R. Srikant

The Mathematics of Internet Congestion Control

Mathematics Of Internet Congestion Control

Franco Sebastian Gentile,Jorge Luis Moiola,Guanrong Chen

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   The Mathematics of Internet Congestion Control Rayadurgam Srikant,2004 Recommended by T Basar SC series ed This text addresses a new active area of research and fills a gap in the literature Bridges mathematics engineering and computer science considers stochastic and optimization aspects of congestion control in Internet data transfers Useful as a supplementary text also suitable for researchers   **The Mathematics of Internet Congestion Control** Rayadurgam Srikant,2012-12-06 Congestion control algorithms were implemented for the Internet nearly two decades ago but mathematical models of congestion control in such a large scale network are relatively new This text presents models for the development of new protocols that can help make Internet data transfers virtually loss and delay free Introduced are tools from optimization control theory and stochastic processes integral to the study of congestion control algorithms Intended for graduate students and researchers in systems theory and computer science the text assumes basic knowledge of first year graduate level control theory optimization and stochastic processes but the key prerequisites are summarized in an appendix for quick reference The work s wide range of applications to the study of both new and existing protocols and control algorithms make the book of interest to researchers and students concerned with many aspects of large scale information flow on the Internet   **Internet Congestion Control** Subir Varma,2015-08-18 Internet Congestion Control provides a description of some of the most important topics in the area of congestion control in computer networks with special emphasis on the analytical modeling of congestion control algorithms The field of congestion control has seen many notable advances in recent years and the purpose of this book which is targeted towards the advanced and intermediate reader is to inform about the most important developments in this area The book should enable the reader to gain a good understanding of the application of congestion control theory to a number of application domains such as Data Center Networks Video Streaming High Speed Links and Broadband Wireless Networks When seen through the lens of analytical modeling there are a number of common threads that run through the design and analysis of congestion control protocols in all these different areas which are emphasized in this book The book also cuts a path through the profusion of algorithms in the literature and puts the topic on a systematic and logical footing Internet Congestion Control provides practicing network engineers and researchers with a comprehensive and accessible coverage of analytical models of congestion control algorithms and gives readers everything needed to understand the latest developments and research in this area Examines and synthesizes the most important developments in internet congestion control from the last 20 years Provides detailed description on the congestion control protocols used in four key areas broadband wireless networks high speed networks with large latencies video transmission networks and data center networks Offers accessible coverage of advanced topics such as Optimization and Control Theory as applied to congestion control systems   **Mathematical Principles of the Internet, Volume 1** Nirdosh Bhatnagar,2018-11-20 This two volume set on Mathematical Principles of the Internet provides a comprehensive

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is established using the Lyapunov method in the network fluid model Simulation results are provided to evaluate the proposed schemes in practical networks   Fuzzy Information and Engineering Bingyuan Cao,Cheng-Yi Zhang,Tai-Fu Li,2009-01-04 This book is the proceedings of the Third Annual Conference on Fuzzy Information and Engineering ACFIE2008 from Dec 5 10 2008 in Haikou China The conf ence proceedingsis published by Springer Verlag Advancesin Soft Computing ISSN 1615 3871 This year we have received 155 submissions Each paper has undergone a rigorous review process Only high quality papers are included The Third Annual Conference on Fuzzy Information and Engineering ACFIE2008 built on the success of previous conferences the ACFIE2005 Guangzhou China is a major symposium for scientists engineers and practitioners in China to present their updated results ideas devel ments and applications in all areas of fuzzy information and engineering It aims to strengthen relations between industry research laboratoriesand universities and to c ate a primary symposium for world scientists in fuzzy elds as follows 1 Fuzzy intelligence neural networks and optimal 2 Fuzzy algebra 3 Fuzzy analysis 4 Fuzzy systems and logic 5 Fuzzy topology and measure 6 Fuzzy probability control forecasting and decision making 7 Fuzzy clustering and fuzzy algorithms 8 Application in fuzzy sets 9 Rough sets and its application etc This book contains 80 papers divided into nine main parts In Section I we have 9 papers on fuzzy intelligence neural networks and optimal In Section II we have 11 papers on fuzzy algebra In Section III we have 9 papers on fuzzy analysis In Section IV we have 9 papers on fuzzy systems and logic In Section V we have 9 papers on fuzzy topology and measure   Next Generation Teletraffic and Wired/Wireless Advanced Networking Yevgeni Koucheryavy,Jarmo Harju,Villy B. Iversen,2006-09-21 This book constitutes the refereed proceedings of the 6th International Conference on Next Generation Teletraffic and Wired Wireless Advanced Networking NEW2AN 2006 held in St Petersburg Russia in May June 2006 The book includes 49 revised full papers presented together with 2 keynote talks The papers are organized in topical sections on teletraffic traffic characterization and modeling 3G UMTS sensor networks WLAN QoS MANETs lower layer techniques PAN technologies and TCP   **Wireless Systems and Mobility in Next Generation Internet** Jorge García-Vidal,2007-02-28 This book constitutes the thoroughly refereed postproceedings of the Third International Workshop on Wirelss and Mobility organized by the European Network of Excellence on Next Generation Internet EURO NGI 2006 held in Sitges Spain in June 2006 The 19 revised full research papers presented were carefully selected during two rounds of reviewing and improvement The papers are organized in topical sections on WLAN characterization vehicular networks WLAN and sensor networks protocols QoS and routing in ad hoc networks heterogeneous networks resource management in cellular networks TCP in wireless and mobility agents   *Complex Dynamics in Communication Networks* Ljupco Kocarev,2005-06-13 Computer and communication networks are among society s most important infrastructures The internet in particular is a giant global network of networks without central control or administration It is a paradigm of a complex system where complexity may arise from different sources topological structure network evolution connection and node

diversity or dynamical evolution The present volume is the first book entirely devoted to the new and emerging field of nonlinear dynamics of TCP IP networks It addresses both scientists and engineers working in the general field of communication networks   *Network Performance Analysis* Alan Holt,2007-10-06 Network Calculus is a mathematical theory concerned with deriving performance bound networks and this book aims to show that it can provide useful methods for designing and engineering networks Examples are implemented in J making the subject more accessible to those that although have a mathematical background are not pure mathematicians Basic and advanced concepts of J are introduced throughout when required to illustrate different issues Topics covering Network Calculus include wide sense increasing functions mini plus algebra convolution and arrival departure and services curves Comprehensive examples in the application of Network Calculus are given models for simulating network traffic and network systems are discussed and congestion control is explored This book brings Network Calculus closer to the network professional and will equally appeal to postgraduates studying network performance by providing valuable analytical tools and using J as a means of providing a practical treatment of the subject   **Mathematics for Future Computing and Communications** Liao Heng,Bill McColl,2021-12-16 For 80 years mathematics has driven fundamental innovation in computing and communications This timely book provides a panorama of some recent ideas in mathematics and how they will drive continued innovation in computing communications and AI in the coming years It provides a unique insight into how the new techniques that are being developed can be used to provide theoretical foundations for technological progress just as mathematics was used in earlier times by Turing von Neumann Shannon and others Edited by leading researchers in the field chapters cover the application of new mathematics in computer architecture software verification quantum computing compressed sensing networking Bayesian inference machine learning reinforcement learning and many other areas   *Numerical Methods for Controlled Stochastic Delay Systems* Harold Kushner,2008-12-19 The Markov chain approximation methods are widely used for the numerical solution of nonlinear stochastic control problems in continuous time This book extends the methods to stochastic systems with delays The book is the first on the subject and will be of great interest to all those who work with stochastic delay equations and whose main interest is either in the use of the algorithms or in the mathematics An excellent resource for graduate students researchers and practitioners the work may be used as a graduate level textbook for a special topics course or seminar on numerical methods in stochastic control   Frequency-domain Approach To Hopf Bifurcation Analysis: Continuous Time-delayed Systems Franco Sebastian Gentile,Jorge Luis Moiola,Guanrong Chen,2019-10-07 This book is devoted to the study of an effective frequency domain approach based on systems control theory to compute and analyze several types of standard bifurcation conditions for general continuous time nonlinear dynamical systems A very rich pictorial gallery of local bifurcation diagrams for such nonlinear systems under simultaneous variations of several system parameters is presented Some higher order harmonic balance approximation formulas are derived for analyzing the

oscillatory dynamics in small neighborhoods of certain types of Hopf and degenerate Hopf bifurcations The frequency domain approach is then extended to the large class of delay differential equations where the time delays can be either discrete or distributed For the case of discrete delays two alternatives are presented depending on the structure of the underlying dynamical system where the more general setting is then extended to the case of distributed time delayed systems Some representative examples in engineering and biology are discussed *Frequency-Domain Analysis and Design of Distributed Control Systems* Yu-Ping Tian,2012-08-24 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 *Web and Internet Economics* Tie-Yan Liu,Qi Qi,Yinyu Ye,2014-11-25 This book constitutes the thoroughly refereed conference proceedings of the 10th International Conference on Web and Internet Economics WINE 2014 held in Beijing China in December 2014 The 32 regular and 13 short papers were carefully reviewed and selected from 107 submissions and cover results on incentives and computation in theoretical computer science artificial intelligence and microeconomics Geometric Programming for Communication Systems Mung Chiang,2005 Recently Geometric Programming has been applied to study a variety of problems in the analysis and design of communication systems from information theory and queuing theory to signal processing and network protocols Geometric Programming for Communication Systems begins its comprehensive treatment of the subject by providing an in depth tutorial on the theory algorithms and modeling methods of Geometric Programming It then gives a systematic survey of the applications of Geometric Programming to the study of communication systems It collects in one place various published results in this area which are currently scattered in several books and many research papers as well as to date unpublished results Geometric Programming for Communication Systems is intended for researchers and students who wish to have a comprehensive starting point for understanding the theory and applications of geometric programming in communication systems **The Princeton Companion to Mathematics** Timothy Gowers,June Barrow-Green,Imre Leader,2008-09-28 A comprehensive guide to mathematics with over 200 entries divided thematically *Mathematical Principles of the Internet, Volume 2* Nirdosh Bhatnagar,2018-11-21 This two volume set on Mathematical Principles of the Internet provides a comprehensive overview of the mathematical principles of Internet engineering The books do not aim to provide all of the mathematical foundations upon which the Internet is based Instead they cover a partial panorama and the key principles Volume 1 explores Internet engineering while the supporting mathematics is covered in Volume 2 The chapters on mathematics complement

those on the engineering episodes and an effort has been made to make this work succinct yet self contained Elements of information theory algebraic coding theory cryptography Internet traffic dynamics and control of Internet congestion and queueing theory are discussed In addition stochastic networks graph theoretic algorithms application of game theory to the Internet Internet economics data mining and knowledge discovery and quantum computation communication and cryptography are also discussed In order to study the structure and function of the Internet only a basic knowledge of number theory abstract algebra matrices and determinants graph theory geometry analysis optimization theory probability theory and stochastic processes is required These mathematical disciplines are defined and developed in the books to the extent that is needed to develop and justify their application to Internet engineering **Handbook of Optimization in Complex Networks** My T. Thai,Panos M. Pardalos,2011-11-25 Complex Social Networks is a newly emerging hot topic with applications in a variety of domains such as communication networks engineering networks social networks and biological networks In the last decade there has been an explosive growth of research on complex real world networks a theme that is becoming pervasive in many disciplines ranging from mathematics and computer science to the social and biological sciences Optimization of complex communication networks requires a deep understanding of the interplay between the dynamics of the physical network and the information dynamics within the network Although there are a few books addressing social networks or complex networks none of them has specially focused on the optimization perspective of studying these networks This book provides the basic theory of complex networks with several new mathematical approaches and optimization techniques to design and analyze dynamic complex networks A wide range of applications and optimization problems derived from research areas such as cellular and molecular chemistry operations research brain physiology epidemiology and ecology

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