Communications and Control Engineering

Ivan Markovsky

Low Rank Approximation

Algorithms, Implementation, Applications

Springer

Low Rank Approximation Algorithms Implementation Applications Communications And Control Engineering

Lingjun Ying

Low Rank Approximation Algorithms Implementation Applications Communications And Control Engineering:

Low-Rank Approximation Ivan Markovsky,2018-08-03 This book is a comprehensive exposition of the theory algorithms and applications of structured low rank approximation Local optimization methods and effective suboptimal convex relaxations for Toeplitz Hankel and Sylvester structured problems are presented A major part of the text is devoted to application of the theory with a range of applications from systems and control theory to psychometrics being described Special knowledge of the application fields is not required The second edition of Low Rank Approximation is a thoroughly edited and extensively rewritten revision It contains new chapters and sections that introduce the topics of variable projection for structured low rank approximation missing data estimation data driven filtering and control stochastic model representation and identification identification of polynomial time invariant systems and blind identification with deterministic input model The book is complemented by a software implementation of the methods presented which makes the theory directly applicable in practice In particular all numerical examples in the book are included in demonstration files and can be reproduced by the reader This gives hands on experience with the theory and methods detailed In addition exercises and MATLAB Octave examples will assist the reader quickly to assimilate the theory on a chapter by chapter basis Each chapter is completed with a new section of exercises to which complete solutions are provided Low Rank Approximation second edition is a broad survey of the Low Rank Approximation theory and applications of its field which will be of direct interest to researchers in system identification control and systems theory numerical linear algebra and optimization The supplementary problems and solutions render it suitable for use in teaching graduate courses in those subjects as well

Low Rank Approximation Ivan Markovsky,2011-11-19 Data Approximation by Low complexity Models details the theory algorithms and applications of structured low rank approximation Efficient local optimization methods and effective suboptimal convex relaxations for Toeplitz Hankel and Sylvester structured problems are presented Much of the text is devoted to describing the applications of the theory including system and control theory signal processing computer algebra for approximate factorization and common divisor computation computer vision for image deblurring and segmentation machine learning for information retrieval and clustering bioinformatics for microarray data analysis chemometrics for multivariate calibration and psychometrics for factor analysis Software implementation of the methods is given making the theory directly applicable in practice All numerical examples are included in demonstration files giving hands on experience and exercises and MATLAB examples assist in the assimilation of the theory **Low-Rank and Sparse Modeling for Visual Analysis** Yun Fu,2014-10-30 This book provides a view of low rank and sparse computing especially approximation recovery representation scaling coding embedding and learning among unconstrained visual data The book includes chapters covering multiple emerging topics in this new field It links multiple popular research fields in Human Centered Computing Social Media Image Classification Pattern Recognition Computer Vision Big Data and Human Computer Interaction Contains

an overview of the low rank and sparse modeling techniques for visual analysis by examining both theoretical analysis and real world applications Computer Algebra in Scientific Computing François Boulier,Matthew England,Timur M. Sadykov,Evgenii V. Vorozhtsov,2021-08-16 This book constitutes the proceedings of the 23rd International Workshop on Computer Algebra in Scientific Computing CASC 2021 held in Sochi Russia in September 2021 The 24 full papers presented together with 1 invited talk were carefully reviewed and selected from 40 submissions The papers cover theoretical computer algebra and its applications in scientific computing *Regularization, Optimization, Kernels, and Support Vector Machines* Johan A.K. Suykens,Marco Signoretto,Andreas Argyriou,2014-10-23 Regularization Optimization Kernels and Support Vector Machines offers a snapshot of the current state of the art of large scale machine learning providing a single multidisciplinary source for the latest research and advances in regularization sparsity compressed sensing convex and large scale optimization kernel methods and support vecto **Brain-Inspired Intelligence and Visual Perception** Wenfeng Wang,Xiangyang Deng,Liang Ding,Limin Zhang,2019-02-14 This book presents the latest findings in the field of brain inspired intelligence and visual perception BIVP and discusses novel research assumptions including an introduction to brain science and the brain vision hypotheses Moreover it introduces readers to the theory and algorithms of BIVP such as pheromone accumulation and iteration neural cognitive computing mechanisms the integration and scheduling of core modules and brain inspired perception motion and control in a step by step manner Accordingly it will appeal to university researchers R to anyone interested in robots brain cognition or computer vision and to all those wishing to learn about the core theory principles methods algorithms and applications of BIVP **Fractal and Multifractal Facets in the Structure and Dynamics of Physiological Systems and Applications to Homeostatic Control, Disease Diagnosis and Integrated Cyber-Physical Platforms** Paul Bogdan,Plamen Ch. Ivanov,Andras Eke,2020-06-25 Widespread chronic diseases e g heart diseases diabetes and its complications stroke cancer brain diseases constitute a significant cause of rising healthcare costs and pose a significant burden on quality of life for many individuals Despite the increased need for smart healthcare sensing systems that monitor measure patients body balance there is no coherent theory that facilitates the modeling of human physiological processes and the design and optimization of future healthcare cyber physical systems HCPS The HCPS are expected to mine the patient s physiological state based on available continuous sensing quantify risk indices corresponding to the onset of abnormality signal the need for critical medical intervention in real time by communicating patient s medical information via a network from individual to hospital and most importantly control actuate vital health signals e g cardiac pacing insulin level blood pressure within personalized homeostasis To prevent health complications maintain good health and or avoid fatal conditions calls for a cross disciplinary approach to HCPS design where recent statistical physics inspired discoveries done by collaborations between physicists and physicians are shared and enriched by applied mathematicians control theorists and bioengineers This critical and urgent multi disciplinary approach

has to unify the current state of knowledge and address the following fundamental challenges One fundamental challenge is represented by the need to mine and understand the complexity of the structure and dynamics of the physiological systems in healthy homeostasis and associated with a disease such as diabetes Along the same lines we need rigorous mathematical techniques for identifying the interactions between integrated physiologic systems and understanding their role within the overall networking architecture of healthy dynamics Another fundamental challenge calls for a deeper understanding of stochastic feedback and variability in biological systems and physiological processes in particular and for deciphering their implications not only on how to mathematically characterize homeostasis but also on defining new control strategies that are accounting for intra and inter patient specificity a truly mathematical approach to personalized medicine Numerous recent studies have demonstrated that heart rate variability blood glucose neural signals and other interdependent physiological processes demonstrate fractal and non stationary characteristics Exploiting statistical physics concepts numerous recent research studies demonstrated that healthy human physiological processes exhibit complex critical phenomena with deep implications for how homeostasis should be defined and how control strategies should be developed when prolonged abnormal deviations are observed In addition several efforts have tried to connect these fractal characteristics with new optimal control strategies that implemented in medical devices such as pacemakers and artificial pancreas could improve the efficiency of medical therapies and the quality of life of patients but neglecting the overall networking architecture of human physiology Consequently rigorously analyzing the complexity and dynamics of physiological processes e g blood glucose and its associated implications and interdependencies with other physiological processes represents a fundamental step towards providing a quantifiable mathematical definition of homeostasis in the context of critical phenomena understanding the onset of chronic diseases predicting deviations from healthy homeostasis and developing new more efficient medical therapies that carefully account for the physiological complexity intra and inter patient variability rather than ignoring it This Research Topic aims to open a synergetic and timely effort between physicians physicists applied mathematicians signal processing bioengineering and biomedical experts to organize the state of knowledge in mining the complexity of physiological systems and their implications for constructing more accurate mathematical models and designing QoL aware control strategies implemented in the new generation of HCPS devices By bringing together multi disciplinary researchers seeking to understand the many aspects of human physiology and its complexity we aim at enabling a paradigm shift in designing future medical devices that translates mathematical characteristics in predictable mathematical models quantifying not only the degree of homeostasis but also providing fundamentally new control strategies within the personalized medicine era

Dissertation Abstracts International ,2006 **The Engineering Index Annual** ,1992 Since its creation in 1884 Engineering Index has covered virtually every major engineering innovation from around the world It serves as the historical record of virtually every major engineering innovation of the 20th century Recent content is a vital resource for current

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