The Real Positive Definite Completion Problem: Cycle Completability (Memoirs of the American Mathematical Society)

Barrett, Wayne W.

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Real Positive Definite Completion Problem Cycle Completability

Naomi Shaked-monderer,Abraham Berman

Real Positive Definite Completion Problem Cycle Completability:

The Real Positive Definite Completion Problem: Cycle Completability Wayne Walton Barrett,Charles R. Johnson,Raphael Loewy,1996 Given a partial symmetric matrix the positive definite completion problem asks if the unspecified entries in the matrix can be chosen so as to make the resulting matrix positive definite Applications include probability and statistics image enhancement systems engineering geophysics and mathematical programming The positive definite completion problem can also be viewed as a mechanism for addressing a fundamental problem in Euclidean geometry which potential geometric configurations of vectors i e configurations with angles between some vectors specified are realizable in a Euclidean space The positions of the specified entries in a partial matrix are naturally described by a graph The question of existence of a positive definite completion was previously solved completely for the restrictive class of chordal graphs and this work solves the problem for the class of cycle completable graphs a significant generalization of chordal graphs These are graphs for which knowledge of completability for induced cycles and cliques implies completability of partial symmetric matrices with the given graph **The Real Positive Definite Completion Problem** Wayne Walton Barrett,1996 Topics in Semidefinite and Interior-Point Methods Panos M. Pardalos,Henry Wolkowicz,1998 This volume presents refereed papers presented at the workshop Semidefinite Programming and Interior Point Approaches for Combinatorial Problems held at The Fields Institute in May 1996 Semidefinite programming SDP is a generalization of linear programming LP in that the non negativity constraints on the variables is replaced by a positive semidefinite constraint on matrix variables Many of the elegant theoretical properties and powerful solution techniques follow through from LP to SDP In particular the primal dual interior point methods which are currently so successful for LP can be used to efficiently solve SDP problems In addition to the theoretical and algorithmic questions SDP has found many important applications in combinatorial optimization control theory and other areas of mathematical programming The papers in this volume cover a wide spectrum of recent developments in SDP The volume would be suitable as a textbook for advanced courses in optimization It is intended for graduate students and researchers in mathematics computer science engineering and operations **Handbook of Graphical Models** Marloes Maathuis,Mathias Drton,Steffen Lauritzen,Martin Wainwright,2018-11-12 A graphical model is a statistical model that is represented by a graph The factorization properties underlying graphical models facilitate tractable computation with multivariate distributions making the models a valuable tool with a plethora of applications Furthermore directed graphical models allow intuitive causal interpretations and have become a cornerstone for causal inference While there exist a number of excellent books on graphical models the field has grown so much that individual authors can hardly cover its entire scope Moreover the field is interdisciplinary by nature Through chapters by leading researchers from different areas this handbook provides a broad and accessible overview of the state of the art Key features Contributions by leading researchers from a range of disciplines Structured in five parts

covering foundations computational aspects statistical inference causal inference and applications Balanced coverage of concepts theory methods examples and applications Chapters can be read mostly independently while cross references highlight connections The handbook is targeted at a wide audience including graduate students applied researchers and experts in graphical models <u>Completion Problems on Operator Matrices</u> Dragana S. Cvetković Ilić,2022-06-07 Completion problems for operator matrices are concerned with the question of whether a partially specified operator matrix can be completed to form an operator of a desired type The research devoted to this topic provides an excellent means to investigate the structure of operators This book provides an overview of completion problems dealing with completions to different types of operators and can be considered as a natural extension of classical results concerned with matrix completions The book assumes some basic familiarity with functional analysis and operator theory It will be useful for graduate students and researchers interested in operator theory and the problem of matrix completions *Discrete Geometry and Optimization* Károly Bezdek,Antoine Deza,Yinyu Ye,2013-07-09 Optimization has long been a source of both inspiration and applications for geometers and conversely discrete and convex geometry have provided the foundations for many optimization techniques leading to a rich interplay between these subjects The purpose of the Workshop on Discrete Geometry the Conference on Discrete Geometry and Optimization and the Workshop on Optimization held in September 2011 at the Fields Institute Toronto was to further stimulate the interaction between geometers and optimizers This volume reflects the interplay between these areas The inspiring Fejes T th Lecture Series delivered by Thomas Hales of the University of Pittsburgh exemplified this approach While these fields have recently witnessed a lot of activity and successes many questions remain open For example Fields medalist Stephen Smale stated that the question of the existence of a strongly polynomial time algorithm for linear optimization is one of the most important unsolved problems at the beginning of the 21st century The broad range of topics covered in this volume demonstrates the many recent and fruitful connections between different approaches and features novel results and state of the art surveys as well as open problems **Geometry of Cuts and Metrics** Michel Marie Deza,Monique Laurent,2009-11-12 Cuts and metrics are well known objects that arise independently but with many deep and fascinating connections in diverse fields in graph theory combinatorial optimization geometry of numbers combinatorial matrix theory statistical physics VLSI design etc This book presents a wealth of results from different mathematical disciplines in a unified comprehensive manner and establishes new and old links which cannot be found elsewhere It provides a unique and invaluable source for researchers and graduate students From the Reviews This book is definitely a milestone in the literature of integer programming and combinatorial optimization It draws from the Interdisciplinarity of these fields With knowledge about the relevant terms one can enjoy special subsections without being entirely familiar with the rest of the chapter This makes it not only an interesting research book but even a dictionary The longer one works with it the more beautiful it becomes Optima 56 1997 *Completely Positive Matrices* Abraham

Berman,Naomi Shaked-monderer,2003-04-11 A real matrix is positive semidefinite if it can be decomposed as A BB In some applications the matrix B has to be elementwise nonnegative If such a matrix exists A is called completely positive The smallest number of columns of a nonnegative matrix B such that A BB is known as the cp rank of A This invaluable book focuses on necessary conditions and sufficient conditions for complete positivity as well as bounds for the cp rank The methods are combinatorial geometric and algebraic The required background on nonnegative matrices cones graphs and Schur complements is outlined **Algebraic Statistics** Seth Sullivant,2023-11-17 Algebraic statistics uses tools from algebraic geometry commutative algebra combinatorics and their computational sides to address problems in statistics and its applications The starting point for this connection is the observation that many statistical models are semialgebraic sets The algebra statistics connection is now over twenty years old and this book presents the first broad introductory treatment of the subject Along with background material in probability algebra and statistics this book covers a range of topics in algebraic statistics including algebraic exponential families likelihood inference Fisher s exact test bounds on entries of contingency tables design of experiments identifiability of hidden variable models phylogenetic models and model selection With numerous examples references and over 150 exercises this book is suitable for both classroom use and independent study **Higher Multiplicities and Almost Free Divisors and Complete Intersections** James Damon,1996 Almost free divisors and complete intersections form a general class of nonisolated hypersurface and completer intersection singularities They also include discriminants of mappings bifurcation sets and certain types of arrangements of hyperplanes such as Coxeter arrangements and generic arrangements Associated to the singularities of this class is a singular Milnor fibration which has the same homotopy properties as the Milnor fibration for isolated singularities This memoir deduces topological properties of singularities in a number of situations including complements of hyperplane arrangements various nonisolated complete intersections nonlinear arrangements of hypersurfaces functions on discriminants singularities defined by compositions of functions and bifurcation sets *Asymptotic Completeness, Global Existence and the Infrared Problem for the Maxwell-Dirac Equations* Moshé Flato,Jacques Charles Henri Simon,Erik Taflin,1997 The purpose of this work is to present and give full proofs of new original research results concerning integration of and scattering for the classical Maxwell Dirac equations **The Integral Manifolds of the Three Body Problem** Christopher Keil McCord,Kenneth Ray Meyer,Quidong Wang,1998 The phase space of the spatial three body problem is an open subset in R18 Holding the ten classical integrals of energu center of mass linear and angular momentum fixed defines an eight dimensional manifold For fixed nonzero angular momentum the topology of this manifold depends only on the energy This volume computes the homology of this manifold for all energy values This table of homology shows that for negative energy the integral manifolds undergo seven bifurcations Four of these are the well known bifurcations due to central configurations and three are due to critical points at infinity This disproves Birkhoffs conjecture that the bifurcations occur only at central configurations

Decision Problems for Equational Theories of Relation Algebras H. Andréka,Steven R. Givant,I. Németi,1997 We prove that any variety of relation algebras which contains an algebra with infinitely many elements below the identity or which contains the full group relation algebra on some infinite group or on arbitrarily large finite groups must have an undecidable equational theory Then we construct an embedding of the lattice of all subsets of the natural numbers into the lattice of varieties of relation algebras such that the variety correlated with a set italic capital X of natural numbers has a decidable equational theory if and only if italic capital X is a decidable i e recursive set Finally we construct an example of an infinite finitely generated simple representable relation algebra that has a decidable equational theory Abstract **Completely Positive Hypergroup Actions** Ajit Iqbal Singh,1996 It is now well know that the measure algebra script capital M italic capital G of a locally compact group can be regarded as a subalgebra of the operator algebra italic capital B italic capital B italic capital L2 italic capital G of the operator algebra italic capital B italic capital L2 italic capital G of the Hilbert space italic capital L2 italic capital G We study the situation in hypergroups and find that in general the analogous map for them is neither an isometry nor a homomorphism However it is completely positive and completely bounded in certain ways This work presents the related general theory and special examples **The Structure of k-CS- Transitive Cycle-Free Partial Orders** Richard Warren,1997 The class of cycle free partial orders CFPOs is defined and the CFPOs fulfilling a natural transitivity assumption called k connected set transitivity k CS transitivity are analysed in some detail Classification in many of the interesting cases is given This work generlizes Droste s classification of the countable k transitive trees k 1 In a CFPO the structure can be branch downwards as well as upwards and can do so repeatedly though it neverr returns to the starting point by a cycle Mostly it is assumed that k 2 and that all maximal chains are finite The main classification splits into the sporadic and skeletal cases The former is complete in all cardinalities The latter is performed only in the countable case The classification is considerably more complicated than for trees and skeletal CFPOs exhibit rich elaborate and rather surprising behaviour Generalized Symplectic Geometries and the Index of Families of Elliptic Problems Liviu I. Nicolaescu,1997 In this book an index theorem is proved for arbitrary families of elliptic boundary value problems for Dirac operators and a surgery formula for the index of a family of Dirac operators on a closed manifold Also obtained is a very general result on the cobordism invariance of the index of a family All results are established by first symplectically rephrasing the problems and then using a generalized symplectic reduction technique This provides a unified approach to all possible parameter spaces and all possible symmetries of a Dirac operator eigh symmetries in the real case and two in the complex case This text will also be of interest to those working in geometry and topology **Families of Curves in ${\mathbb P}^3$ and Zeuthen's Problem** Robin Hartshorne,1997 Content Description November 1997 volume 130 number 617 first of 4 numbers On t p P is blackboard bold Includes bibliographical references **Copositive And Completely Positive Matrices** Naomi Shaked-monderer,Abraham Berman,2021-02-09 This book is an updated and

extended version of Completely Positive Matrices Abraham Berman and Naomi Shaked Monderer World Scientific 2003 It contains new sections on the cone of copositive matrices which is the dual of the cone of completely positive matrices and new results on both copositive matrices and completely positive matrices The book is an up to date comprehensive resource for researchers in Matrix Theory and Optimization It can also serve as a textbook for an advanced undergraduate or graduate course **The Fundamental Lemma for the Shalika Subgroup of $GL(4)$** Solomon Friedberg,Hervé Jacquet,1996 The authors establish the fundamental lemma for a relative trace formula The trace formula compares generic automorphic representations of italic capitals GS italic p 4 with automorphic representations of italic capitals GS 4 which are distinguished with respect to a character of the Shalika subgroup the subgroup of matrices of 2 x 2 block form superscript italic g over subscript capital italic X and 0 over superscript italic g The fundamental lemma giving the equality of the orbital integrals of the unit elements of the respective Hecke algebras amounts to a comparison of certain exponential sums arising from these two different groups **Abelian Galois Cohomology of Reductive Groups** Mikhail Borovoi,1998 In this volume a new function H 2 ab K G of abelian Galois cohomology is introduced from the category of connected reductive groups G over a field K of characteristic 0 to the category of abelian groups The abelian Galois cohomology and the abelianization map ab1 H1 K G H 2 ab K G are used to give a functorial almost explicit description of the usual Galois cohomology set H1 K G when K is a number field

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