Lectures On Computation Frontiers In Physics

Constraints and constraint solving : an introduction / Jean-Pierre Jouannaud / - Constraint solving on terms / Hubert Comon / - Combining constraint solving / Franz Baader / - Constraints and theorem proving / Harald Ganzinger / - Functional and constraint logic programming / Mario Rodríguez-Artalejo / - Building industrial applications with constraint programming / Helmut Simonis.

In these volume scholars honor M. Rita Manzini for her contributions to the field of Generative Morphosyntax. The essays in this book celebrate her career by continuing to explore inter-area research in linguistics and by pursuing a broad comparative approach, investigating and comparing different languages and dialects.

Part of a four-volume set, this book constitutes the refereed proceedings of the 7th International Conference on Computational Science, ICCS 2007, held in Beijing, China in May 2007. The papers cover a large volume of topics in computational science and related areas, from multiscale physics to wireless networks, and from graph theory to tools for program development.

This state-of-the-art survey offers a renewed and refreshing focus on the progress in evolutionary computation, in neural networks, and in fuzzy systems. The book presents the expertise and experiences of leading researchers spanning a diverse spectrum of computational intelligence in these areas. The result is a balanced contribution to the research area of computational intelligence that should serve the community not only as a survey and a reference, but also as an inspiration for the future advancement of the state of the art of the field. The 13 selected chapters originate from lectures and presentations given at the IEEE World Congress on Computational Intelligence, WCCI 2012, held in Brisbane, Australia, in June 2012.

Frontiers of Evolutionary Computation

Frontiers of Combining Systems

verteld aan Ralph Leighton

Foundations and Frontiers in Computer, Communication and Electrical Engineering

5th International Conference, Porto, Portugal, June 26-28, 2002. Selected Papers and Invited Talks

Constraints in Computational Logics. Theory and Applications

IEEE World Congress on Computational Intelligence, WCCI 2012, Brisbane, Australia, June 10-15, 2012. Plenary/Invited Lectures

This book contains thoroughly refereed and revised papers from the 8th International Andrei Ershov Memorial Conference on Perspectives of System Informatics, PSI 2011, held in Akademgorodok, Novosibirsk, Russia, in June/July 2011. The 18 revised full papers and 10 revised short papers presented were carefully reviewed and selected from 60 submissions. The volume also contains 5 invited papers covering a range of hot topics in computer science and informatics. The papers are organized in topical sections on foundations of program and system development and analysis, partial evaluation, mixed computation, abstract interpretation, compiler construction, computer models and algorithms for bioinformatics, programming methodology and software engineering, information technologies, knowledge-based systems, and knowledge engineering.

Richard P. Feynman made profoundly important and prescient contributions to the physics of computing, notably with his seminal articles "There's Plenty of Room at the Bottom" and "Simulating Physics with Computers." These two provocative papers (both reprinted in this volume) anticipated, decades before their time, several breakthroughs that have since become fields of science in their own right, such as nanotechnology and the newest, perhaps most exciting area of physics and computer science, quantum computing.The contributors to this book are all distinguished physicists and computer scientists, and many of them were guest lecturers in Feynman's famous CalTech course on the limits of computers. they include Charles Bennett on Quantum Information Theory, Geoffrey Fox on Internetics, Norman Margolus on Crystalline Computation, and Tommaso Toffoli on the Fungibility of Computation.Both a tribute to Feynman and a new exploration of the limits of computers by some of today's most influential scientists, Feynman and Computation continues the pioneering work started by Feynman and published by him in his own Lectures on Computation. This new computation volume consists of both original chapters and reprints of classic papers by leaders in the field. Feynman and Computation will generate great interest from the scientific community and provide essential background for further work in this field.

Clusters of workstations/PCs connected by o?-the-shelf networks have become popular as a platform for cost-e?ective parallel computing. Hardware and so- ware technological advances have made this network-based parallel computing platform feasible. A large number of research groups from academia and industry are working to enhance the capabilities of such a platform, thereby improving its cost-e?ectiveness and usability. These developments are facilitating the mig- tion of many existing applications as well as the development of new applications on this platform. Continuing in the tradition of the two previously successful workshops, this 3rd Workshop on Communication, Architecture and Applications for Netwo- based Parallel Computing (CANPC'99) has brought together researchers and practitioners working in architecture, system software, applications and perf- mance evaluation to discuss state-of-the-art solutions for network-based parallel computing systems. This workshop has become an excellent forum for timely dissemination of ideas and healthy interaction on topics at the cutting edge in cluster computing technology. Each submitted paper underwent a rigorous review process, and was assigned to at least 3 reviewers, including at least 2 program committee members. Each paper received at least 2 reviews, most received 3 and some even had 4 reviews.

The open research center project "Interdisciplinary fundamental research toward realization of a quantum computer" has been supported by the Ministry of Education, Japan for five years. This is a collection of the research outcomes by the members engaged in the project. To make the presentation self-contained, it starts with an overview by Mikio Nakahara, which serves as a concise introduction to quantum information and quantum computing. Subsequent contributions include subjects from physics, chemistry, mathematics, and information science, reflecting upon the wide variety of scientists working under this project. These contributions introduce NMR quantum computing and related techniques, number theory and coding theory, quantum error correction, photosynthesis, non-classical correlations and entanglement, neutral atom quantum computer, among others. Each of the contributions will serve as a short introduction to these cutting edge research fields.

Handbook of Research on Methodologies and Applications of Supercomputing

IEEE World Congress on Computational Intelligence, WCCI 2008, Hong Kong, China, June 1-6, 2008, Plenary/Invited Lectures

With Applications To Fusion And Astrophysics

Linguistic Variation: Structure and Interpretation

Computational Methods in Science and Engineering

Principles, Algorithms and Applications

Festschrift in Honor of Volker Mehrmann

Parallel Scientific Computation presents a methodology for designing parallel algorithms and writing parallel computer programs for modern computer architectures with multiple processors.

All papers have been peer-reviewed. The aim of ICCMSE 2007 is to bring together computational scientists and engineers from several disciplines in order to share methods, methodologies and ideas. The potential readers of these proceedings are all the scientists with interest in the following fields: Computational Mathematics, Theoretical Physics, Computational Physics, Theoretical Chemistry, Computational Chemistry, Mathematical Chemistry, Computational Engineering, Computational Mechanics, Computational Biology and Medicine, Scientific Computation, High Performance Computing, Parallel and Distributed Computing, Visualization, Problem Solving Environments, Software Tools, Advanced Numerical Algorithms, Modeling and Simulation of Complex Systems, Web-based Simulation and Computing, Grid-based Simulation and Computing, Computational Grids, and Computer Science.

This state-of-the-art survey offers a renewed and refreshing focus on the progress in nature-inspired and linguistically motivated computation. The book presents the expertise and experiences of leading researchers spanning a diverse spectrum of computational intelligence in the areas of neurocomputing, fuzzy systems, evolutionary computation, and adjacent areas. The result is a balanced contribution to the field of computational intelligence that should serve the community not only as a survey and a reference, but also as an inspiration for the future advancement of the state of the art of the field. The 18 selected chapters originate from lectures and presentations given at the 5th IEEE World Congress on Computational Intelligence, WCCI 2008, held in Hong Kong, China, in June 2008. After an introduction to the field and an overview of the volume, the chapters are divided into four topical sections on machine learning and brain computer interface, fuzzy modeling and control, computational evolution, and applications.

Covering the theory of computation, information and communications, the physical aspects of computation, and the physical limits of computers, this text is based on the notes taken by one of its editors, Tony Hey, on a lecture course on computation given b

Computational Methods in Neural Modeling

FEYNMAN LECTURES ON COMPUTATION

Constraints in Computational Logics: Theory and Applications

Theory and Computation: Old Problems and New Challenges Volume 1

The Fourth Symposium on the Frontiers of Massively Parallel Computation

High Performance Computing for Computational Science - VECPAR 2002

Diversities in Quantum Computation and Quantum Information

Proceedings of the meeting held in McLean, Virginia, October 19-21, 1992 on compiling and languages for MIMD and SIMD, algorithms, architectures, numerical applications and algorithms, networks, algorithm-software issues, imaging and visualization, hypercube systems, programs for dataflow and data p

This book is a collection of lecture notes from the Symposium on Quantum Computing, Thermodynamics, and Statistical Physics, held at Kinki University in March 2012. Quantum information theory has a deep connection with statistical physics and thermodynamics. This volume introduces some of the topics on interface among the mentioned fields. Subjects included in the lecture notes include quantum annealing method, nonequilibrium thermodynamics and spin glass theory, among others. These subjects were presented with much emphasis put in its relevance in quantum information theory. These lecture notes are prepared in a self-contained manner so that a reader with modest background may understand the subjects.

Constraints provide a declarative way of representing infinite sets of data. They are well suited for combining different logical or programming paradigms as has been known for constraint logic programming since the 1980s and more recently for functional programming. The use of constraints in automated deduction is more recent and has proved to be very successful, moving the control from the meta-level to the constraints, which are now first-class objects. This monograph-like book presents six thoroughly reviewed and revised lectures given by leading researchers at the summer school organized by the ESPRIT CCL Working Group in Gif-sur-Yvette, France, in September 1999. The book offers coherently written chapters on constraints and constraint solving, constraint solving on terms, combining constraint solving, constraints and theorem proving, functional and constraint logic programming, and building industrial applications.

Het levensverhaal van de Amerikaanse natuurkundige en Nobelprijswinnaar (1918-1988).

Natural Computing for Simulation and Knowledge Discovery

Frontiers '92

Lectures on Global Optimization

Computational Science - ICCS 2007

7th International Conference, Beijing China, May 27-30, 2007, Proceedings, Part II

State of the Art in Scientific Computing

Theoretical Perspective in High Energy Physics

The book "Cognitive and Computational Neuroscience - Principles, Algorithms and Applications" will answer the following question and statements: System-level neural modeling: what and why? We know a lot about the brain! Need to integrate data: molecular/cellular/system levels. Complexity: need to abstract away higher-order principles. Models are tools to develop explicit theories, constrained by multiple levels (neural and behavioral). Key: models (should) make novel testable predictions on both neural and behavioral levels. Models are useful tools for guiding experiments. The hope is that the information provided in this book will trigger new researches that will help to connect basic neuroscience to clinical medicine.

This book constitutes the refereed proceedings of the 8th International Symposium on Frontiers of Combining Systems, FroCoS 2011, held in Saarbrücken, Germany, in October 2011. The 15 revised full papers presented together with three invited papers were carefully reviewed and selected from 22 submissions. The event builds a common forum for research activities in the general area of combination, modularization and integration of systems, with emphasis on logic-based ones, and of their practical use.

The open research center project "Interdisciplinary fundamental research toward realization of a quantum computer" has been supported by the Ministry of Education, Japan for five years. This is a collection of the research outcomes by the members engaged in the project. To make the presentation self-contained, it starts with an overview Mikio Nakahara, which serves as a concise introduction to quantum information and quantum computing. Subsequent contributions include subjects from physics, chemistry, mathematics, and information science, reflecting upon the wide variety of scientists working under this project. These contributions introduce NMR quantum computing and related techniques, number theory and coding theory, quantum error correction, photosynthesis, non-classical correlations and entanglement, neutral atom quantum computer, among others. Each of contributions will serve as a short introduction to these cutting edge research fields. Contents:Computing with Quanta (M Nakahara)Implementation of a Selective Two-Qubit Gate Operation in a Neutral Atom Quantum Computer (E H Lapasar, K Kasamatsu, Y Kondo, M Nakahara and T Ohmi)Magnetic Resonance as an Experimental Device for Quantum Computing Research (M Chiba and Y Kondo)Introduction to Surface Code Quantum Computation (Y Wan)Quantum Computing and Number Theory (Y Sasaki)Linear Preservers in Nonclassical Correlation Theories: An Introduction (A SaiToh, R Rahimi and M Nakahara)Identification of the Hamiltonian of a 3-Particle Ising Model with Local Transverse Fields (M A Fasihi, S Tanaka, M Nakahara and Y Kondo)How to Evaluate the Area Surrounded by Segments on a Unit Sphere? (Y Kondo)Microscopic Properties of Quantum Annealing — Application to Fully Frustrated Ising Systems (S Tanaka)Implementation of Unitary Quantum Error Correction (H Tomita)Spin Crossover Properties of Iron(II) Complexes with a N4O2 Donor Set by Extended ?-Conjugated Schiff-base Ligands (T Kuroda)OKNMR Spectroscopic Studies of Light-Harvesting Bacteriochlorophylls Purified from Green Sulfur Photosynthetic Bacteria (Y Hirai and Y Saga)Spectroscopic Studies of Individual Extramembranous Light-Harvesting Complexes of Green Photosynthetic Bacteria (Y Saga)Entanglement Operator for a Multi-Qubit System (C Bagnasco, Y Kondo and M Nakahara)Some Topics in Coding Theory (K Chinen) Readership: Graduate students and researchers in physics, chemistry, mathematics, informatics and computer science. Also accessible to advanced undergraduate students. Keywords:Quantum Information;Quantum Computer;Entanglement;Non-Classical Correlation;NMR;Number Theory;Coding Theory;Hamiltonian Estimation;Holonomy;Quantum Annealing;Quantum Error Correction;Photosynthesis

Lectures On ComputationPerseus Books

The Real World Is Not A Game Of Go

Numerical Algebra, Matrix Theory, Differential-Algebraic Equations and Control Theory

Proceedings of the 3rd International Conference C2E2, Mankundu, West Bengal, India, 15th-16th January, 2016.

7th International Work-Conference on Artificial and Natural Neural Networks, IWANN 2003, Maó, Menorca, Spain, June 3-6. Proceedings, Part I

Cognitive and Computational Neuroscience

Quantum Information and Quantum Computing

This book explores mental disorders from a uniquely evolutionary perspective. Although there have been many attempts to mathematically model neural processes and, to some extent, their dysfunction, there is very little literature that models mental function within a sociocultural, socioeconomic, and environmental context. Addressing this gap in the extant literature, this book explores essential aspects of mental disorders, recognizing the ubiquitous role played by the exaptation of crosstalk between cognitive modules at many different scales and levels of organization, the missing heritability of complex diseases, and cultural epigenetics. Further, it introduces readers to valuable control theory tools that permit the exploration of the environmental induction of neurodevelopmental disorders, as well as the study of the synergism between culture, psychopathology and sleep disorders, offering a distinctively unique resource.

Parallel and High Performance Computing offers techniques guaranteed to boost your code's effectiveness. Summary Complex calculations, like training deep learning models or running large-scale simulations, can take an extremely long time. Efficient parallel programming can save hours—or even days—of computing time. Parallel and High Performance Computing shows you how to deliver faster run-times, greater scalability, and increased energy efficiency to your programs by mastering parallel techniques for multicore processor and GPU hardware. About the technology Write fast, powerful, energy efficient programs that scale to tackle huge volumes of data. Using parallel programming, your code spreads data processing tasks across multiple CPUs for radically better performance. With a little help, you can create software that maximizes both speed and efficiency. About the book Parallel and High Performance Computing offers techniques guaranteed to boost your code's effectiveness. You'll learn to evaluate hardware architectures and work with industry standard tools such as OpenMP and MPI. You'll master the data structures and algorithms best suited for high performance computing and learn techniques that save energy on handheld devices. You'll even run a massive tsunami simulation across a bank of GPUs. What's inside Planning a new parallel project Understanding differences in CPU and GPU architecture Addressing underperforming kernels and loops Managing applications with batch scheduling About the reader For experienced programmers proficient with a high-performance computing language like C, C++, or

Fortran. About the author Robert Robey works at Los Alamos National Laboratory and has been active in the field of parallel computing for over 30 years. Yuliana Zamora is currently a PhD student and Siebel Scholar at the University of Chicago, and has lectured on programming modern hardware at numerous national conferences. Table of Contents PART 1 INTRODUCTION TO PARALLEL COMPUTING 1 Why parallel computing? 2 Planning for parallelization 3 Performance limits and profiling 4 Data design and performance models 5 Parallel algorithms and patterns PART 2 CPU: THE PARALLEL WORKHORSE 6 Vectorization: FLOPs for free 7 OpenMP that performs 8 MPI: The parallel backbone PART 3 GPUS: BUILT TO ACCELERATE 9 GPU architectures and concepts 10 GPU programming model 11 Directive-based GPU programming 12 GPU languages: Getting down to basics 13 GPU profiling and tools PART 4 HIGH PERFORMANCE COMPUTING ECOSYSTEMS 14 Affinity: Truce with the kernel 15 Batch schedulers: Bringing order to chaos 16 File operations for a parallel world 17 Tools and resources for better code These lecture notes are dedicated to the most recent theoretical applications of Black Hole solutions in high-energy physics. The main motivation of this volume is to present the latest black hole backgrounds that are relevant for gauge/gravity correspondence. Leading scientists in the field explain effective techniques for finding singular and cosmological solutions embedded in gauged supergravity, shedding light on underlying properties and symmetries. Starting from a basic level, the mathematical structures underlying black holes and cosmologies are revealed, helping the reader grasp the connection between theoretical approaches and physical observations with insights into possible future developments from both a theoretical and experimental point of view. The topics covered in this volume are based on lectures delivered during the "Theoretical Frontiers in Black Holes and Cosmology" school, held in Natal in June 2015.

The two-volume set LNCS 2686 and LNCS 2687 constitute the refereed proceedings of the 7th International Work-Conference on Artificial and Natural Neural Networks, IWANN 2003, held in MaÃ3, Menorca, Spain in June 2003.The 197 revised papers presented were carefully reviewed and selected for inclusion in the book and address the following topics: mathematical and computational methods in neural modelling, neurophysiological data analysis and modelling, structural and functional models of neurons, learning and other plasticity phenomena, complex systems dynamics, cognitive processes and artificial intelligence, methodologies for net design, bio-inspired systems and engineering, and applications in a broad variety of fields.

Third International Workshop, Gent, Belgium, July 4-5, 2011, Revised Papers

8th International Andrei Ershov Memorial Conference, PSI 2011, Novosibirsk, Russia, June 27 - July 1, 2011, Revised Selected Papers

Heel geestig, meneer Feynman!

Third International Workshop, CANPC'99, Orlando, Florida, USA, January 9th, 1999, Proceedings

9th International Symposium, FroCoS 2013, Nancy, France, September 18-20, 2013, Proceedings

Network-Based Parallel Computing Communication, Architecture, and Applications

Lectures On Computation

This book is a collection of lecture notes and contributions in "Summer School on Diversities in Quantum Computation/Information" held on 1-5 August, 2010 at U-Community Hotel, Higashi-Osaka, Japan. Lecturers are world class authorities in respective areas in quantum information and quantum computing including physics, mathematics, chemistry and information science. They lectured on cutting-edge research frontiers where they are currently working, including quantum error correction, relativistic quantum information, quantum computing of link polynomials, quantum algorithms, etc. Each lecture note is written in a self-contained manner so that it may be used as a textbook for one semester graduate course or advanced undergraduate course. Contributions report current research subjects also in a self-contained manner. We believe that these articles are accessible to the readers form various disciplines.

This book constitutes the refereed proceedings of the 9th International Symposium on Frontiers of Combining Systems, FroCoS 2013, held in Nancy, France, in September 2013. The 20 revised full papers presented together with 4 invited papers were carefully reviewed and selected from 33 submissions. FroCoS'13 seeks to offer a common forum for research in the general area of combination, modularization and integration of systems, with emphasis on logic-based ones, and of their practical use. Typical topics of interest include following subjects: combinations of logics such as combined predicate, temporal, modal or epistemic logics, combinations and modularity in ontologies, combination of decision, procedures, of satisfiability, procedures and of constraint solving techniques, combinations and modularity in term rewriting, integration of equational and other theories into deductive systems, combination of deduction systems and computer algebra, integration of data structures into constraint logic programming and deduction, and modularizing programs and specifications.

Frontiers of Evolutionary Computation brings together eleven contributions by international leading researchers discussing what significant issues still remain unresolved in the field of Evolutionary Computation (Ee. They explore such topics as the role of building blocks, the balancing of exploration with exploitation, the modeling of EC algorithms, the connection with optimization theory and the role of EC as a meta-heuristic method, to name a few. The articles feature a mixture of informal discussion interspersed with formal statements, thus providing the reader an opportunity to observe a wide range of EC problems from the investigative perspective of world-renowned researchers. These prominent researchers include: Heinz M]hlenbein, Kenneth De Jong, Carlos Cotta and Pablo Moscato, Lee Altenberg, Gary A. Kochenberger, Fred Glover, Bahram Alidaee and Cesar Rego, William G. Macready, Christopher R. Stephens and Riccardo Poli, Lothar M. Schmitt, John R. Koza, Matthew J. Street and Martin A. Keane, Vivek Balaraman, Wolfgang Banzhaf and Julian Miller.

Nature has long provided the inspiration for a variety of scientific discoveries in engineering, biomedicine, and computing, though only recently have these elements of nature been used directly in computational systems. Natural Computing for Simulation and Knowledge Discovery investigates the latest developments in nature-influenced technologies. Within its pages, readers will find an in-depth analysis of such advances as cryptographic solutions based on cell division, the creation and manipulation of biological computers, and particle swarm optimization techniques. Scientists, practitioners, and students in fields such as computing, mathematics, and molecular science will make use of this essential reference to explore current trends in natural computation and advance nature-inspired technologies to the next generation.

Lectures on Quantum Computing, Thermodynamics and Statistical Physics

Feynman Lectures On Gravitation

Perspectives of Systems Informatics

Computational Intelligence: Research Frontiers

Lectures Presented in the International Conference of Computational Methods in Sciences and Engineering (ICCMSE 2005)

Energy Limits in Computation

A Review of Landauer's Principle, Theory and Experiments

A large number of mathematical models in many diverse areas of science and engineering have lead to the formulation of optimization problems where the best solution (globally optimal) is needed. Due to the interdisciplinary nature of global optimization, there has been astonishing progress in this field during the last few decades. Many powerful computational algorithms and new theoretical developments have been introduced to solve a spectrum of hard problems in several disciplines. This book covers a small subset of recent important topics in global optimization with emphasis on recent theoretical developments and scientific applications. The chapters are based on the talks presented at the workshop on 'Global Optimization: Methods and Applications' that was held at the Fields Institute from May 11-12, 2007. The target audience includes graduate students in mathematics, engineering, and sciences, academic researchers, as well as practitioners, who use global optimization for their specific needs and applications.

The 3rd International Conference on Foundations and Frontiers in Computer, Communication and Electrical Engineering is a notable event which brings together academia, researchers, engineers and students in the fields of Electronics and Communication, Computer and Electrical Engineering making the conference a perfect platform to share experience, f

The 5th edition of the VECPAR series of conferences marked a change of the conference title. The full conference title now reads VECPAR 2002 — 5th Int- national Conference on High Performance Computing for Computational S- ence. This re?ects more accurately what has been the main emphasis of the conference since its early days in 1993 – the use of computers for solving pr- lems in science and engineering. The present postconference book includes the best papers and invited talks presented during the three days of the conference, held at the Faculty of Engineering of the University of Porto (Portugal), June 26-28 2002. The book is organized into 8 chapters, which as a whole appeal to a wide research community, from those involved in the engineering applications to those interested in the actual details of the hardware or software implementation, in line with what, in these days, tends to be considered as Computational Science and Engineering (CSE). The book comprises a total of 49 papers, with a prominent position reserved for the four invited talks and the two ?rst prizes of the best student paper competition.

As computers continue to remain essential tools for the pursuit of physics, medicine, economics, social sciences, and more, supercomputers are proving that they can further extend and greatly enhance as-of-yet undiscovered knowledge and solve the world□s most complex problems. As these instruments continue to lead to groundbreaking discoveries and breakthroughs, it is imperative that research remains up to date with the latest findings and uses. The Handbook of Research on Methodologies and Applications of Supercomputing is a comprehensive and critical reference book that provides research on the latest advances of control flow and dataflow supercomputing and highlights selected emerging big data applications needing high acceleration and/or low power. Consequently, this book advocates the need for hybrid computing, where the control flow part represents the host architecture and dataflow part represents the acceleration architecture. These issues cover the initial eight chapters. The remaining eight chapters cover selected modern applications that are best implemented on a hybrid computer, in which the transactional parts (serial code) are implemented on the control flow part and the loops (parallel code) on the dataflow part. These final eight chapters cover two major application domains: scientific computing and computing for digital economy. This book offers applications in marketing, medicine, energy systems, and library science, among others, and is an essential source for scientists, programmers, engineers, practitioners, researchers, academicians, and students interested in the latest findings and advancements in supercomputing.

International Summer School, CCL'99 Gif-sur-Yvette, France, September 5-8, 1999 Revised Lectures

8th International Symposium, FroCoS 2011, Saarbrücken, Germany, October 5-7, 2011. Proceedings

Applied Parallel Computing

Advances in Computational Intelligence

Theoretical Frontiers in Black Holes and Cosmology

In the Frontiers of Computational Science

Parallel and High Performance Computing

The physics of plasmas is an extremely rich and complex subject as the variety of topics addressed in this book demonstrates. This richness and complexity demands new and powerful techniques for investigating plasma physics. An outgrowth from his graduate course teaching, now with corrections, Tajima's text provides not only a lucid introduction to computational plasma physics, but also offers the reader many examples of the way numerical modeling, properly handled, can provide valuable physical understanding of the nonlinear aspects so often encountered in both laboratory and astrophysical plasmas. Included here are computational methods for modern nonlinear physics as applied to hydrodynamic turbulence, solitons, fast reconnection of magnetic fields, anomalous transports, dynamics of the sun, and more. The text contains examples of problems now solved using computational techniques including those concerning finite-size particles, spectral techniques, implicit differencing, gyrokinetic approaches, and particle simulation.

The Feynman Lectures on Gravitation are based on notes prepared during a course on gravitational physics that Richard Feynman taught at Caltech during the 1962-63 academic year. For several years prior to these lectures, Feynman thought long and hard about the fundamental problems in gravitational physics, yet he published very little. These lectures represent a useful record of his viewpoints and some of his insights into gravity and its application to cosmology, superstars, wormholes, and gravitational waves at that particular time. The lectures also contain a number of fascinating digressions and asides on the foundations of physics and other issues.Characteristically, Feynman took an untraditional non-geometric approach to gravitation and general relativity based on the underlying quantum aspects of gravity. Hence, these lectures contain a unique pedagogical account of the development of Einstein's general theory of relativity as the inevitable result of the demand for a self-consistent theory of a massless spin-2 field (the graviton) coupled to the energy-momentum tensor of matter. This approach also demonstrates the intimate and fundamental connection between gauge invariance and the principle of equivalence.

This book constitutes the refereed proceedings of the 7th International Conference on Applied Parallel Computing, PARA 2004, held in June 2004. The 118 revised full papers presented together with five invited lectures and 15 contributed talks were carefully reviewed and selected for inclusion in the proceedings. The papers are organized in topical sections.

The language of business is the language of dreams, but the language of war is the language of nightmare made real. Yet business dreams of driverless cars on intelligent roads, and of other real-time critical systems under the control of algorithmic entities, have much of war about them. Such systems, including military institutions at the tactical, operational and strategic scales, act on rapidly-shifting roadway topologies whose 'traffic rules' can rapidly change. War is never without both casualty and collateral damage, and realtime critical systems of any nature will inevitably partake of fog-of-war and frictional challenges almost exactly similar to those that have made warfare intractable for modern states. Into the world of Carl von Clausewitz, John Boyd, Mao Tse-Tung, Vo Nguyen Giap and Genghis Khan, come the brash, bright-eyed techies of Alphabet, Microsoft, Amazon, and Uber who forthrightly step in where a phalanx of angels has not feared to tread, but treaded badly indeed. In this book we use cutting-edge tools from information and control theories to examine canonical and idiosyncratic failure modes of real-time cognitive systems facing fog-of-war and frictional constraints. In sum, nobody ever navigates, or can navigate, the landscapes of Carl von Clausewitz unscathed.

A Systems Biology Approach to the Epigenetics of Mental Disorders

A Structured Approach Using BSP

Feynman And Computation

Computational Psychiatry

Reversible Computation

Parallel Scientific Computation

Computational Plasma Physics

This edited volume highlights the scientific contributions of Volker Mehrmann, a leading expert in the area of numerical (linear) algebra, matrix theory, differential-algebraic equations and control theory. These mathematical research areas are strongly related and often occur in the same real-world applications. The main areas where such applications emerge are computational engineering and sciences, but increasingly also social sciences and economics. This book also reflects some of Volker Mehrmann's major career stages. Starting out working in the areas of numerical linear algebra (his first full professorship at TU Chemnitz was in "Numerical Algebra," hence the title of the book) and matrix theory, Volker Mehrmann has made significant contributions to these areas ever since. The highlights of these are discussed in Parts I and II of the present book. Often the development of new algorithms in numerical linear algebra is motivated by problems in system and control theory. These and his later major work on differential-algebraic equations, to which he together with Peter Kunkel made many groundbreaking contributions, are the topic of the chapters in Part III. Besides providing a scientific discussion of Volker Mehrmann's work and its impact on the development of several areas of applied mathematics, the individual chapters stand on their own as reference works for selected topics in the fields of numerical (linear) algebra, matrix theory, differential-algebraic equations and control theory.

This book constitutes the thoroughly refereed post-conference proceedings of the 7th International Reversible Computation, RC 2011, held in Gent, Belgium, in July 2011. The 10 revised full papers presented were carefully reviewed and selected from 25 initial submissions for inclusion in the book. The papers are devoted to all aspects of reversible computation, ranging from theoretical and experimental aspects to various applications. Topics addressed are: functional language for reversible computations, logic design, reversible circuits designed by a software toolkit called RevKit, application of reversible computation to the domain of quantum circuits, and physical realizations of reversible circuits in CMOS technologies.

This volume contains a collection of the lectures of the invited speakers and symposium organizers presented at the International Conference of Computational methods in Science and Engineering (ICCMSE 2005), held in Corinth, Greece, October 2005. The content of the papers bears upon new developments of Computational Science pertinent to Physics, Chemistry, Biology, Medicine, Mathematics and Engineering. Molecular Science is a privileged ground for the application and evaluation of new mathematical tools and computational methods. In recent years, novelty and progress with greatest conceivable speed is common experience. This flavor of research findings carrying many consequences for distant fields is easily evidenced in the lectures collected in this volume.

This book is a single-source reference to the issues involved in the Landauer principle, which has gained new prominence recently, due to the large amount of heat generated by today's computers. If Landauer's principle is correct, there may be ways to build computers that dissipate far less power (corresponding to heat generated) than today's computers. This book brings together all sides of the discussions regarding Landauer's principle, both theoretical and experimental, empowering readers to gain better understanding of dissipation in computation, and the limits if any to progress in computation related to energy dissipation. It represents the best and most thorough examination of the important issue of Landauer's principle that is available in one volume. Provides an in-depth investigation of the Landauer principle and how it relates to the possible existence of lower bounds on dissipation in computation; Gathers together both sides of the discussion: those who agree with Landauer and his conclusions, and those who think that Landauer was not correct, offering fresh perspective on the issues in the new light of experiments; Offers insight into the future of silicon CMOS and the limits if any to progress in computation related to energy dissipation.

Carl von Clausewitz, the Fog-of-War, and the AI Revolution