

Graph Theory Modeling Applications And Algorithms

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Digraphs - Jorgen Bang-Jensen 2013-06-29

The study of directed graphs (digraphs) has developed enormously over recent decades, yet the results are rather scattered across the journal literature. This is the first book to present a unified and comprehensive survey of the subject. In addition to covering the theoretical aspects, the authors discuss a large number of applications and their generalizations to topics such as the traveling salesman problem, project scheduling, genetics, network connectivity, and sparse matrices. Numerous exercises are included. For all graduate students, researchers and professionals interested in graph theory and its applications, this book will be essential reading.

Graph Theory with Algorithms and its Applications - Santanu Saha Ray 2012-11-02

The book has many important features which make it suitable for both undergraduate and postgraduate students in various branches of engineering and general and applied sciences. The important topics interrelating Mathematics & Computer Science are also covered briefly. The book is useful to readers with a wide range of backgrounds including Mathematics, Computer Science/Computer Applications and Operational Research. While dealing with theorems and algorithms, emphasis is laid on constructions which consist of formal proofs, examples with applications. Uptill, there is scarcity of books in the open literature which cover all the things including most importantly various algorithms and applications with examples.

Recent Applications in Graph Theory - Harun Pirim 2022-05-18

Graph theory, being a rigorously investigated field of combinatorial mathematics, is adopted by a wide variety of disciplines addressing a plethora of real-world applications. Advances in graph algorithms and software implementations have made graph theory accessible to a larger community of interest. Ever-increasing interest in machine learning and model deployments for network data demands a coherent selection of topics rewarding a fresh, up-to-date summary of the theory and fruitful applications to probe further. This volume is a small yet unique contribution to graph theory applications and modeling with graphs. The subjects discussed include information hiding using graphs, dynamic graph-based systems to model and control cyber-physical systems, graph reconstruction, average distance neighborhood graphs, and pure and mixed-integer linear programming formulations to cluster networks.

A Guide to Graph Colouring - R.M.R. Lewis 2015-10-26

This book treats graph colouring as an algorithmic problem, with a strong emphasis on practical applications. The author describes and analyses some of the best-known algorithms for colouring arbitrary graphs, focusing on whether these heuristics can provide optimal solutions in some cases; how they perform on graphs where the chromatic number is unknown; and whether they can produce better solutions than other algorithms for certain types of graphs, and why. The introductory chapters explain graph colouring, and bounds and constructive algorithms. The author then shows how advanced, modern techniques can be applied to classic real-world operational research problems such as seating plans, sports scheduling, and university timetabling. He includes many examples, suggestions for further reading, and historical notes, and the book is supplemented by a website with an online suite of downloadable code. The book will be of value to researchers, graduate students, and practitioners in the areas of operations research, theoretical computer science, optimization, and computational intelligence. The reader should have elementary knowledge of sets, matrices, and enumerative combinatorics.

Algorithms Unlocked - Thomas H. Cormen 2013-03-01

For anyone who has ever wondered how computers solve problems, an engagingly written guide for nonexperts to the basics of computer algorithms. Have you ever wondered how your GPS can find the fastest way to your destination, selecting one route from seemingly countless possibilities in mere seconds? How your credit card account number is protected when you make a purchase over the Internet? The answer is algorithms. And how do these mathematical formulations translate themselves into your GPS, your laptop, or your smart phone? This book offers an engagingly written guide to the basics of computer algorithms. In *Algorithms Unlocked*, Thomas Cormen—coauthor of the leading college textbook on the subject—provides a general explanation, with limited mathematics, of how algorithms enable computers to solve problems. Readers will learn what computer algorithms are, how to describe them, and how to evaluate them. They will discover simple ways to search for information in a computer; methods for rearranging information in a computer into a prescribed order (“sorting”); how to solve basic problems that can be modeled in a computer with a mathematical structure called a “graph” (useful for modeling road networks, dependencies among tasks, and financial relationships); how to solve problems that ask questions about strings of characters such as DNA structures; the basic principles behind cryptography; fundamentals of data compression; and even that there are some problems that no one has figured out how to solve on a computer in a reasonable amount of time.

A Hetero-functional Graph Theory for Modeling Interdependent Smart City Infrastructure -

Wester C. H. Schoonenberg 2018-11-30

Cities have always played a prominent role in the prosperity of civilization. Indeed, every great civilization we can think of is associated with the prominence of one or more thriving cities. And so understanding cities -- their inhabitants, their institutions, their infrastructure -- what they are and how they work independently and together -- is of fundamental importance to our collective growth as a human civilization. Furthermore, the 21st century “smart” city, as a result global climate change and large-scale urbanization, will emerge as a societal grand challenge. This book focuses on the role of interdependent infrastructure systems in such smart cities especially as it relates to timely and poignant questions about resilience and sustainability. In particular, the goal of this book is to present, in one volume, a consistent Hetero-Functional Graph Theoretic (HFGT) treatment of interdependent smart city infrastructures as an overarching application domain of engineering systems. This work may be contrasted to the growing literature on multi-layer networks, which despite significant theoretical advances in recent years, has modeling limitations that prevent their real-world application to interdependent smart city infrastructures of arbitrary topology. In contrast, this book demonstrates that HFGT can be applied extensively to an arbitrary number of arbitrarily connected topologies of interdependent smart city infrastructures. It also integrates, for the first time, all six matrices of HFGT in a single system adjacency matrix. The book makes every effort to be accessible to a broad audience of infrastructure system practitioners and researchers (e.g. electric power system planners, transportation engineers, and hydrologists, etc.). Consequently, the book has extensively visualized the graph theoretic concepts for greater intuition and clarity. Nevertheless, the book does require a common methodological base of its readers and directs itself to the Model-Based Systems Engineering (MBSE) community and the Network Science Community (NSC). To the MBSE

community, we hope that HFGT will be accepted as a quantification of many of the structural concepts found in model-based systems engineering languages like SysML. To the NSC, we hope to present a new view as how to construct graphs with fundamentally different meaning and insight. Finally, it is our hope that HFGT serves to overcome many of the theoretical and modeling limitations that have hindered our ability to systematically understand the structure and function of smart cities.

Topics in Intersection Graph Theory - Terry A. McKee 1999-01-01

Finally there is a book that presents real applications of graph theory in a unified format. This book is the only source for an extended, concentrated focus on the theory and techniques common to various types of intersection graphs. It is a concise treatment of the aspects of intersection graphs that interconnect many standard concepts and form the foundation of a surprising array of applications to biology, computing, psychology, matrices, and statistics.

The SAGE Encyclopedia of Research Design - Bruce B. Frey 2022-01-18

The SAGE Encyclopedia of Research Design maps out how one makes decisions about research design, interprets data, and draws valid inferences, undertakes research projects in an ethical manner, and evaluates experimental design strategies and results. From A-to-Z, this four-volume work covers the spectrum of research design strategies and topics including, among other things: fundamental research design principles, ethics in the research process, quantitative versus qualitative and mixed-method designs, completely randomized designs, multiple comparison tests, diagnosing agreement between data and models, fundamental assumptions in analysis of variance, factorial treatment designs, complete and incomplete block designs, Latin square and related designs, hierarchical designs, response surface designs, split-plot designs, repeated measures designs, crossover designs, analysis of covariance, statistical software packages, and much more. Research design, with its statistical underpinnings, can be especially daunting for students and novice researchers. At its heart, research design might be described simply as a formalized approach toward problem solving, thinking, and acquiring knowledge, the success of which depends upon clearly defined objectives and appropriate choice of statistical design and analysis to meet those objectives. The SAGE Encyclopedia of Research Design will assist students and researchers with their work while providing vital information on research strategies.

Graph Algorithms in the Language of Linear Algebra - Jeremy Kepner 2011-01-01

The current exponential growth in graph data has forced a shift to parallel computing for executing graph algorithms. Implementing parallel graph algorithms and achieving good parallel performance have proven difficult. This book addresses these challenges by exploiting the well-known duality between a canonical representation of graphs as abstract collections of vertices and edges and a sparse adjacency matrix representation. This linear algebraic approach is widely accessible to scientists and engineers who may not be formally trained in computer science. The authors show how to leverage existing parallel matrix computation techniques and the large amount of software infrastructure that exists for these computations to implement efficient and scalable parallel graph algorithms. The benefits of this approach are reduced algorithmic complexity, ease of implementation, and improved performance.

Graph Machine Learning - Claudio Stamile 2021-06-25

Build machine learning algorithms using graph data and efficiently exploit topological information within your models Key FeaturesImplement machine learning techniques and algorithms in graph dataIdentify the relationship between nodes in order to make better business decisionsApply graph-based machine learning methods to solve real-life problemsBook Description Graph Machine Learning will introduce you to a set of tools used for processing network data and leveraging the power of the relation between entities that can be used for predictive, modeling, and analytics tasks. The first chapters will introduce you to graph theory and graph machine learning, as well as the scope of their potential use. You'll then learn all you need to know about the main machine learning models for graph representation learning: their purpose, how they work, and how they can be implemented in a wide range of supervised and unsupervised learning applications. You'll build a complete machine learning pipeline, including data processing, model training, and prediction in order to exploit the full potential of graph data. After covering the basics, you'll be taken through real-world scenarios such as extracting data from social networks, text analytics, and natural language processing (NLP) using graphs and financial transaction systems on graphs. You'll also learn how

to build and scale out data-driven applications for graph analytics to store, query, and process network information, and explore the latest trends on graphs. By the end of this machine learning book, you will have learned essential concepts of graph theory and all the algorithms and techniques used to build successful machine learning applications. What you will learnWrite Python scripts to extract features from graphsDistinguish between the main graph representation learning techniquesLearn how to extract data from social networks, financial transaction systems, for text analysis, and moreImplement the main unsupervised and supervised graph embedding techniquesGet to grips with shallow embedding methods, graph neural networks, graph regularization methods, and moreDeploy and scale out your application seamlesslyWho this book is for This book is for data scientists, data analysts, graph analysts, and graph professionals who want to leverage the information embedded in the connections and relations between data points to boost their analysis and model performance using machine learning. It will also be useful for machine learning developers or anyone who wants to build ML-driven graph databases. A beginner-level understanding of graph databases and graph data is required, alongside a solid understanding of ML basics. You'll also need intermediate-level Python programming knowledge to get started with this book.

Graph Theory - Karin R Saoub 2021-03-17

Graph Theory: An Introduction to Proofs, Algorithms, and Applications Graph theory is the study of interactions, conflicts, and connections. The relationship between collections of discrete objects can inform us about the overall network in which they reside, and graph theory can provide an avenue for analysis. This text, for the first undergraduate course, will explore major topics in graph theory from both a theoretical and applied viewpoint. Topics will progress from understanding basic terminology, to addressing computational questions, and finally ending with broad theoretical results. Examples and exercises will guide the reader through this progression, with particular care in strengthening proof techniques and written mathematical explanations. Current applications and exploratory exercises are provided to further the reader's mathematical reasoning and understanding of the relevance of graph theory to the modern world. Features The first chapter introduces graph terminology, mathematical modeling using graphs, and a review of proof techniques featured throughout the book The second chapter investigates three major route problems: eulerian circuits, hamiltonian cycles, and shortest paths. The third chapter focuses entirely on trees - terminology, applications, and theory. Four additional chapters focus around a major graph concept: connectivity, matching, coloring, and planarity. Each chapter brings in a modern application or approach. Hints and Solutions to selected exercises provided at the back of the book. Author Karin R. Saoub is an Associate Professor of Mathematics at Roanoke College in Salem, Virginia. She earned her PhD in mathematics from Arizona State University and BA from Wellesley College. Her research focuses on graph coloring and on-line algorithms applied to tolerance graphs. She is also the author of A Tour Through Graph Theory, published by CRC Press.

Graph Theory - Beril Sirmacek 2018-01-31

This book is prepared as a combination of the manuscripts submitted by respected mathematicians and scientists around the world. As an editor, I truly enjoyed reading each manuscript. Not only will the methods and explanations help you to understand more about graph theory, but I also hope you will find it joyful to discover ways that you can apply graph theory in your scientific field. I believe the book can be read from the beginning to the end at once. However, the book can also be used as a reference guide in order to turn back to it when it is needed. I have to mention that this book assumes the reader to have a basic knowledge about graph theory. The very basics of the theory and terms are not explained at the beginner level. I hope this book will support many applied and research scientists from different scientific fields.

Graph Algorithms - Mark Needham 2019-05-16

Discover how graph algorithms can help you leverage the relationships within your data to develop more intelligent solutions and enhance your machine learning models. You'll learn how graph analytics are uniquely suited to unfold complex structures and reveal difficult-to-find patterns lurking in your data. Whether you are trying to build dynamic network models or forecast real-world behavior, this book illustrates how graph algorithms deliver value—from finding vulnerabilities and bottlenecks to detecting communities and improving machine learning predictions. This practical book walks you through hands-on

examples of how to use graph algorithms in Apache Spark and Neo4j—two of the most common choices for graph analytics. Also included: sample code and tips for over 20 practical graph algorithms that cover optimal pathfinding, importance through centrality, and community detection. Learn how graph analytics vary from conventional statistical analysis Understand how classic graph algorithms work, and how they are applied Get guidance on which algorithms to use for different types of questions Explore algorithm examples with working code and sample datasets from Spark and Neo4j See how connected feature extraction can increase machine learning accuracy and precision Walk through creating an ML workflow for link prediction combining Neo4j and Spark

Lecture Notes on Graph Theory - Sudev Naduvath 2017-12-08

The book is based on the syllabus of Computer Science and Engineering Programme under APJ Abdul Kalam Technological University, Kerala.

Computational Discrete Mathematics - Sriram Pemmaraju 2003-12-08

This definitive reference on Combinatorica contains examples of all 450 functions plus tutorial text.

Data Clustering: Theory, Algorithms, and Applications, Second Edition - Guojun Gan 2020-11-10

Data clustering, also known as cluster analysis, is an unsupervised process that divides a set of objects into homogeneous groups. Since the publication of the first edition of this monograph in 2007, development in the area has exploded, especially in clustering algorithms for big data and open-source software for cluster analysis. This second edition reflects these new developments, covers the basics of data clustering, includes a list of popular clustering algorithms, and provides program code that helps users implement clustering algorithms. Data Clustering: Theory, Algorithms and Applications, Second Edition will be of interest to researchers, practitioners, and data scientists as well as undergraduate and graduate students.

Graph Theory - Karin R Saoub 2021-03-17

Graph Theory: An Introduction to Proofs, Algorithms, and Applications Graph theory is the study of interactions, conflicts, and connections. The relationship between collections of discrete objects can inform us about the overall network in which they reside, and graph theory can provide an avenue for analysis. This text, for the first undergraduate course, will explore major topics in graph theory from both a theoretical and applied viewpoint. Topics will progress from understanding basic terminology, to addressing computational questions, and finally ending with broad theoretical results. Examples and exercises will guide the reader through this progression, with particular care in strengthening proof techniques and written mathematical explanations. Current applications and exploratory exercises are provided to further the reader's mathematical reasoning and understanding of the relevance of graph theory to the modern world. Features The first chapter introduces graph terminology, mathematical modeling using graphs, and a review of proof techniques featured throughout the book The second chapter investigates three major route problems: eulerian circuits, hamiltonian cycles, and shortest paths. The third chapter focuses entirely on trees - terminology, applications, and theory. Four additional chapters focus around a major graph concept: connectivity, matching, coloring, and planarity. Each chapter brings in a modern application or approach. Hints and Solutions to selected exercises provided at the back of the book. Author Karin R. Saoub is an Associate Professor of Mathematics at Roanoke College in Salem, Virginia. She earned her PhD in mathematics from Arizona State University and BA from Wellesley College. Her research focuses on graph coloring and on-line algorithms applied to tolerance graphs. She is also the author of A Tour Through Graph Theory, published by CRC Press.

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Handbook of Graph Theory, Combinatorial Optimization, and Algorithms - Krishnaiyan "KT"

Thulasiraman 2016-01-05

The fusion between graph theory and combinatorial optimization has led to theoretically profound and practically useful algorithms, yet there is no book that currently covers both areas together. Handbook of Graph Theory, Combinatorial Optimization, and Algorithms is the first to present a unified, comprehensive treatment of both graph theory and c

Combinatorics and Graph Theory - John Harris 2009-04-03

These notes were first used in an introductory course team taught by the authors at Appalachian State University to advanced undergraduates and beginning graduates. The text was written with four pedagogical goals in mind: offer a variety of topics in one course, get to the main themes and tools as

efficiently as possible, show the relationships between the different topics, and include recent results to convince students that mathematics is a living discipline.

Algorithms and Models for Network Data and Link Analysis - François Fouss 2016-07-12

A hands-on, entry-level guide to algorithms for extracting information about social and economic behavior from network data.

Introduction to Random Graphs - Alan Frieze 2016

The text covers random graphs from the basic to the advanced, including numerous exercises and recommendations for further reading.

Research Trends in Graph Theory and Applications - Daniela Ferrero

The Workshop for Women in Graph Theory and Applications was held at the Institute for Mathematics and Its Applications (University of Minnesota, Minneapolis) on August 19-23, 2019. During this five-day workshop, 42 participants performed collaborative research, in six teams, each focused on open problems in different areas of graph theory and its applications. The research work of each team was led by two experts in the corresponding area, who prior to the workshop, carefully selected relevant and meaningful open problems that would yield high-quality research and results of strong impact. As a result, all six teams have made significant contributions to several open problems in their respective areas. The workshop led to the creation of the Women in Graph Theory and Applications Research Network, which provided the framework to continue collaborating and to produce this volume. This book contains six chapters, each of them on one of the different areas of research at the Workshop for Women in Graph Theory and Applications, and written by participants of each team.

Graph Theory with Applications - C. Vasudev 2006

Over 1500 problems are used to illustrate concepts, related to different topics, and introduce applications. Over 1000 exercises in the text with many different types of questions posed. Precise mathematical language is used without excessive formalism and abstraction. Care has been taken to balance the mix of notation and words in mathematical statements. Problem sets are stated clearly and unambiguously, and all are carefully graded for various levels of difficulty. This text has been carefully designed for flexible use.

Basic Graph Theory - Md. Saidur Rahman 2017-05-02

This undergraduate textbook provides an introduction to graph theory, which has numerous applications in modeling problems in science and technology, and has become a vital component to computer science, computer science and engineering, and mathematics curricula of universities all over the world. The author follows a methodical and easy to understand approach. Beginning with the historical background, motivation and applications of graph theory, the author first explains basic graph theoretic terminologies. From this firm foundation, the author goes on to present paths, cycles, connectivity, trees, matchings, coverings, planar graphs, graph coloring and digraphs as well as some special classes of graphs together with some research topics for advanced study. Filled with exercises and illustrations, Basic Graph Theory is a valuable resource for any undergraduate student to understand and gain confidence in graph theory and its applications to scientific research, algorithms and problem solving.

A Graph-Theoretic Approach to Enterprise Network Dynamics - Horst Bunke 2007-04-05

This monograph treats the application of numerous graph-theoretic algorithms to a comprehensive analysis of dynamic enterprise networks. Network dynamics analysis yields valuable information about network performance, efficiency, fault prediction, cost optimization, indicators and warnings. Based on many years of applied research on generic network dynamics, this work covers a number of elegant applications (including many new and experimental results) of traditional graph theory algorithms and techniques to computationally tractable network dynamics analysis to motivate network analysts, practitioners and researchers alike.

Graph Theory - K M Koh 2015-03

NUS represents National University of Singapore. NTU represents National Technological University, Singapore.

Graphs, Dioids and Semirings - Michel Gondran 2008-05-14

The primary objective of this essential text is to emphasize the deep relations existing between the semiring

and dioid structures with graphs and their combinatorial properties. It does so at the same time as demonstrating the modeling and problem-solving flexibility of these structures. In addition the book provides an extensive overview of the mathematical properties employed by "nonclassical" algebraic structures which either extend usual algebra or form a new branch of it.

Sparse Modeling - Irina Rish 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 the growing field of sparse modeling, including application examples, problem formulations that yield sparse solutions, algorithms for finding such solutions, and recent theoretical results on sparse recovery. The book gets you up to speed on the latest sparsity-related developments and will motivate you to continue learning about the field. The authors first present motivating examples and a high-level survey of key recent developments in sparse modeling. The book then describes optimization problems involving commonly used sparsity-enforcing tools, presents essential theoretical results, and discusses several state-of-the-art algorithms for finding sparse solutions. The authors go on to address a variety of sparse recovery problems that extend the basic formulation to more sophisticated forms of structured sparsity and to different loss functions. They also examine a particular class of sparse graphical models and cover dictionary learning and sparse matrix factorizations.

Graph Theory and Its Applications, Second Edition - Jonathan L. Gross 2005-09-22

Already an international bestseller, with the release of this greatly enhanced second edition, *Graph Theory and Its Applications* is now an even better choice as a textbook for a variety of courses -- a textbook that will continue to serve your students as a reference for years to come. The superior explanations, broad coverage, and abundance of illustrations and exercises that positioned this as the premier graph theory text remain, but are now augmented by a broad range of improvements. Nearly 200 pages have been added for this edition, including nine new sections and hundreds of new exercises, mostly non-routine. What else is new? New chapters on measurement and analytic graph theory Supplementary exercises in each chapter - ideal for reinforcing, reviewing, and testing. Solutions and hints, often illustrated with figures, to selected exercises - nearly 50 pages worth Reorganization and extensive revisions in more than half of the existing chapters for smoother flow of the exposition Foreshadowing - the first three chapters now preview a number of concepts, mostly via the exercises, to pique the interest of reader Gross and Yellen take a comprehensive approach to graph theory that integrates careful exposition of classical developments with emerging methods, models, and practical needs. Their unparalleled treatment provides a text ideal for a two-semester course and a variety of one-semester classes, from an introductory one-semester course to courses slanted toward classical graph theory, operations research, data structures and algorithms, or algebra and topology.

Classes of Directed Graphs - Jørgen Bang-Jensen 2018-06-18

This edited volume offers a detailed account of the theory of directed graphs from the perspective of important classes of digraphs, with each chapter written by experts on the topic. Outlining fundamental discoveries and new results obtained over recent years, this book provides a comprehensive overview of the latest research in the field. It covers core new results on each of the classes discussed, including chapters on tournaments, planar digraphs, acyclic digraphs, Euler digraphs, graph products, directed width parameters, and algorithms. Detailed indices ease navigation while more than 120 open problems and conjectures ensure that readers are immersed in all aspects of the field. *Classes of Directed Graphs* provides a valuable reference for graduate students and researchers in computer science, mathematics and operations research. As digraphs are an important modelling tool in other areas of research, this book will also be a useful resource to researchers working in bioinformatics, chemoinformatics, sociology, physics, medicine, etc.

Graph Theory with Applications - John Adrian Bondy 1976

Deep Learning on Graphs - Yao Ma 2021-09-23

A comprehensive text on foundations and techniques of graph neural networks with applications in NLP,

data mining, vision and healthcare.

Biological Network Analysis - Pietro Hiram Guzzi 2020-05-11

Biological Network Analysis: Trends, Approaches, Graph Theory, and Algorithms considers three major biological networks, including Gene Regulatory Networks (GRN), Protein-Protein Interaction Networks (PPIN), and Human Brain Connectomes. The book's authors discuss various graph theoretic and data analytics approaches used to analyze these networks with respect to available tools, technologies, standards, algorithms and databases for generating, representing and analyzing graphical data. As a wide variety of algorithms have been developed to analyze and compare networks, this book is a timely resource. Presents recent advances in biological network analysis, combining Graph Theory, Graph Analysis, and various network models Discusses three major biological networks, including Gene Regulatory Networks (GRN), Protein-Protein Interaction Networks (PPIN) and Human Brain Connectomes Includes a discussion of various graph theoretic and data analytics approaches

Graph Theory with Applications to Engineering and Computer Science - Narsingh Deo 1974

Because of its inherent simplicity, graph theory has a wide range of applications in engineering, and in physical sciences. It has of course uses in social sciences, in linguistics and in numerous other areas. In fact, a graph can be used to represent almost any physical situation involving discrete objects and the relationship among them. Now with the solutions to engineering and other problems becoming so complex leading to larger graphs, it is virtually difficult to analyze without the use of computers. This book is recommended in IIT Kharagpur, West Bengal for B.Tech Computer Science, NIT Arunachal Pradesh, NIT Nagaland, NIT Agartala, NIT Silchar, Gauhati University, Dibrugarh University, North Eastern Regional Institute of Management, Assam Engineering College, West Bengal University of Technology (WBUT) for B.Tech, M.Tech Computer Science, University of Burdwan, West Bengal for B.Tech. Computer Science, Jadavpur University, West Bengal for M.Sc. Computer Science, Kalyani College of Engineering, West Bengal for B.Tech. Computer Science. Key Features: This book provides a rigorous yet informal treatment of graph theory with an emphasis on computational aspects of graph theory and graph-theoretic algorithms. Numerous applications to actual engineering problems are incorporated with software design and optimization topics.

Topics in Topological Graph Theory - Lowell W. Beineke 2009-07-09

The use of topological ideas to explore various aspects of graph theory, and vice versa, is a fruitful area of research. There are links with other areas of mathematics, such as design theory and geometry, and increasingly with such areas as computer networks where symmetry is an important feature. Other books cover portions of the material here, but there are no other books with such a wide scope. This book contains fifteen expository chapters written by acknowledged international experts in the field. Their well-written contributions have been carefully edited to enhance readability and to standardize the chapter structure, terminology and notation throughout the book. To help the reader, there is an extensive introductory chapter that covers the basic background material in graph theory and the topology of surfaces. Each chapter concludes with an extensive list of references.

Graph Representation Learning - William L. Hamilton 2022-06-01

Graph-structured data is ubiquitous throughout the natural and social sciences, from telecommunication networks to quantum chemistry. Building relational inductive biases into deep learning architectures is crucial for creating systems that can learn, reason, and generalize from this kind of data. Recent years have seen a surge in research on graph representation learning, including techniques for deep graph embeddings, generalizations of convolutional neural networks to graph-structured data, and neural message-passing approaches inspired by belief propagation. These advances in graph representation learning have led to new state-of-the-art results in numerous domains, including chemical synthesis, 3D vision, recommender systems, question answering, and social network analysis. This book provides a synthesis and overview of graph representation learning. It begins with a discussion of the goals of graph representation learning as well as key methodological foundations in graph theory and network analysis. Following this, the book introduces and reviews methods for learning node embeddings, including random-walk-based methods and applications to knowledge graphs. It then provides a technical synthesis and introduction to the highly successful graph neural network (GNN) formalism, which has become a dominant

and fast-growing paradigm for deep learning with graph data. The book concludes with a synthesis of recent advancements in deep generative models for graphs—a nascent but quickly growing subset of graph representation learning.

[A First Course in Graph Theory](#) - Gary Chartrand 2013-05-20

Written by two prominent figures in the field, this comprehensive text provides a remarkably student-friendly approach. Its sound yet accessible treatment emphasizes the history of graph theory and offers unique examples and lucid proofs. 2004 edition.

Graph Theory and Complex Networks - Maarten van Steen 2010

This book aims to explain the basics of graph theory that are needed at an introductory level for students in computer or information sciences. To motivate students and to show that even these basic notions can be extremely useful, the book also aims to provide an introduction to the modern field of network science.

Mathematics is often unnecessarily difficult for students, at times even intimidating. For this reason, explicit attention is paid in the first chapters to mathematical notations and proof techniques, emphasizing that the notations form the biggest obstacle, not the mathematical concepts themselves. This approach allows to gradually prepare students for using tools that are necessary to put graph theory to work:

complex networks. In the second part of the book the student learns about random networks, small worlds, the structure of the Internet and the Web, peer-to-peer systems, and social networks. Again, everything is discussed at an elementary level, but such that in the end students indeed have the feeling that they:

1. Have learned how to read and understand the basic mathematics related to graph theory. 2. Understand how basic graph theory can be applied to optimization problems such as routing in communication networks. 3. Know a bit more about this sometimes mystical field of small worlds and random networks.

There is an accompanying web site www.distributed-systems.net/gtcn from where supplementary material

can be obtained, including exercises, Mathematica notebooks, data for analyzing graphs, and generators for various complex networks.

[Discrete Maths and Its Applications Global Edition 7e](#) - Kenneth Rosen 2012-09-16

We are pleased to present this Global Edition which has been developed specifically to meet the needs of international students of discrete mathematics. In addition to great depth in key areas and a broad range of real-world applications across multiple disciplines, we have added new material to make the content more relevant and improve learning outcomes for the international student. This Global Edition includes: An entire new chapter on Algebraic Structures and Coding Theory New and expanded sections within chapters covering Foundations, Basic Structures, and Advanced Counting Techniques Special online only chapters on Boolean Algebra and Modeling Computation New and revised problems for the international student integrating alternative methods and solutions. This Global Edition has been adapted to meet the needs of courses outside of the United States and does not align with the instructor and student resources available with the US edition.

Graph Theory - Geir Agnarsson 2007

For junior- to senior-level courses in Graph Theory taken by majors in Mathematics, Computer Science, or Engineering or for beginning-level graduate courses. Once considered an "unimportant" branch of topology, graph theory has come into its own through many important contributions to a wide range of fields -- and is now one of the fastest-growing areas in discrete mathematics and computer science. This new text introduces basic concepts, definitions, theorems, and examples from graph theory. The authors present a collection of interesting results from mathematics that involve key concepts and proof techniques; cover design and analysis of computer algorithms for solving problems in graph theory; and discuss applications of graph theory to the sciences. It is mathematically rigorous, but also practical, intuitive, and algorithmic.