4029 Mathematics Paper November 2013

This book is a printed edition of the Special Issue "River and Lake Ice Processes—Impacts of Freshwater Ice on Aquatic Ecosystems in a Changing Globe" that was published in Water
BACKGROUND Sir Isaac Newton hrought to the world the idea of modeling the motion of physical systems with equations. It was necessary to invent calculus along the way, since fundamental equations of motion involve velocities and accelerations, of position. His greatest single success was his discovery that which are derivatives the motion of the planets and moons of the solar system resulted from a single fundamental source: the gravitational attraction of the hodies. He demonstrated that the ohserved motion of the planets could he explained hy assuming that there is a gravitational attraction he tween any two ohjects, a force that is proportional to the product of masses and inversely proportional to the square of the distance between them. The circular, elliptical, and parabolic orhits of astronomy were v INTRODUCTION no longer fundamental determinants of motion, but were approximations of laws specified with differential equations. His methods are now used in modeling motion and change in all areas of science. Subsequent generations of scientists extended the method of using differ ential equations to describe how physical systems evolve. But the method had a limitation. While the differential equations were sufficient to determine the behavior-in

the sense that solutions of the equations did exist-it was frequently difficult to figure out what that behavior would be. It was often impossible to write down solutions in relatively simple algebraic expressions using a finite number of terms. Series solutions involving infinite sums often would not converge beyond some finite time.

Now in its second edition Maritime Economics provides a valuable introduction to the organisation and workings of the global shipping industry. The author outlines the economic theory as well as many of the operational practicalities involved. Extensively revised for the new edition, the book has many clear illustrations and tables. Topics covered include: * an overview of international trade * Maritime Law * economic organisation and principles * financing ships and shipping companies * market research and forecasting.

Travel thousands of years into our past and discover the significant events that shaped the world as we know it. This book includes short, descriptive explanations of key ideas, themes, and events of world history that are easy to understand. Explore topics such as the founding of Baghdad, the colonization of the Americas, and the inception of Buddhism without complicated jargon. This book is part of DK's award-winning Big Ideas Simply Explained educational series that uses witty graphics and engaging descriptions to enlighten readers. Don't stop at American history, explore the world! This book is full of fun facts from the human story, going as far back as the origins of our species to space exploration today. Discover all things revolution, from the French

to the digital, including the rise of the internet. Enjoy short and sweet biographies of some of the most important thinkers and leaders throughout history, like Martin Luther, Charles Darwin, and Nelson Mandela. You'll learn who said famous historical quotes, and what they really meant when they said it. Big Ideas This is a modern twist on the good old-fashioned encyclopedia, now easier to follow with diagrams, mind maps, and timelines. Step-by-step diagrams will have you reviewing your ideas about history. Start from the very beginning: - Human Origins 200,000 years ago - 3500 BGE - Ancient Civilizations 6000 BGE - 500 CE - The Medieval World 500 - 1492 - Early Modern Era 1420 - 1795 - Changing Societies 1776 - 1914 - The Modern World 1914 - Present The Series Simply Explained With over 7 million copies sold worldwide to date, The History Book is part of the award-winning Big Ideas Simply Explained series from DK Books. It uses innovative graphics along with engaging writing to make complex subjects easier to understand.

A complete study on an important class of linear dynamicalsystems-positive linear systems One of the most often-encountered systems in nearly all areas ofscience and technology, positive linear systems is a specific butremarkable and fascinating class. Renowned scientists LorenzoFarina and Sergio Rinaldi introduce readers to the world ofpositive linear systems in their rigorous but highly accessiblebook, rich in applications, examples, and figures. This professional reference is divided into three main parts: Thefirst part contains the definitions and basic properties ofpositive linear systems. The

second part, following the theoreticalexposition, reports the main conceptual results, consideringapplicable examples taken from a number of widely used models. Thethird part is devoted to the study of some classes of positivelinear systems of particular relevance in applications (such as theLeontief model, the Leslie model, the Markov chains, thecompartmental systems, and the queueing systems). Readers familiarwith linear algebra and linear systems theory will appreciate theway arguments are treated and presented. Extraordinarily comprehensive, Positive Linear Systemsfeatures: * Applications from a variety of backgrounds including modeling,control engineering, computer science, demography, economics,bioengineering, chemistry, and ecology * References and annotated bibliographies throughout the book * Two appendices concerning linear algebra and linear systemstheory for readers unfamiliar with the mathematics used Farina and Rinaldi make no effort to hide their enthusiasm for thetopics presented, making Positive Linear Systems: Theory andApplications an indispensable resource for researchers andprofessionals in a broad range of fields. Showcasing evidence-based models for schoolwide prevention of reading and behavior problems, this book is highly informative, practical, and grounded in research. Chapters first identify the core features of effective three-tier prevention models and explain their role within a response-to-intervention framework. In-depth case studies then illustrate the experience of implementing distinct models (targeting reading problems, behavior problems, or both) in actual schools across the country. The cases yield vital insights

into the process of choosing the right prevention model for a particular school; coordinating faculty teams and building their skills; and conducting universal screening, progress monitoring, and data-based decision making to improve student outcomes. New Syllabus Mathematics (NSM) is a series of textbooks specially designed to provide valuable learning experiences to engage the hearts and minds of students sitting for the GCE O-level examination in Mathematics. Included in the textbooks are Investigation, Class Discussion, Thinking Time, Journal Writing, Performance Task and Problems in Real-World Contexts to support the teaching and learning of Mathematics. Every chapter begins with a chapter opener which motivates students in learning the topic. Interesting stories about Mathematicians, real-life examples and applications are used to arouse students' interest and curiosity so that they can appreciate the beauty of Mathematics in their surroundings. The use of ICT helps students to visualise and manipulate mathematical objects more easily, thus making the learning of Mathematics more interactive. Ready-to-use interactive ICT templates are available at http://www.shinglee.com.sg/ StudentResources/
In this fifth edition of the bestselling text in organizational theory and behavior, Bolman and Deal's update includes coverage of pressing issues such as globalization, changing workforce, multi-cultural and virtual workforces and communication, and sustainability. A full instructor support package is available including an instructor's guide, summary tip sheets for each chapter, hot links to videos & extra resources, mini-

assessments for each of the frames, and podcast Q&As with Bolman & Deal. Deepening disaffection with conventional public schools has inspired flight to private schools, home schooling, and new alternatives, such as charter schools. Barely a decade old, the charter school movement has attracted a colorful band of supporters, from presidential candidates, to ethnic activists, to the religious Right. At present there are about 1,700 charter schools, with total enrollment estimated to reach one million early in the century. Yet, until now, little has been known about the inner workings of these small, inventive schools that rely on public money but are largely independent of local school boards. Inside Charter Schools takes readers into six strikingly different schools, from an evangelical home-schooling charter in California to a back-to-basics charter in a black neighborhood in Lansing, Michigan. With a keen eye for human aspirations and dilemmas, the authors provide incisive analysis of the challenges and problems facing this young movement. Do charter schools really spur innovation, or do they simply exacerbate tribal forms of American pluralism? Inside Charter Schools provides shrewd and illuminating studies of the struggles and achievements of these new schools, and offers practical lessons for educators, scholars, policymakers, and parents.

The book focuses on soft computing and its applications to solve real-world problems in different domains, ranging from medicine and health care, to supply chain management, image processing and cryptanalysis. It includes high-quality papers

presented at the International Conference on Soft Computing: Theories and Applications (SoCTA 2018), organized by Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, Punjab, India. Offering significant insights into soft computing for teachers and researchers alike, the book inspires more researchers to work in the field of soft computing.

During the past 20 years, there has been enormous productivity in theoretical as well as computational integration. Some attempts have been made to find an optimal or best numerical method and related computer code to put to rest the problem of numerical integration, but the research is continuously ongoing, as this problem is still very much open-ended. The importance of numerical integration in so many areas of science and technology has made a practical, up-to-date reference on this subject long overdue. The Handbook of Computational Methods for Integration discusses quadrature rules for finite and infinite range integrals and their applications in differential and integral equations, Fourier integrals and transforms, Hartley transforms, fast Fourier and Hartley transforms, Laplace transforms and wavelets. The practical, applied perspective of this book makes it unique among the many theoretical books on numerical integration and quadrature. It will be a welcomed addition to the libraries of applied mathematicians, scientists, and engineers in virtually every discipline.

Mathematicians, science historians, and general readers will find this book a lively history; women will find it a reminder of a proud tradition and a challenge to take their

rightful place in academic life today. The colorful lives of these women, who often traveled in the most avant-garde circles of their day, are presented in fascinating detail. The obstacles and censures that were also a part of their lives are a sobering reminder of the bias against women still present in this and other fields of academic endeavor. Mathematicians, science historians, and general readers will find this book a lively history; women will find it a reminder of a proud tradition and a challenge to take their rightful place in academic life today.

This book explores ways in which libraries can reach new levels of service, quality, and efficiency while minimizing cost by collaborating in acquisitions. In consortial acquisitions, a number of libraries work together, usually in an existing library consortia, to leverage size to support acquisitions in each individual library. In cross-functional acquisitions, acquisitions collaborates to support other library functions. For the library acquisitions manager, technical services manager, or the library director, awareness of different options for effective consortial and cross-functional acquisitions allows for the optimization of staff and resources to reach goals. This work presents those options in the form of case studies as well as useful analysis of the benefits and challenges of each. By supporting each other's acquisitions services in a consortium, libraries leverage size to get better prices, and share systems and expertise to maximize resources while minimizing costs. Within libraries, the acquisitions function can be combined with other library functions in a unit with more than one purpose, or

acquisitions can develop a close working relationship with another unit to support their work. This book surveys practice at different libraries and at different library consortia, and presents a detailed description and analysis of a variety of practices for how acquisitions units support each other within a consortium, and how they work with other library units, specifically collection management, cataloging, interlibrary loan, and the digital repository, in the form of case studies. A final section of the book covers fundamentals of collaboration.

In less than a decade, activism against the fossil fuel industry has exploded across the globe. While environmentalists used to focus on legislative goals, such as carbon emissions trading or renewable energy policies, today the most prominent activists directly attack the fossil fuel industry. This timely book offers a comprehensive evaluation of different types of activism, the success and impact of campaigns and activities, and suggestions as to ways forward. This book is the first systematic treatment of the anti-fossil fuel movement in the United States. An accessible and readable text, it is an essential reference for scholars, policymakers, activists, and citizens interested in climate change, fossil fuels, and environmental sustainability. The entire book or chapters from it can be used as required or supplementary material in various courses at the undergraduate and graduate level. As the book is not technically challenging but contains a comprehensive review of climate change, fossil fuels, and the literature on environmental activism, it can be used as an accessible introduction to

the anti-fossil fuel campaign across disciplines.

This book looks at the broad field of engineering science through the lens of nonlinear approaches. Examples focus on issues in vehicle technology, including vehicle dynamics, vehicle-road interaction, steering, and control for electric and hybrid vehicles. Also included are discussions on train and tram systems, aerial vehicles, robot-human interaction, and contact and scratch analysis at the micro/nanoscale. Chapters are based on invited contributions from world-class experts in the field who advance the future of engineering by discussing the development of more optimal, accurate, efficient, and cost and energy effective systems. This book is appropriate for researchers, students, and practicing engineers who are interested in the applications of nonlinear approaches to solving engineering and science problems.

??This volume arose from the Third Annual Workshop on Inverse Problems, held in Stockholm on May 2-6, 2012. The proceedings present new analytical developments and numerical methods for solutions of inverse and ill-posed problems, which consistently pose complex challenges to the development of effective numerical methods. The book highlights recent research focusing on reliable numerical techniques for the solution of inverse problems, with relevance to a range of fields including acoustics, electromagnetics, optics, medical

imaging, and geophysics. ?

Mathematical Modeling of the Immune System in Homeostasis, Infection and DiseaseFrontiers Media SA

This book introduces and provides commentary on a selection of published and unpublished works by Victoria Welby and exponents of the Signific Movement in the Netherlands. Beyond offering an important contribution to the reconstruction of a neglected phase in the history of ideas, it evidences the theoretical topicality of significs, in particular the focus on the relation of signs to value, meaning, and understanding, on verbal and nonverbal behavior, and on language and communication.

This book presents high-quality original contributions on positive systems, including those with positivity in compartmental switched systems, Markovian jump systems, Boolean networks, interval observer design, fault detection, and delay systems. It comprises a selection of the best papers from POSTA 2018, the 6th International Conference on Positive Systems, which was held in Hangzhou, China, in August 2018. The POSTA conference series represents a targeted response to the growing need for research that reports on and critically discusses a wide range of topics concerning the theory and applications of positive systems. The book offers valuable insights for researchers in applied

mathematics, control theory and their applications.

This book is a comprehensive introduction to the application of geoscience to criminal investigations. Clearly structured throughout, the text follows a path from the large-scale application of remote sensing, landforms and geophysics in the first half to the increasingly small-scale examination of rock and soils to trace amounts of material. The two scales of investigation are linked by geoscience applications to forensics that can be applied at a range of dimensions. These include the use of topographic mapping, x-ray imaging, geophysics and remote sensing in assessing whether sediment, rocks or concrete may have hidden or buried materials inside for example, drugs, weapons, bodies. This book describes the wider application of many different geoscience-based methods in assisting law enforcers with investigations such as international and national crimes of genocide and pollution, terrorism and domestic crime as well as accident investigation. The text makes a clear link to the increasingly important aspects of the spatial distribution of geoscience materials (be it soil sampling or the distribution of mud-spatter on clothing), Geographic Information Science and geostatistics. A comprehensive introduction to the application of geoscience to criminal investigation Examples taken from an environmental and humanitarian perspective in addition to the terrorist and domestic criminal cases more regularly

discussed A chapter on the use of GIS in criminalistics and information on unusual applications and methods - for example underwater scene mapping and extraterrestrial applications Material on how geoscience methods and applications are used at a crime scene Accompanying website including key images and references to further material An invaluable text for both undergraduate and postgraduate students taking general forensic science degrees or geoscience courses "The whole book is peppered with useful and appropriate examples from the authors' wide experiences and also from the wider literature... an essential purchase for any forensic science department as well as for any law enforcement organisation." Lorna Dawson, Macaulay Institute The field of multimedia is unique in offering a rich and dynamic forum for researchers from "traditional" fields to collaborate and develop new solutions and knowledge that transcend the boundaries of individual disciplines. Despite the prolific research activities and outcomes, however, few efforts have been made to develop books that serve as an introduction to the rich spectrum of topics covered by this broad field. A few books are available that either focus on specific subfields or basic background in multimedia. Tutorial-style materials covering the active topics being pursued by the leading researchers at frontiers of the field are currently lacking. In 2015, ACM SIGMM, the special interest group

on multimedia, launched a new initiative to address this void by selecting and inviting 12 rising-star speakers from different subfields of multimedia research to deliver plenary tutorial-style talks at the ACM Multimedia conference for 2015. Each speaker discussed the challenges and state-of-the-art developments of their prospective research areas in a general manner to the broad community. The covered topics were comprehensive, including multimedia content understanding, multimodal human-human and human-computer interaction, multimedia social media, and multimedia system architecture and deployment. Following the very positive responses to these talks, the speakers were invited to expand the content covered in their talks into chapters that can be used as reference material for researchers, students, and practitioners. Each chapter discusses the problems, technical challenges, state-of-the-art approaches and performances, open issues, and promising direction for future work. Collectively, the chapters provide an excellent sampling of major topics addressed by the community as a whole. This book, capturing some of the outcomes of such efforts, is well positioned to fill the aforementioned needs in providing tutorial-style reference materials for frontier topics in multimedia. At the same time, the speed and sophistication required of data processing have grown. In addition to simple queries, complex algorithms like machine learning and graph analysis are

becoming common. And in addition to batch processing, streaming analysis of real-time data is required to let organizations take timely action. Future computing platforms will need to not only scale out traditional workloads, but support these new applications too. This book, a revised version of the 2014 ACM Dissertation Award winning dissertation, proposes an architecture for cluster computing systems that can tackle emerging data processing workloads at scale. Whereas early cluster computing systems, like MapReduce, handled batch processing, our architecture also enables streaming and interactive queries, while keeping MapReduce's scalability and fault tolerance. And whereas most deployed systems only support simple one-pass computations (e.g., SQL queries), ours also extends to the multi-pass algorithms required for complex analytics like machine learning. Finally, unlike the specialized systems proposed for some of these workloads, our architecture allows these computations to be combined, enabling rich new applications that intermix, for example, streaming and batch processing. We achieve these results through a simple extension to MapReduce that adds primitives for data sharing, called Resilient Distributed Datasets (RDDs). We show that this is enough to capture a wide range of workloads. We implement RDDs in the open source Spark system, which we evaluate using synthetic and real workloads. Spark matches or exceeds the

performance of specialized systems in many domains, while offering stronger fault tolerance properties and allowing these workloads to be combined. Finally, we examine the generality of RDDs from both a theoretical modeling perspective and a systems perspective. This version of the dissertation makes corrections throughout the text and adds a new section on the evolution of Apache Spark in industry since 2014. In addition, editing, formatting, and links for the references have been added.

This is the first textbook on pattern recognition to present the Bayesian viewpoint. The book presents approximate inference algorithms that permit fast approximate answers in situations where exact answers are not feasible. It uses graphical models to describe probability distributions when no other books apply graphical models to machine learning. No previous knowledge of pattern recognition or machine learning concepts is assumed. Familiarity with multivariate calculus and basic linear algebra is required, and some experience in the use of probabilities would be helpful though not essential as the book includes a self-contained introduction to basic probability theory.

Are we alone? asks the writeup on the back cover of the dust jacket. The contributors to this collection raise questions that may have been overlooked by physical scientists about the ease of establishing meaningful communication with an extraterrestrial intelligence. By drawing on issues at the core of contemporary archaeology and anthropology, we can be much better prepared for contact with an extraterrestrial

civilization, should that day ever come. NASA SP-2013-4413.

Moving on from earlier stochastic and robust control paradigms, this book introduces the reader to the fundamentals of probabilistic methods in the analysis and design of uncertain systems. It significantly reduces the computational cost of high-quality control and the complexity of the algorithms involved.

The World Report on Disability suggests more than a billion people totally experience disability. They generally have poorer health, lower education and fewer economic opportunities and higher rates of poverty than people without disabilities. This report provides the best available evidence about what works to overcome barriers to better care and services.

The immune system provides the host organism with defense mechanisms against invading pathogens and tumor development and it plays an active role in tissue and organ regeneration. Deviations from the normal physiological functioning of the immune system can lead to the development of diseases with various pathologies including autoimmune diseases and cancer. Modern research in immunology is characterized by an unprecedented level of detail that has progressed towards viewing the immune system as numerous components that function together as a whole network. Currently, we are facing significant difficulties in analyzing the data being generated from high-throughput technologies for understanding immune system dynamics and functions, a problem known as the 'curse of dimensionality'. As the mainstream research in

mathematical immunology is based on low-resolution models, a fundamental question is how complex the mathematical models should be? To respond to this challenging issue, we advocate a hypothesis-driven approach to formulate and apply available mathematical modelling technologies for understanding the complexity of the immune system. Moreover, pure empirical analyses of immune system behavior and the system's response to external perturbations can only produce a static description of the individual components of the immune system and the interactions between them. Shifting our view of the immune system from a static schematic perception to a dynamic multi-level system is a daunting task. It requires the development of appropriate mathematical methodologies for the holistic and quantitative analysis of multi-level molecular and cellular networks. Their coordinated behavior is dynamically controlled via distributed feedback and feedforward mechanisms which altogether orchestrate immune system functions. The molecular regulatory loops inherent to the immune system that mediate cellular behaviors, e.g. exhaustion, suppression, activation and tuning, can be analyzed using mathematical categories such as multi-stability, switches, ultra-sensitivity, distributed system, graph dynamics, or hierarchical control. GB is supported by the Russian Science Foundation (grant 18-11-00171). AM is also supported by grants from the Spanish Ministry of Economy, Industry and Competitiveness and FEDER grant no. SAF2016-75505-R, the "María de Maeztu" Programme for Units of Excellence in R&D (MDM-2014-0370) and the Russian Science

The present book deals with the finite-part singular integral equations, the multidimensional singular integral equations and the non-linear singular integral equations, which are currently used in many fields of engineering mechanics with applied character, like elasticity, plasticity, thermoelastoplasticity, viscoelasticity, viscoplasticity, fracture mechanics, structural analysis, fluid mechanics, aerodynamics and elastodynamics. These types of singular integral equations form the latest high technology on the solution of very important problems of solid and fluid mechanics and therefore special attention should be given by the reader of the present book, who is interested for the new technology of the twentieth-one century. Chapter 1 is devoted with a historical report and an extended outline of References, for the finite-part singular integral equations, the multidimensional singular integral equations and the non-linear singular integral equations. Chapter 2 provides a finite-part singular integral representation analysis in Lp spaces and in general Hilbert spaces. In the same Chapter are investigated all possible approximation methods for the numerical evaluation of the finite-part singular integral equations, as closed form solutions for the above type of integral equations are available only in simple cases. Also, Chapter 2 provides further a generalization of the well known Sokhotski-Plemelj formulae and the Nother theorems, for the case of a finite-part singular integral equation.
Volume 1 (A and B) of the Yearbook of International Organizations covers international

organizations throughout the world, comprising their aims, activities and events Provides valuable insights on the dynamics of women's mobility, autonomy and agency in India's informal labour market. It illustrates mixed methods research and challenges the current discourse on gender and paid work using Capability Approach.

Over 220,000 entries representing some 56,000 Library of Congress subject headings. Covers all disciplines of science and technology, e.g., engineering, agriculture, and domestic arts. Also contains at least 5000 titles published before 1876. Has many applications in libraries, information centers, and other organizations concerned with scientific and technological literature. Subject index contains main listing of entries. Each entry gives cataloging as prepared by the Library of Congress. Author/title indexes

High-Achieving Students and Teachers—Winning Strategies from Title I Schools! This illuminating book shows how four outstanding Title I schools make the goal of personalized learning a reality for every student and every teacher. The common thread is commitment to equity—the belief that every child can achieve. Readers will find: Guidance on identifying obstacles to equity within your school and building a case for personalized learning Case studies showing the lived values, practices, and leadership that have helped schools transform learning

How-to's and templates for creating a team-based professional development program that helps teachers individualize instruction

Prompted by the growing body of knowledge about chaotic behavior in an increasing number of scientific disciplines, this volume brings together a distinguished group of experts to evaluate the impact that chaos has had on the conduct of science and on our understanding of society.