Modern Graph Theory Graduate Texts In Mathematics

The first book devoted exclusively to quantitative graph theory, Quantitative Graph Theory: Mathematical Foundations and Applications presents and demonstrates existing and novel methods for analyzing graphs quantitatively. Incorporating interdisciplinary knowledge from graph theory, information theory, measurement theory, and statistical technique

This textbook can serve as a comprehensive manual of discrete mathematics and graph theory for non-Computer Science majors; as a reference and study aid for professionals and researchers who have not taken any discrete math course before. It can also be used as a reference book for a course on Discrete Mathematics in Computer Science or Mathematics curricula. The study of discrete mathematics is one of the first courses on curricula in various disciplines such as Computer Science, Mathematics and Engineering education practices. Graphs are key data structures used to represent networks, chemical structures, games etc. and are increasingly used more in various applications such as bioinformatics and the Internet. Graph theory has gone through an unprecedented growth in the last few decades both in terms of theory and implementations; hence it deserves a thorough treatment which is not adequately found in any other contemporary books on discrete mathematics, whereas about 40% of this textbook is devoted to graph theory. The text follows an algorithmic approach for discrete mathematics and graph problems where applicable, to reinforce learning and to show how to implement the concepts in real-world applications.

????:Real and abstract analysis

The 34th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2008) took place in Van Mildert College at Durham University, UK, 30 June – 2 July 2008. The approximately 80 participants came from va- ous countries all over the world, among them Australia, Brazil, Canada, Chile, Czech Republic, France, Greece, Hungary,Israel, Italy, Japan, The Netherlands, Norway, Poland, Spain, Switzerland, UK and the USA. WG 2008 continued the series of 33 previous WG conferences. Since 1975, the WG conference has taken place 21 times in Germany, four times in The Netherlands, twice in Austria as well as once in Italy, Slovakia, Switzerland, the Czech Republic, France, Norway and now in the UK. The WG conference traditionally aims at uniting theory and practice by demonstrating how graph-theoretic concepts can be applied to various areas in computer science, or by extracting new problems from applications. The goal is to present recent researchresults and to identify and exploredirections of future research. The continuing interest in the WG conferences was re?ected in the number and quality of submissions; 76 papers were submitted and in an evaluation p- cess with four reports per submission, 30 papers were accepted by the Program Committee for the conference. Due to the high number of submissions and the limited schedule of 3 days, various good papers could not be accepted. Therewereexcellent invited talks by Giuseppe Di Battista(UniversitàRoma Tre,Italy)onalgorithmicaspectsof(un)-stableroutingintheInternet,byLeszek G?sieniec (University of Liverpool, UK) on memory-e?cient graph exploration, andbyMartinGrohe(Humboldt-UniversitätzuBerlin,Germany)onalgorithmic meta theorems.

In its second edition, expanded with new chapters on domination in graphs and on the spectral properties of graphs, this book offers a solid background in the basics of graph theory. Introduces such topics as Dirac's theorem on k-connected graphs and more.

An in-depth account of graph theory, written for serious students of mathematics and computer science. It reflects the current state of the subject and emphasises connections with other branches of pure mathematics. Recognising that graph theory is one of several courses competing for the attention of a student, the book contains extensive descriptive passages designed to convey the flavour of the subject and to arouse interest. In addition to a modern treatment of the classical areas of graph theory, the book presents a detailed account of newer topics, including Szemerédis Regularity Lemma and its use, Shelahs extension of the Hales-Jewett Theorem, the precise nature of the phase transition in a random graph process, the connection between electrical networks and random walks on graphs, and the Tutte polynomial and its cousins in knot theory. Moreover, the book contains over 600 well thought-out exercises: although some are straightforward, most are substantial, and some will stretch even the most able reader.

The primary intent of the book is to introduce an array of beautiful problems in a variety of subjects quickly, pithily and completely rigorously to graduate students and advanced undergraduates. The book takes a number of specific problems and solves them, the needed tools developed along the way in the context of the particular problems. It treats a melange of topics from combinatorial probability theory, number theory, random graph theory and combinatorics. The problems in this book involve the asymptotic analysis of a discrete construct, as some natural parameter of the system tends to infinity. Besides bridging discrete mathematics and mathematical analysis, the book makes a modest attempt at bridging disciplines. The problems were selected with an eye toward accessibility to a wide audience, including advanced undergraduate students. The book could be used for a seminar course in which students present the lectures.

This is the first book to comprehensively cover quantum probabilistic approaches to spectral analysis of graphs, an approach developed by the authors. The book functions as a concise introduction to quantum probability from an algebraic aspect. Here readers will learn several powerful methods and techniques of wide applicability, recently developed under the name of quantum probability. The exercises at the end of each chapter help to deepen understanding.

This volume is devoted to Joseph A. (Joe) Ball’s contributions to operator theory and its applications and in celebration of his seventieth birthday. Joe Ball’s career spans over four and a half decades, starting with his work on model theory and related topics for non-contractions and operators on multiply connected domains. Later on, more applied operator theory themes appeared in his work, involving factorization and interpolation for operator-valued functions, with extensive applications in system and control theory. He has worked on nonlinear control, time-varying systems and, more recently, on multidimensional systems and noncommutative H?-theory on the unit ball and polydisk, and more general domains, and these are only the main themes in his vast oeuvre. Fourteen research papers constitute the core of this volume, written by mathematicians who have collaborated with Joe or have been influenced by his vast mathematical work. A curriculum vitae, a publications list and a list of Joe Ball’s PhD students are included in this volume, as well as personal reminiscences by colleagues and friends. Contributions by Yu. M. Arlinskii, S. Hassi, M. Augat, J. W. Helton, I. Klep, S. McCullough, S. Balasubramanian, U. Wijesooriya, N. Cohen, Q. Fang, S. Gorai, J. Sarkar, G. J. Groenewald, S. ter Horst, J. Jaftha, A. C. M. Ran, M.A. Kaashoek, F. van Schagen, A. Kheifets, Z. A. Lykova, N. J. Young, A. E. Ajibo, R. T. W. Martin, A. Ramanantoanina, M.-J. Y. Ou, H. J. Woerdeman, A. van der Schaft, A. Tannenbaum, T. T. Georgiou, J. O. Deasy and L. Norton.

This new edition illustrates the power of linear algebra in the study of graphs. The emphasis on matrix techniques is greater than in other texts on algebraic graph theory. Important matrices associated with graphs (for example, incidence, adjacency and Laplacian matrices) are treated in detail. Presenting a useful overview of selected topics in algebraic graph theory, early chapters of the text focus on regular graphs, algebraic connectivity, the distance matrix of a tree, and its generalized version for arbitrary graphs, known as the resistance matrix. Coverage of later topics include Laplacian eigenvalues of threshold graphs, the positive definite completion problem and matrix games based on a graph. Such an extensive coverage of the subject area provides a welcome prompt for further exploration. The inclusion of exercises enables practical learning throughout the book. In the new edition, a new chapter is added on the line graph of a tree, while some results in Chapter 6 on Perron-Frobenius theory are reorganized. Whilst this book will be invaluable to students and researchers in graph theory and combinatorial matrix theory, it will also benefit readers in the sciences and engineering.

This book constitutes the proceedings of the International Conference on Information Computing and Applications, held in Tangshan, China, in October 2010.

Professional electronic edition available from http://diestel-graph-theory.com/professional.html This standard textbook of modern graph theory, now in its fifth edition, combines the authority of a classic with the engaging freshness of style that is the hallmark of active mathematics. It covers the core material of the subject with concise yet reliably complete proofs, while offering glimpses of more advanced methods in each field by one or two deeper results, again with proofs given in full detail. The book can be used as a reliable text for an introductory course, as a graduate text, and for self-study. New in this 5th edition: Sections on tangles and tree-width, on tree packing and covering, and on topological spaces as inverse limits of finite graphs. Several new proofs of classical theorems. Many new exercises. From the reviews: “This outstanding book cannot be substituted with any other book on the present textbook market. It has every chance of becoming the standard textbook for graph theory.” Acta Scientiarum Mathematicarum "Deep, clear, wonderful. This is a serious book about the heart of graph theory. It has depth and integrity." Persi Diaconis & Ron Graham, SIAM Review “The book has received a very enthusiastic reception, which it amply deserves. A masterly elucidation of modern graph theory.” Bulletin of the Institute of Combinatorics and its Applications “Succeeds dramatically… a hell of a good book.” MAA Reviews “A highlight of the book is what is by far the best account in print of the Seymour-Robertson theory of graph minors.” Mathematika “…like listening to someone explain mathematics.” Bulletin of the AMS

This book constitutes the refereed proceedings of the 5th INNS IAPR TC3 GIRPR International Workshop on Artificial Neural Networks in Pattern Recognition, ANNPR 2012, held in Trento, Italy, in September 2012. The 21 revised full papers presented were carefully reviewed and selected for inclusion in this volume. They cover a large range of topics in the field of neural network- and machine learning-based pattern recognition presenting and discussing the latest research, results, and ideas in these areas.

This volume contains nine survey articles based on the invited lectures given at the 23rd British Combinatorial Conference, held at Exeter in July 2011. This biennial conference is a well-established international event, with speakers from all over the world. By its nature, this volume provides an up-to-date overview of current research activity in several areas of combinatorics, including extremal graph theory, the cyclic sieving phenomenon and transversals in Latin squares. Each article is clearly written and assumes little prior knowledge on the part of the reader. The authors are some of the world's foremost researchers in their fields, and here they summarise existing results and give a unique preview of the most recent developments. The book provides a valuable survey of the present state of knowledge in combinatorics. It will be useful to research workers and advanced graduate students, primarily in mathematics but also in computer science and statistics.

Graphs and matrices enjoy a fascinating and mutually beneficial relationship. This interplay has benefited both graph theory and linear algebra. In one direction, knowledge about one of the graphs that can be associated with a matrix can be used to illuminate matrix properties and to get better information about the matrix. Examples include the use of digraphs to obtain strong results on diagonal dominance and eigenvalue inclusion regions and the use of the Rado-Hall theorem to deduce properties of special classes of matrices. Going the other way, linear algebraic properties of one of the matrices associated with a graph can be used to obtain useful combinatorial information about the graph. The adjacency matrix and the Laplacian matrix are two well-known matrices associated to a graph, and their eigenvalues encode important information about the graph. Another important linear algebraic invariant associated with a graph is the Colin de Verdiere number, which, for instance, characterizes certain topological properties of the graph. This book is not a comprehensive study of graphs and matrices. The particular content of the lectures was chosen for its accessibility, beauty, and current relevance, and for the possibility of enticing the audience to want to learn more.

The primary aim of this book is to present a coherent introduction to graph theory, suitable as a textbook for advanced undergraduate and beginning graduate students in mathematics and computer science. It provides a systematic treatment of the theory of graphs without sacrificing its intuitive and aesthetic appeal. Commonly used proof techniques are described and illustrated. The book also serves as an introduction to research in graph theory.

This book constitutes the thoroughly referred post-workshop proceedings of the 23rd International Workshop on Combinatorial Algorithms, IWOCA 2012, held in Krishnankoil, Tamil Nadu, India, in July 2012. The 32 revised full papers presented were carefully reviewed and selected from a total of 88 submissions. The papers are organized in topical sections in algorithms and data Structures, applications (including Bioinformatics, Networking, etc.), combinatorics of words and strings, combinatorial optimization, combinatorial enumeration, decompositions and combinatorial designs, complexity theory (structural and computational), computational biology and graph theory and combinatorics submissions.

This book presents a unified frequency-domain method for the analysis of distributed control systems. The following important topics are discussed by using the proposed frequency-domain method: (1) Scalable stability criteria of networks of distributed control systems; (2) Effect of heterogeneous delays on the stability of a network of distributed control system; (3) Stability of Internet congestion control algorithms; and (4) Consensus in multi-agent systems. This book is ideal for graduate students in control, networking and robotics, as well as researchers in the fields of control theory and networking who are interested in learning and applying distributed control algorithms or frequency-domain analysis methods.

While typically many approaches have been mainly mathematics focused, graph theory has become a tool used by scientists, researchers, and engineers in using modeling techniques to solve real-world problems. Graph Theory for Operations Research and Management: Applications in Industrial Engineering presents traditional and contemporary applications of graph theory in the areas of industrial engineering, management science, and applied operations research. This comprehensive collection of research introduces the useful basic concepts of graph theory in real world applications.

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Symposium held in Miami, Florida, January 22–24, 2006.This symposium is jointly sponsored by the ACM Special Interest Group on Algorithms and Computation Theory and the SIAM Activity Group on Discrete Mathematics.Contents Preface; Acknowledgments; Session 1A: Confronting Hardness Using a Hybrid Approach, Virginia Vassilevska, Ryan Williams, and Shan Leung Maverick Woo; A New Approach to Proving Upper Bounds for MAX-2-SAT, Arist Kojevnikov and Alexander S. Kulikov, Measure and Conquer: A Simple O(20.288n) Independent Set Algorithm, Fedor V. Fomin, Fabrizio Grandoni, and Dieter Kratsch; A Polynomial Algorithm to Find an Independent Set of Maximum Weight in a Fork-Free Graph, Vadim V. Lozin and Martin Milanic; The Knuth-Yao Quadrangle-Inequality Speedup is a Consequence of Total-Monotonicity, Wolfgang W. Bein, Mordecai J. Golin, Larry L. Larmore, and Yan Zhang; Session 1B: Local Versus Global Properties of Metric Spaces, Sanjeev Arora, László Lovász, Ilan Newman, Yuval Rabani, Yuri Rabinovich, and Santosh Vempala; Directed Metrics and Directed Graph Partitioning Problems, Moses Charikar, Konstantin Makarychev, and Yury Makarychev; Improved Embeddings of Graph Metrics into Random Trees, Kedar Dhamdhere, Anupam Gupta, and Harald Räcke; Small Hop-diameter Sparse Spanners for Doubling Metrics, T-H. Hubert Chan and Anupam Gupta; Metric Cotype, Manor Mendel and Assaf Naor; Session 1C: On Nash Equilibria for a Network Creation Game, Susanne Albers, Stefan Eilts, Eyal Even-Dar, Yishay Mansour, and Liam Roditty; Approximating Unique Games, Anupam Gupta and Kunal Talwar; Computing Sequential Equilibria for Two-Player Games, Peter Bro Miltersen and Troels Bjerre Sørensen; A Deterministic Subexponential Algorithm for Solving Parity Games, Marcin Jurdzinski, Mike Paterson, and Uri Zwick; Finding Nucleolus of Flow Game, Xiaotie Deng, Qizhi Fang, and Xiaoxun Sun, Session 2: Invited Plenary Abstract: Predicting the “Unpredictable”, Rakesh V. Vohra, Northwestern University; Session 3A: A Near-Tight Approximation Lower Bound and Algorithm for the Kidnapped Robot Problem, Sven Koenig, Apurva Mudgal, and Craig Tovey; An Asymptotic Approximation Algorithm for 3D-Strip Packing, Klaus Jansen and Roberto Solis-Oba; Facility Location with Hierarchical Facility Costs, Zoya Svitkina and Éva Tardos; Combination Can Be Hard: Approximability of the Unique Coverage Problem, Erik D. Demaine, Uriel Feige, Mohammad Taghi Hajiaghayi, and Mohammad R. Salavatipour; Computing Steiner Minimum Trees in Hamming Metric, Ernst Althaus and Rouven Naujoks; Session 3B: Robust Shape Fitting via Peeling and Grating Coresets, Pankaj K. Agarwal, Sariel Har-Peled, and Hai Yu; Tightening Non-Simple Paths and Cycles on Surfaces, Éric Colin de Verdière and Jeff Erickson; Anisotropic Surface Meshing, Siu-Wing Cheng, Tamal K. Dey, Edgar A. Ramos, and Rephael Wenger; Simultaneous Diagonal Flips in Plane Triangulations, Prosenjit Bose, Jurek Czyzowicz, Zhicheng Gao, Pat Morin, and David R. Wood; Morphing Orthogonal Planar Graph Drawings, Anna Lubiw, Mark Petrick, and Michael Spriggs; Session 3C: Overhang, Mike Paterson and Uri Zwick; On the Capacity of Information Networks, Micah Adler, Nicholas J. A. Harvey, Kamal Jain, Robert Kleinberg, and April Rasala Lehman; Lower Bounds for Asymmetric Communication Channels and Distributed Source Coding, Micah Adler, Erik D. Demaine, Nicholas J. A. Harvey, and Mihai Patrascu; Self-Improving Algorithms, Nir Ailon, Bernard Chazelle, Seshadhri Comandur, and Ding Liu; Cake Cutting Really is Not a Piece of Cake, Jeff Edmonds and Kirk Pruhs; Session 4A: Testing Triangle-Freeness in General Graphs, Noga Alon, Tali Kaufman, Michael Krivelevich, and Dana Ron; Constraint Solving via Fractional Edge Covers, Martin Grohe and Dániel Marx; Testing Graph Isomorphism, Eldar Fischer and Arie Matsliah; Efficient Construction of Unit Circular-Arc Models, Min Chih Lin and Jayme L. 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Ian Munro; Session 5A: Sampling Binary Contingency Tables with a Greedy Start, Ivona Bezáková, Nayantara Bhatnagar, and Eric Vigoda; Asymmetric Balanced Allocation with Simple Hash Functions, Philipp Woelfel; Balanced Allocation on Graphs, Krishnaram Kenthapadi and Rina Panigrahy; Superiority and Complexity of the Spaced Seeds, Ming Li, Bin Ma, and Louxin Zhang; Solving Random Satisfiable 3CNF Formulas in Expected Polynomial Time, Michael Krivelevich and Dan Vilenchik; Session 5B: Analysis of Incomplete Data and an Intrinsic-Dimension Helly Theorem, Jie Gao, Michael Langberg, and Leonard J. Schulman; Finding Large Sticks and Potatoes in Polygons, Olaf Hall-Holt, Matthew J. Katz, Piyush Kumar, Joseph S. B. Mitchell, and Arik Sityon; Randomized Incremental Construction of Three-Dimensional Convex Hulls and Planar Voronoi Diagrams, and Approximate Range Counting, Haim Kaplan and Micha Sharir; Vertical Ray Shooting and Computing Depth Orders for Fat Objects, Mark de Berg and Chris Gray; On the Number of Plane Graphs, Oswin Aichholzer, Thomas Hackl, Birgit Vogtenhuber, Clemens Huemer, Ferran Hurtado, and Hannes Krasser; Session 5C: All-Pairs Shortest Paths for Unweighted Undirected Graphs in o(mn) Time, Timothy M. Chan; An O(n log n) Algorithm for Maximum st-Flow in a Directed Planar Graph, Glencora Borradaile and Philip Klein; A Simple GAP-

Canceling Algorithm for the Generalized Maximum Flow Problem, Mateo Restrepo and David P. Williamson; Four Point Conditions and Exponential Neighborhoods for Symmetric TSP, Vladimir Deineko, Bettina Klinz, and Gerhard J. Woeginger; Upper Degree-Constrained Partial Orientations, Harold N. Gabow; Session 7A: On the Tandem Duplication-Random Loss Model of Genome Rearrangement, Kamalika Chaudhuri, Kevin Chen, Radu Mihaescu, and Satish Rao; Reducing Tile Complexity for Self-Assembly Through Temperature Programming, Ming-Yang Kao and Robert Schweller; Cache-Oblivious String Dictionaries, Gerth Stølting Brodal and Rolf Fagerberg; Cache-Oblivious Dynamic Programming, Rezaul Alam Chowdhury and Vijaya Ramachandran; A Computational Study of External-Memory BFS Algorithms, Deepak Ajwani, Roman Dementiev, and Ulrich Meyer; Session 7B: Tight Approximation Algorithms for Maximum General Assignment Problems, Lisa Fleischer, Michel X. Goemans, Vahab S. Mirrokni, and Maxim Sviridenko; Approximating the k-Multicut Problem, Daniel Golovin, Viswanath Nagarajan, and Mohit Singh; The Prize-Collecting Generalized Steiner Tree Problem Via A New Approach Of Primal-Dual Schema, Mohammad Taghi Hajiaghayi and Kamal Jain; 8/7-Approximation Algorithm for (1,2)-TSP, Piotr Berman and Marek Karpinski; Improved Lower and Upper Bounds for Universal TSP in Planar Metrics, Mohammad T. Hajiaghayi, Robert Kleinberg, and Tom Leighton; Session 7C: Leontief Economies Encode NonZero Sum Two-Player Games, B. Codenotti, A. Saberi, K. Varadarajan, and Y. Ye; Bottleneck Links, Variable Demand, and the Tragedy of the Commons, Richard Cole, Yevgeniy Dodis, and Tim Roughgarden; The Complexity of Quantitative Concurrent Parity Games, Krishnendu Chatterjee, Luca de Alfaro, and Thomas A. Henzinger; Equilibria for Economies with Production: Constant-Returns Technologies and Production Planning Constraints, Kamal Jain and Kasturi Varadarajan; Session 8A: Approximation Algorithms for Wavelet Transform Coding of Data Streams, Sudipto Guha and Boulos Harb; Simpler Algorithm for Estimating Frequency Moments of Data Streams, Lakshimath Bhuvanagiri, Sumit Ganguly, Deepanjan Kesh, and Chandan Saha; Trading Off Space for Passes in Graph Streaming Problems, Camil Demetrescu, Irene Finocchi, and Andrea Ribichini; Maintaining Significant Stream Statistics over Sliding Windows, L.K. Lee and H.F. Ting; Streaming and Sublinear Approximation of Entropy and Information Distances, Sudipto Guha, Andrew McGregor, and Suresh Venkatasubramanian; Session 8B: FPTAS for Mixed-Integer Polynomial Optimization with a Fixed Number of Variables, J. A. De Loera, R. Hemmecke, M. Köppe, and R. Weismantel; Linear Programming and Unique Sink Orientations, Bernd Gärtner and Ingo Schurr; Generating All Vertices of a Polyhedron is Hard, Leonid Khachiyan, Endre Boros, Konrad Borys, Khaled Elbassioni, and Vladimir Gurvich; A Semidefinite Programming Approach to Tensegrity Theory and Realizability of Graphs, Anthony Man-Cho So and Yinyu Ye; Ordering by Weighted Number of Wins Gives a Good Ranking for Weighted Tournaments, Don Coppersmith, Lisa Fleischer, and Atri Rudra; Session 8C: Weighted Isotonic Regression under L1 Norm, Stanislav Angelov, Boulos Harb, Sampath Kannan, and Li-San Wang; Oblivious String Embeddings and Edit Distance Approximations, Tugkan Batu, Funda Ergun, and Cenk Sahinalp0898716012\\This comprehensive book not only introduces the C and C++ programming languages but also shows how to use them in the numerical solution of partial differential equations (PDEs). It leads the reader through the entire solution process, from the original PDE, through the discretization stage, to the numerical solution of the resulting algebraic system. The well-debugged and tested code segments implement the numerical methods efficiently and transparently. Basic and advanced numerical methods are introduced and implemented easily and efficiently in a unified object-oriented approach.

A graduate-level introduction to finite geometry and its applications to other areas of combinatorics.

This textbook acts as a pathway to higher mathematics by seeking and illuminating the connections between graph theory and diverse fields of mathematics, such as calculus on manifolds, group theory, algebraic curves, Fourier analysis, cryptography and other areas of combinatorics. An overview of graph theory definitions and polynomial invariants for graphs prepares the reader for the subsequent dive into the applications of graph theory. To pique the reader’s interest in areas of possible exploration, recent results in mathematics appear throughout the book, accompanied with examples of related graphs, how they arise, and what their valuable uses are. The consequences of graph theory covered by the authors are complicated and far-reaching, so topics are always exhibited in a user-friendly manner with copious graphs, exercises, and Sage code for the computation of equations. Samples of the book’s source code can be found at github.com/springer-math/adventures-in-graph-theory. The text is geared towards advanced undergraduate and graduate students and is particularly useful for those trying to decide what type of problem to tackle for their dissertation. This book can also serve as a reference for anyone interested in exploring how they can apply graph theory to other parts of mathematics.

This book introduces a variety of statistical tools for characterising and designing the dynamical features of complex quantum systems. These tools are applied in the contexts of energy transfer in photosynthesis, and boson sampling. In dynamical quantum systems, complexity typically manifests itself via the interference of a rapidly growing number of paths that connect the initial and final states. The book presents the language of graphs and networks, providing a useful framework to discuss such scenarios and explore the rich phenomenology of transport phenomena. As the complexity increases, deterministic approaches rapidly become intractable, which leaves statistics as a viable alternative.

Graph algorithms is a well-established subject in mathematics and computer science. Beyond classical application fields, such as approximation, combinatorial optimization, graphics, and operations research, graph algorithms have recently attracted increased attention from computational molecular biology and computational chemistry. Centered around the fundamental issue of graph isomorphism, this text goes beyond classical graph problems of shortest paths, spanning trees, flows in networks, and matchings in bipartite graphs. Advanced algorithmic results and techniques of practical relevance are presented in a coherent and consolidated way. This book introduces graph algorithms on an intuitive basis followed by a detailed exposition in a literate programming style, with correctness proofs as well as worst-case analyses. Furthermore, full C++ implementations of all algorithms presented are given using the LEDA library of efficient data structures and algorithms.

This book constitutes the refereed proceedings of the International Conference on Mathematical Modelling and Scientific Intelligence, ICMMSC 2012, Gandhigram, Tamil Nadu, India, in March 2012. The 62 revised full papers presented were carefully reviewed and selected from 332 submissions. The papers are organized in two topical sections on mathematical modelling and on scientific computation.

Graphs on Surfaces: Dualities, Polynomials, and Knots offers an accessible and comprehensive treatment of recent developments on generalized duals of graphs on surfaces, and their applications. The authors illustrate the interdependency between duality, medial graphs and knots; how this interdependency is reflected in algebraic invariants of graphs and knots; and how it can be exploited to solve problems in graph and knot theory. Taking a constructive approach, the authors emphasize how generalized duals and related ideas arise by localizing classical constructions, such as geometric duals and Tait graphs, and then removing artificial restrictions in these constructions to obtain full extensions of them to embedded graphs. The authors demonstrate the benefits of these generalizations to embedded graphs in chapters describing their applications to graph polynomials and knots. Graphs on Surfaces: Dualities, Polynomials, and Knots also provides a self-contained introduction to graphs on surfaces, generalized duals, topological graph polynomials, and knot polynomials that is accessible both to graph theorists and to knot theorists. Directed at those with some familiarity with basic graph theory and knot theory, this book is appropriate for graduate students and researchers in either area. Because the area is advancing so rapidly, the authors give a comprehensive overview of the topic and include a robust bibliography, aiming to provide the reader with the necessary foundations to stay abreast of the field. The reader will come away from the text convinced of advantages of considering these higher genus analogues of constructions of plane and abstract graphs, and with a good understanding of how they arise.

Data mining provides a set of new techniques to integrate, synthesize, and analyze tdata, uncovering the hidden patterns that exist within. Traditionally, techniques such as kernel learning methods, pattern recognition, and data mining, have been the domain of researchers in areas such as artificial intelligence, but leveraging these tools, techniques, and concepts against your data asset to identify problems early, understand interactions that exist and highlight previously unrealized relationships through the combination of these different disciplines can provide significant value for the investigator and her organization.

This book is a concise - yet most carefully written - introduction to modern graph theory, covering all its major recent developments. It can be used both as a reliable textbook for an introductory course and as a graduate text: on each topic it covers all the basic material in full detail, and adds one or two deeper results (again with detailed proofs) to illustrate the more advanced methods of that field.

The papers in this volume represent the proceedings of the Conference entitled OC Ischia Group Theory 2010OCO, which took place at NH Ischia Thermal SPA Resort, Ischia, Naples, Italy, from April 14 to April 17, 2010. The articles in this volume are contributions by speakers and participants of the Conference. The volume contains a collection of research articles by leading experts in group theory and some accessible surveys of recent research in the area. Together they provide an overview of the diversity of themes and applications that interest group theorists today. Topics covered in this volume include: finite p-groups, character and representation theory, combinatorial group theory, varieties of groups, profinite and pro-p-groups, linear groups, graphs connected with groups, subgroup structure, finiteness conditions, radical rings, conjugacy classes, automorphisms."

Additive combinatorics is a relatively recent term coined to comprehend the developments of the more classical additive number theory, mainly focussed on problems related to the addition of integers. Some classical problems like the Waring problem on the sum of k-th powers or the Goldbach conjecture are genuine examples of the original questions addressed in the area. One of the features of contemporary additive combinatorics is the interplay of a great variety of mathematical techniques, including combinatorics, harmonic analysis, convex geometry, graph theory, probability theory, algebraic geometry or ergodic theory. This book gathers the contributions of many of the leading researchers in the area and is divided into three parts. The two first parts correspond to the material of the main courses delivered, Additive combinatorics and non-unique factorizations, by Alfred Geroldinger, and Sumsets and structure, by Imre Z. Ruzsa. The third part collects the notes of most of the seminars which accompanied the main courses, and which cover a reasonably large part of the methods, techniques and problems of contemporary additive combinatorics.

Advanced Graph Theory focuses on some of the main notions arising in graph theory with an emphasis from the very start of the book on the possible applications of the theory and the fruitful links existing with linear algebra. The second part of the book covers basic material related to linear recurrence relations with application to counting and the asymptotic estimate of the rate of growth of a sequence satisfying a recurrence relation.

This standard textbook of modern graph theory, now in its fifth edition, combines the authority of a classic with the engaging freshness of style that is the hallmark of active mathematics. It covers the core material of the subject with concise yet reliably complete proofs, while offering glimpses of more advanced methods in each field by one or two deeper results, again with proofs given in full detail. The book can be used as a reliable text for an introductory course, as a graduate text, and for self-study. From the reviews: “This outstanding book cannot be substituted with any other book on the present textbook market. It has every chance of becoming the standard textbook for graph theory.” Acta Scientiarum Mathematiciarum “Deep, clear, wonderful. This is a serious book about the heart of graph theory. It has depth and integrity.” Persi Diaconis & Ron Graham, SIAM Review “The book has received a very enthusiastic reception, which it amply deserves. A masterly elucidation of modern graph theory.” Bulletin of the Institute of Combinatorics and its Applications “Succeeds dramatically ... a hell of a good book.” MAA Reviews “A highlight of the book is what is by far the best account in print of the Seymour-Robertson theory of graph minors.” Mathematika “ ... like listening to someone explain mathematics." Bulletin of the AMS

This reference serves as a reader-friendly guide to every basic tool and skill required in the mathematical library and helps mathematicians find resources in any format in the mathematics literature. It lists a wide range of standard texts, journals, review articles, newsgroups, and Internet and database tools for every major subfield in mathematics and details methods of access to primary literature sources of new research, applications, results, and techniques. Using the Mathematics Literature is the most comprehensive and up-to-date resource on mathematics literature in both print and electronic formats, presenting time-saving strategies for retrieval of the latest information.

The Handbook of Graph Theory is the most comprehensive single-source guide to graph theory ever published. Best-selling authors Jonathan Gross and Jay Yellen assembled an outstanding team of experts to contribute overviews of more than 50 of the most significant topics in graph theory-including those related to algorithmic and optimization approach

This book provides a detailed description of network science concepts applied to power systems and electricity markets, offering an appropriate blend of theoretical background and practical applications for operation and power system planning. It discusses an approach to understanding power systems from a network science perspective using the direct recognition of the interconnectivity provided by the transmission system. Further, it explores the network properties in detail and characterizes them as a tool for online and offline applications for power system operation. The book includes an in-depth explanation of electricity markets problems that can be addressed from a graph theory perspective. It is intended for advanced undergraduate and graduate students in the fields of electric energy systems, operations research, management science and economics. Practitioners in the electric energy sector also benefit from the concepts and techniques presented here.

This book is primarily aimed at graduate students and researchers in graph theory, combinatorics, or discrete mathematics in general. However, all the necessary graph theory is developed from scratch, so the only pre-requisite for reading it is a first course in linear algebra and a small amount of elementary group theory. It should be accessible to motivated upper-level undergraduates.

This second volume, edited and authored by world leading experts, gives a review of the principles, methods and techniques of important and emerging research topics and technologies in communications and radar engineering. With this reference source you will: Quickly grasp a new area of research Understand the underlying principles of a topic and its application Ascertain how a topic relates to other areas and learn of the research issues yet to be resolved Quick tutorial reviews of important and emerging topics of research in array and statistical signal processing Presents core principles and shows their application Reference content on core principles, technologies, algorithms and applications Comprehensive references to journal articles and other literature on which to build further, more specific and detailed knowledge Edited by leading people in the field who, through their reputation, have been able to commission experts to write on a particular topic

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