adaptive RBF neural control strategies. In this book, a broad range of implementable neural network control design methods for mechanical systems are presented, such as robot manipulators, inverted pendulums, single link flexible joint robots, motors, etc. Advanced neural network controller design methods and their stability analysis are explored. The book provides readers with the fundamentals of neural network control system design. This book is intended for the researchers in the fields of neural adaptive control, mechanical systems, Matlab simulation, engineering design, robotics and automation. Jinkun Liu is a professor at Beijing University of Aeronautics and Astronautics.

Swarm Intelligence for Multi-objective Problems in Data Mining - Carlos Coello Coello 2009-09-28

The purpose of this book is to collect contributions that are at the intersection of multi-objective optimization, swarm intelligence (specifically, particle swarm optimization and ant colony optimization) and data mining.

Computational Science and Its Applications - ICCSA 2019 - Sanjay Misra 2019-06-28

The six volumes LNCS 11619-11624 constitute the refereed proceedings of the 19th International Conference on Computational Science and Its Applications, ICCSA 2019, held in Saint Petersburg, Russia, in July 2019.

The 64 full papers, 10 short papers and 259 workshop papers presented were carefully reviewed and selected from numerous submissions. The 64 full papers are organized in the following five general tracks: computational methods, algorithms and scientific applications; high performance computing and networks; geometric modeling, graphics and visualization; advanced and emerging applications; and information systems and technologies. The 259 workshop papers were presented at 33 workshops in various areas of computational sciences, ranging from computational science technologies to specific areas of computational sciences, such as software engineering, security, artificial intelligence and blockchain technologies.

Radial Basis Function Networks 2 - Robert J. Howlett 2001-03-27

The Radial Basis Function (RBF) neural network has gained in popularity over recent years because of its rapid training and its desirable properties in classification and functional approximation applications. RBF network research has focused on enhanced training algorithms and variations on the basic architecture to improve the performance of the network. In addition, the RBF network is proving to be a valuable tool in a diverse range of application areas, for example, robotics, biomedical engineering, and the financial sector. The two volumes provide a comprehensive survey of the latest developments in this area. Volume 2 contains a wide range of applications in the laboratory and case studies describing current industrial use. Both volumes will prove extremely useful to practitioners in the field, engineers, reserachers, students and technically accomplished managers.

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