NUMERICAL MATHEMATICS AND SCIENTIFIC COMPUTATION

Numerical Methods for Structured Markov Chains

DARIO A. BINI,
GUY LATOUCHE, and
BEATRICE MEINI

$$P = \begin{bmatrix} B_0 & B_1 & B_2 & B_3 & \cdots \\ A_{-1} & A_0 & A_1 & A_2 & \cdots \\ & A_{-1} & A_0 & A_1 & \ddots \\ & & A_{-1} & A_0 & \ddots \\ 0 & & & \ddots & \ddots \end{bmatrix}$$

$$G = A_{-1} + A_0 G + A_1 G^2 + A_2 G^3 + \cdots$$

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Numerical Methods For Structured Markov Chains:

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concepts and results used in the book a list of the main annotations and algorithms used in the book and an extensive index Numerical Methods for Structured Markov Chains ,2008 Numerical Methods for Structured Markov Chains ,2008

Markov Chains Bruno Sericola,2013-08-05 Markov Chains Theory and Applications Markov chains are a fundamental class of stochastic processes They are widely used to solve problems in a large number of domains such as operational research computer science communication networks and manufacturing systems The success of Markov chains is mainly due to their simplicity of use the large number of available theoretical results and the quality of algorithms developed for the numerical evaluation of many metrics of interest The author presents the theory of both discrete time and continuous time homogeneous Markov chains He carefully examines the explosion phenomenon the Kolmogorov equations the convergence to equilibrium and the passage time distributions to a state and to a subset of states These results are applied to birth and death processes He then proposes a detailed study of the uniformization technique by means of Banach algebra This technique is used for the transient analysis of several queuing systems **Handbook of Linear Algebra, Second Edition** Leslie Hogben,2013-11-26 With a substantial amount of new material the Handbook of Linear Algebra Second Edition provides comprehensive coverage of linear algebra concepts applications and computational software packages in an easy to use format It guides you from the very elementary aspects of the subject to the frontiers of current research Along with revisions and updates throughout the second edition of this bestseller includes 20 new chapters New to the Second Edition Separate chapters on Schur complements additional types of canonical forms tensors matrix polynomials matrix equations special types of matrices generalized inverses matrices over finite fields invariant subspaces representations of quivers and spectral sets New chapters on combinatorial matrix theory topics such as tournaments the minimum rank problem and spectral graph theory as well as numerical linear algebra topics including algorithms for structured matrix computations stability of structured matrix computations and nonlinear eigenvalue problems More chapters on applications of linear algebra including epidemiology and quantum error correction New chapter on using the free and open source software system Sage for linear algebra Additional sections in the chapters on sign pattern matrices and applications to geometry Conjectures and open problems in most chapters on advanced topics Highly praised as a valuable resource for anyone who uses linear algebra the first edition covered virtually all aspects of linear algebra and its applications This edition continues to encompass the fundamentals of linear algebra combinatorial and numerical linear algebra and applications of linear algebra to various disciplines while also covering up to date software packages for linear algebra computations *Algorithms for Quadratic Matrix and Vector Equations* Federico Poloni,2012-03-13 This book is devoted to studying algorithms for the solution of a class of quadratic matrix and vector equations These equations appear in different forms in several practical applications especially in applied probability and control theory The equations are first presented using a novel unifying approach then specific numerical methods are presented for the cases most relevant for applications and new algorithms and theoretical

results developed by the author are presented The book focuses on matrix multiplication rich iterations such as cyclic reduction and the structured doubling algorithm SDA and contains a variety of new research results which as of today are only available in articles or preprints **Numerical Methods for Solving Discrete Event Systems** Winfried Grassmann,Javad Tavakoli,2022-11-05 This graduate textbook provides an alternative to discrete event simulation It describes how to formulate discrete event systems how to convert them into Markov chains and how to calculate their transient and equilibrium probabilities The most appropriate methods for finding these probabilities are described in some detail and templates for efficient algorithms are provided These algorithms can be executed on any laptop even in cases where the Markov chain has hundreds of thousands of states This book features the probabilistic interpretation of Gaussian elimination a concept that unifies many of the topics covered such as embedded Markov chains and matrix analytic methods The material provided should aid practitioners significantly to solve their problems This book also provides an interesting approach to teaching courses of stochastic processes Introduction to Queueing Systems with Telecommunication Applications László Lakatos,László Szeidl,Miklós Telek,2019-05-16 The book is the extended and revised version of the 1st edition and is composed of two main parts mathematical background and queueing systems with applications The mathematical background is a self containing introduction to the stochastic processes of the later studied queueing systems It starts with a quick introduction to probability theory and stochastic processes and continues with chapters on Markov chains and regenerative processes More recent advances of queueing systems are based on phase type distributions Markov arrival processes and quasy birth death processes which are introduced in the last chapter of the first part The second part is devoted to queueing models and their applications After the introduction of the basic Markovian from M M 1 to M M 1 N and non Markovian M G 1 G M 1 queueing systems a chapter presents the analysis of queues with phase type distributions Markov arrival processes from PH M 1 to MAP PH 1 K Thenext chapter presents the classical queueing network results and the rest of this part is devoted to the application examples There are queueing models for bandwidth charing with different traffic classes slotted multiplexers media access protocols like Aloha and IEEE 802 11b priority systems and retrial systems An appendix supplements the technical content with Laplace and z transformation rules Bessel functions and a list of notations The book contains examples and exercises throughout and could be used for graduate students in engineering mathematics and sciences Reviews of first edition The organization of the book is such that queueing models are viewed as special cases of more general stochastic processes such as birth death or semi Markov processes this book is a valuable addition to the queuing literature and provides instructors with a viable alternative for a textbook to be used in a one or two semester course on queueing models at the upper undergraduate or beginning graduate levels Charles Knessl SIAM Review Vol 56 1 March 2014 *Princeton Companion to Applied Mathematics* Nicholas J. Higham,Mark R. Dennis,Paul Glendinning,Paul A. Martin,Fadil Santosa,Jared Tanner,2015-09-09 The must have compendium on applied mathematics This

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These applications include such areas as Markov chains networks signal processing systems and control theory mathematical programming economic and biological modeling and statistics and operations research **Quasi-stationary Phenomena in Nonlinearly Perturbed Stochastic Systems** Mats Gyllenberg,Dmitriĭ Sergeevich Silʹvestrov,2008 This book is devoted to the mathematical studies of stochastic systems with quasi stationary phenomena which have applications to population dynamics or epidemic models In addition to its use for the research and reference purposes the book can also be used in special courses on the subject and as a complementary reading in general courses on stochastic processes In this respect it may be useful for specialists as well as doctoral and advanced undergraduate students **Structured Stochastic Matrices of M/G/1 Type and Their Applications** Neuts,2021-12-16 This book deals with Markov chains and Markov renewal processes M G 1 type It discusses numerical difficulties which are apparently inherent in the classical analysis of a variety of stochastic models by methods of complex analysis *Proceedings of the ... International Workshop on Petri Nets and Performance Models* ,1997

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