

Sparsity and its Applications

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Sparsity And Its Applications:

Sparsity and Its Applications David J. Evans, 1985-01-10 Good No Highlights No Markup all pages are intact Slight Shelfwear may have the corners slightly dented may have slight color changes slightly damaged spine *Sparsity* A. Brameller, Ronald Norman Allan, Y. M. Hamam, 1976 Sparse Coding And Its Applications In Computer Vision Zhaowen Wang, Jianchao Yang, Haichao Zhang, Zhangyang Wang, Thomas S Huang, Ding Liu, Yingzhen Yang, 2015-10-28 This book provides a broader introduction to the theories and applications of sparse coding techniques in computer vision research It introduces sparse coding in the context of representation learning illustrates the fundamental concepts and summarizes the most active research directions A variety of applications of sparse coding are discussed ranging from low level image processing tasks such as super resolution and de blurring to high level semantic understanding tasks such as image recognition clustering and fusion The book is suitable to be used as an introductory overview to this field with its theoretical part being both easy and precious enough for quick understanding It is also of great value to experienced researchers as it offers new perspective to the underlying mechanism of sparse coding and points out potential future directions for different applications Sparsity Measures and their Signal Processing Applications for Machine Condition Monitoring Dong Wang, Bingchang Hou, 2025-02-01 Sparsity Measures and their Signal Processing Applications for Machine Condition Monitoring presents newly designed sparsity measures and their advanced signal processing technologies for machine condition monitoring and fault diagnosis This book systematically covers new sparsity measures including a quasiarithmetic mean ratio framework for fault signatures quantification a generalized Gini index as well as classic sparsity measures based on signal processing technologies and a cycle embedded sparsity measure based on new impulsive mode decomposition technology This book additionally includes a sparsity measure data driven framework based optimized weights spectrum theory and its relevant advanced signal processing technologies Provides the background roadmaps and detailed discussion of newly designed sparsity measures and their advanced signal processing technologies for machine condition monitoring and fault diagnosis Covers new theories advanced technologies and the latest contributions in the field of machine condition monitoring and fault diagnosis Particularly focuses on newly advanced sparsity measures for fault signature quantification classic and advanced sparsity measures based signal processing technologies and sparsity measures using data driven framework based signal processing technologies Provides experimental and real world practical validation cases including newly advanced sparsity measures and their advanced signal processing technologies **Nonlinear Principal Component Analysis and Its Applications** Yuichi Mori, Masahiro Kuroda, Naomichi Makino, 2016-12-09 This book expounds the principle and related applications of nonlinear principal component analysis PCA which is useful method to analyze mixed measurement levels data In the part dealing with the principle after a brief introduction of ordinary PCA a PCA for categorical data nominal and ordinal is introduced as nonlinear PCA in which an optimal scaling technique is used to quantify

the categorical variables The alternating least squares ALS is the main algorithm in the method Multiple correspondence analysis MCA a special case of nonlinear PCA is also introduced All formulations in these methods are integrated in the same manner as matrix operations Because any measurement levels data can be treated consistently as numerical data and ALS is a very powerful tool for estimations the methods can be utilized in a variety of fields such as biometrics econometrics psychometrics and sociology In the applications part of the book four applications are introduced variable selection for mixed measurement levels data sparse MCA joint dimension reduction and clustering methods for categorical data and acceleration of ALS computation The variable selection methods in PCA that originally were developed for numerical data can be applied to any types of measurement levels by using nonlinear PCA Sparseness and joint dimension reduction and clustering for nonlinear data the results of recent studies are extensions obtained by the same matrix operations in nonlinear PCA Finally an acceleration algorithm is proposed to reduce the problem of computational cost in the ALS iteration in nonlinear multivariate methods This book thus presents the usefulness of nonlinear PCA which can be applied to different measurement levels data in diverse fields As well it covers the latest topics including the extension of the traditional statistical method newly proposed nonlinear methods and computational efficiency in the methods **Mathematical**

Analysis and its Applications P. N. Agrawal, R. N. Mohapatra, Uday Singh, H. M. Srivastava, 2015-08-22 This book discusses recent developments in and the latest research on mathematics statistics and their applications All contributing authors are eminent academics scientists researchers and scholars in their respective fields hailing from around the world The book presents roughly 60 unpublished high quality and peer reviewed research papers that cover a broad range of areas including approximation theory harmonic analysis operator theory fixed point theory functional differential equations dynamical and control systems complex analysis special functions function spaces summability theory Fourier and wavelet analysis and numerical analysis all of which are topics of great interest to the research community while further papers highlight important applications of mathematical analysis in science engineering and related areas This conference aims at bringing together experts and young researchers in mathematics from all over the world to discuss the latest advances in mathematical analysis and at promoting the exchange of ideas in various applications of mathematics in engineering physics and biology This conference encourages international collaboration and provides young researchers an opportunity to learn about the current state of the research in their respective fields Computational Methods for General Sparse Matrices

Zahari Zlatev, 2013-04-17 **Compressed Sensing and Its Applications** Holger Boche, Giuseppe Caire, Robert Calderbank, Gitta Kutyniok, Rudolf Mathar, Philipp Petersen, 2019-08-13 The chapters in this volume highlight the state of the art of compressed sensing and are based on talks given at the third international MATHEON conference on the same topic held from December 4 8 2017 at the Technical University in Berlin In addition to methods in compressed sensing chapters provide insights into cutting edge applications of deep learning in data science highlighting the overlapping ideas and

methods that connect the fields of compressed sensing and deep learning Specific topics covered include Quantized compressed sensing Classification Machine learning Oracle inequalities Non convex optimization Image reconstruction Statistical learning theory This volume will be a valuable resource for graduate students and researchers in the areas of mathematics computer science and engineering as well as other applied scientists exploring potential applications of compressed sensing Graph Theory and Sparse Matrix Computation Alan George, John R. Gilbert, Joseph W.H.

Liu, 2012-12-06 When reality is modeled by computation matrices are often the connection between the continuous physical world and the finite algorithmic one Usually the more detailed the model the bigger the matrix the better the answer however efficiency demands that every possible advantage be exploited The articles in this volume are based on recent research on sparse matrix computations This volume looks at graph theory as it connects to linear algebra parallel computing data structures geometry and both numerical and discrete algorithms The articles are grouped into three general categories graph models of symmetric matrices and factorizations graph models of algorithms on nonsymmetric matrices and parallel sparse matrix algorithms This book will be a resource for the researcher or advanced student of either graphs or sparse matrices it will be useful to mathematicians numerical analysts and theoretical computer scientists alike **Sparse**

Representation, Modeling and Learning in Visual Recognition Hong Cheng, 2015-05-25 This unique text reference presents a comprehensive review of the state of the art in sparse representations modeling and learning The book examines both the theoretical foundations and details of algorithm implementation highlighting the practical application of compressed sensing research in visual recognition and computer vision Topics and features describes sparse recovery approaches robust and efficient sparse representation and large scale visual recognition covers feature representation and learning sparsity induced similarity and sparse representation and learning based classifiers discusses low rank matrix approximation graphical models in compressed sensing collaborative representation based classification and high dimensional nonlinear learning includes appendices outlining additional computer programming resources and explaining the essential mathematics required to understand the book **Practical Applications of Sparse Modeling** Irina Rish, Guillermo A.

Cecchi, Aurelie Lozano, Alexandru Niculescu-Mizil, 2014-09-12 Sparse modeling is a rapidly developing area at the intersection of statistical learning and signal processing motivated by the age old statistical problem of selecting a small number of predictive variables in high dimensional data sets This collection describes key approaches in sparse modeling focusing on its applications in such fields as neuroscience computational biology and computer vision Sparse modeling methods can improve the interpretability of predictive models and aid efficient recovery of high dimensional unobserved signals from a limited number of measurements Yet despite significant advances in the field a number of open issues remain when sparse modeling meets real life applications The book discusses a range of practical applications and state of the art approaches for tackling the challenges presented by these applications Topics considered include the choice of method in genomics applications

analysis of protein mass spectrometry data the stability of sparse models in brain imaging applications sequential testing approaches algorithmic aspects of sparse recovery and learning sparse latent models Jacket Sparse Matrices Tewarson,1973-05-11 *Sparse Matrices* *Active Lighting and Its Application for Computer Vision* Katsushi Ikeuchi,Yasuyuki Matsushita,Ryusuke Sagawa,Hiroshi Kawasaki,Yasuhiro Mukaigawa,Ryo Furukawa,Daisuke Miyazaki,2020-09-07 This book describes active illumination techniques in computer vision We can classify computer vision techniques into two classes passive and active techniques Passive techniques observe the scene statically and analyse it as is Active techniques give the scene some actions and try to facilitate the analysis In particular active illumination techniques project specific light for which the characteristics are known beforehand to a target scene to enable stable and accurate analysis of the scene Traditional passive techniques have a fundamental limitation The external world surrounding us is three dimensional the image projected on a retina or an imaging device is two dimensional That is reduction of one dimension has occurred Active illumination techniques compensate for the dimensional reduction by actively controlling the illumination The demand for reliable vision sensors is rapidly increasing in many application areas such as robotics and medical image analysis This book explains this new endeavour to explore the augmentation of reduced dimensions in computer vision This book consists of three parts basic concepts techniques and applications The first part explains the basic concepts for understanding active illumination techniques In particular the basic concepts of optics are explained so that researchers and engineers outside the field can understand the later chapters The second part explains currently available active illumination techniques covering many techniques developed by the authors The final part shows how such active illumination techniques can be applied to various domains describing the issue to be overcome by active illumination techniques and the advantages of using these techniques This book is primarily aimed at 4th year undergraduate and 1st year graduate students and will also help engineers from fields beyond computer vision to use active illumination techniques Additionally the book is suitable as course material for technical seminars **The Sparse Fourier Transform** Haitham Hassanieh,2018-02-27 The Fourier transform is one of the most fundamental tools for computing the frequency representation of signals It plays a central role in signal processing communications audio and video compression medical imaging genomics astronomy as well as many other areas Because of its widespread use fast algorithms for computing the Fourier transform can benefit a large number of applications The fastest algorithm for computing the Fourier transform is the Fast Fourier Transform FFT which runs in near linear time making it an indispensable tool for many applications However today the runtime of the FFT algorithm is no longer fast enough especially for big data problems where each dataset can be few terabytes Hence faster algorithms that run in sublinear time i e do not even sample all the data points have become necessary This book addresses the above problem by developing the Sparse Fourier Transform algorithms and building practical systems that use these algorithms to solve key problems in six different applications wireless networks mobile systems computer graphics medical imaging biochemistry

and digital circuits This is a revised version of the thesis that won the 2016 ACM Doctoral Dissertation Award *Sparse Modeling* Irina Rish, Genady Grabarnik, 2014-12-01 Sparse models are particularly useful in scientific applications such as biomarker discovery in genetic or neuroimaging data where the interpretability of a predictive model is essential Sparsity can also dramatically improve the cost efficiency of signal processing *Sparse Modeling Theory Algorithms and Applications* provides an introduction to Direct Methods for Sparse Matrices Iain S. Duff, A. M. Erisman, John Ker Reid, 2017 The subject of sparse matrices has its root in such diverse fields as management science power systems analysis surveying circuit theory and structural analysis Efficient use of sparsity is a key to solving large problems in many fields This book provides both insight and answers for those attempting to solve these problems Sparse Solutions of Underdetermined Linear Systems and Their Applications Ming-Jun Lai, Yang Wang, 2021-06-25 This textbook presents a special solution to underdetermined linear systems where the number of nonzero entries in the solution is very small compared to the total number of entries This is called a sparse solution Since underdetermined linear systems can be very different the authors explain how to compute a sparse solution using many approaches *Sparse Solutions of Underdetermined Linear Systems and Their Applications* contains 64 algorithms for finding sparse solutions of underdetermined linear systems and their applications for matrix completion graph clustering and phase retrieval and provides a detailed explanation of these algorithms including derivations and convergence analysis Exercises for each chapter help readers understand the material This textbook is appropriate for graduate students in math and applied math computer science statistics data science and engineering Advisors and postdoctoral scholars will also find the book interesting and useful **Computational Electromagnetics and Its Applications** Thomas G. Campbell, Roy A. Nicolaides, Manuel D. Salas, 2012-12-06 This volume contains the proceedings of the first ICASE LaRC Work shop on Computational Electromagnetics and Its Applications conducted by the Institute for Computer Applications in Science and Engineering and NASA Langley Research Center We had several goals in mind when we decided jointly with the Electromagnetics Research Branch to organize this workshop on Computational Electromagnetics CEM Among our goals were a desire to obtain an overview of the current state of CEM covering both algorithms and applications and their effect on NASA's activities in this area In addition we wanted to provide an attractive setting for computational scientists with expertise in other fields especially computational fluid dynamics CFD to observe the algorithms and tools of CEM at work Our expectation was that scientists from both fields would discover mutually beneficial inter connections and relationships Another goal was to learn of progress in solution algorithms for electromagnetic optimization and design problems such problems make extensive use of field solvers and computational efficiency is at a premium To achieve these goals we assembled the renowned group of speakers from academia and industry whose talks are contained in this volume The papers are printed in the same order in which the talks were presented at the meeting The first paper is an overview of work currently being performed in the Electromagnetic Research Branch at the Langley Research

Center *Advances of New Technologies in Seismic Exploration* Shaoping Lu, Sanyi Yuan, Lingyun Qiu, Xiang Li, Tie Zhong, Xintong Dong, Peng Guo, 2025-10-01 In the past few decades the geophysics community has proposed a large number of new technologies for seismic exploration to meet the needs of high resolution subsurface imaging These new technologies have made great contributions to advances in seismic exploration and structural geology For instance the appearance of distributed optical fiber acoustic sensing DAS makes it possible to acquire seismic data with high spatial resolution at low cost Advances have been made in full waveform inversion FWI and it is now considered the most robust approach for the reconstruction of subsurface velocity models Multiples which were originally regarded as a common noise are now applied to seismic imaging and accordingly provide extra illumination and least square migration LSM greatly improves illumination and resolution of seismic imaging Deep learning especially the convolutional neural network CNN has shown remarkable performance in seismic noise attenuation interpolation velocity model reconstruction arrival time picking and interpretation Although these new technologies have solved certain real world geophysical issues they still have the following limitations Firstly fiber system noise reduces the quality of seismic data received by DAS restricting its further applications Secondly slow convergence rate and huge computational cost are main bottlenecks faced by iterative seismic inversion approaches such as LSM and FWI Moreover the cycle skipping problem is still a challenging issue in FWI Thirdly the weak generalization of trained models needs to be addressed before deep learning can be implemented widely to solve real world problems Forthly the solution of the anisotropic elastic wave equation needs to be improved for its applications in practice

Computational Science and Its Applications - ICCSA 2004 Antonio Laganà, Marina L. Gavrilova, Vipin Kumar, Youngsong Mun, C.J. Kenneth Tan, Osvaldo Gervasi, 2004-04-29 The natural mission of Computational Science is to tackle all sorts of human problems and to work out intelligent automata aimed at alleviating the burden of working out suitable tools for solving complex problems For this reason Computational Science though originating from the need to solve the most challenging problems in science and engineering computational science is the key player in the fight to gain fundamental advances in astronomy biology chemistry environmental science physics and several other scientific and engineering disciplines is increasingly turning its attention to all fields of human activity In all activities in fact intensive computation information handling knowledge synthesis the use of ad hoc devices etc increasingly need to be exploited and coordinated regardless of the location of both the users and the various and heterogeneous computing platforms As a result the key to understanding the explosive growth of this discipline lies in two adjectives that more and more appropriately refer to Computational Science and its applications interoperable and ubiquitous Numerous examples of ubiquitous and interoperable tools and applications are given in the present four LNCS volumes containing the contributions delivered at the 2004 International Conference on Computational Science and its Applications ICCSA 2004 held in Assisi Italy May 14-17 2004

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