Computational Science And Engineering Springer

This book presents a collection of research findings and proposals on computer science and computer engineering, introducing readers to essential concepts, theories, and applications. It also shares perspectives on how cutting-edge and established methodologies and techniques can be used to obtain new and interesting results. Each chapter focuses on a specific aspect of computer science or computer engineering, such as: software engineering, complex systems, computational intelligence, embedded systems, and systems engineering. As such, the book will bring students and professionals alike up to date on key advances in these areas.

This comprehensive textbook introduces students to the wide-ranging responsibilities of computing, science and engineering professionals by laying strong transdisciplinary foundations and by highlighting ethical issues that may arise during their careers. The work is well illustrated, and makes extensive use of both activities, and ethical dilemmas which are designed to stimulate reader engagement. A number of memorable case studies are also included and frequently draw on the demanding aerospace industry. The book adopts a strongly human centric approach, with matters such as privacy erosion and censorship being viewed not only in their current context but also in terms of their ongoing evolution. What are our individual ethical responsibilities for ensuring that we do not develop for future generations a technological leviathan with the potential to create a dystopian world? A broad range of technologies and techniques are introduced and are examined within an ethical framework. These include biometrics, surveillance systems (including facial recognition), radio frequency identification devices, drone technologies, the Internet of Things, and robotic systems. The application and potential societal ramifications of such systems are examined in some detail and this is intended to support the reader in gaining a clear insight into our current direction of travel. Importantly, the author asks whether we can afford to allow ongoing developments to be primarily driven by market forces, or whether a more cautious approach is needed. Further chapters examine the benefits that are associated with ethical leadership, environmental issues relating to the technology product lifecycle (from inception to e-waste), ethical considerations in research (including medical experimentation involving both humans and animals), and the need to develop educational programs which will better prepare students for the needs of a much more fluid employment landscape. The final chapter introduces a structured approach to ethical issue resolution, providing a valuable, long-term source of reference. In addition it emphasises the ethical responsibilities of the professional, and considers issues that can arise when we endeavour to effect ethically sound change within organisations. Examples are provided which highlight the possible ramifications of exercising ethical valour. The author has thus created an extensively referenced textbook that catalyses student interest, is internationally

relevant, and which is multicultural in both its scope and outlook.

Scripting with Python makes you productive and increases the reliability of your scientific work. Here, the author teaches you how to develop tailored, flexible, and efficient working environments built from small programs (scripts) written in Python. The focus is on examples and applications of relevance to computational science: gluing existing applications and tools, e.g. for automating simulation, data analysis, and visualization; steering simulations and computational experiments; equipping programs with graphical user interfaces; making computational Web services; creating interactive interfaces with a Maple/Matlab-like syntax to numerical applications in C/C++ or Fortran; and building flexible object-oriented programming interfaces to existing C/C++ or Fortran libraries.

This contributed volume collects papers presented at a special session of the conference Computational and Mathematical Methods in Science and Engineering (CMMSE) held in Cadiz, Spain from June 30 - July 6, 2019. Covering the applications of integral methods to scientific developments in a variety of fields, ranging from pure analysis to petroleum engineering, the chapters in this volume present new results in both pure and applied mathematics. Written by well-known researchers in their respective disciplines, each chapter shares a common methodology based on a combination of analytic and computational tools. This approach makes the collection a valuable, multidisciplinary reference on how mathematics can be applied to various real-world processes and phenomena. Computational and Analytic Methods in Science and Engineering will be ideal for applied mathematicians, physicists, and research engineers.

This book comprises high-quality refereed research papers presented at the Fourth International Conference on Computer Science, Engineering and Education Applications (ICCSEEA2021), held in Kyiv, Ukraine, on January 23-24, 2021, organized jointly by the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", National Aviation University, and the International Research Association of Modern Education and Computer Science. The topics discussed in the book include state-of-the-art papers in computer science, artificial intelligence, engineering techniques, genetic coding systems, deep learning with its medical applications, and knowledge representation with its applications in education. It is an excellent source of references for researchers, graduate students, engineers, management practitioners, and undergraduate students interested in computer science and their applications in engineering and education.

This volume constitutes the refereed proceedings of the 7th Workshop on Engineering Applications, WEA 2020, held in Bogota, Colombia, in October 2020. The 32 revised full papers and 12 short papers presented in this volume were carefully reviewed and selected from 136 submissions. The papers are organized in the following topical sections: computational intelligence; computer science; optimization; bioengineering; military applications; simulation, IoT and networks;

power applications.

Source coding theory has as its goal the characterization of the optimal performance achievable in idealized communication systems which must code an information source for transmission over a digital communication or storage channel for transmission to a user. The user must decode the information into a form that is a good approximation to the original. A code is optimal within some class if it achieves the best possible fidelity given whatever constraints are imposed on the code by the available channel. In theory, the primary constraint imposed on a code by the channel is its rate or resolution, the number of bits per second or per input symbol that it can transmit from sender to receiver. In the real world, complexity may be as important as rate. The origins and the basic form of much of the theory date from Shan non's classical development of noiseless source coding and source coding subject to a fidelity criterion (also called rate-distortion theory) [73] [74]. Shannon combined a probabilistic notion of information with limit theo rems from ergodic theory and a random coding technique to describe the optimal performance of systems with a constrained rate but with uncon strained complexity and delay. An alternative approach called asymptotic or high rate quantization theory based on different techniques and approx imations was introduced by Bennett at approximately the same time [4]. This approach constrained the delay but allowed the rate to grow large.

This book is open access under a CC BY 4.0 license. This easy-to-read book introduces the basics of solving partial differential equations by means of finite difference methods. Unlike many of the traditional academic works on the topic, this book was written for practitioners. Accordingly, it especially addresses: the construction of finite difference schemes, formulation and implementation of algorithms, verification of implementations, analyses of physical behavior as implied by the numerical solutions, and how to apply the methods and software to solve problems in the fields of physics and biology.

This book presents the state-of-the-art in supercomputer simulation. It includes the latest findings from leading researchers using systems from the High Performance Computing Center Stuttgart (HLRS) in 2020. The reports cover all fields of computational science and engineering ranging from CFD to computational physics and from chemistry to computer science with a special emphasis on industrially relevant applications. Presenting findings of one of Europe's leading systems, this volume covers a wide variety of applications that deliver a high level of sustained performance. The book covers the main methods in high-performance computing. Its outstanding results in achieving the best performance for production codes are of particular interest for both scientists and engineers. The book comes with a wealth of color illustrations and tables of results.

This contributed volume highlights two areas of fundamental interest in high-performance computing: core algorithms for important kernels and computationally demanding applications. The first few chapters explore

algorithms, numerical techniques, and their parallel formulations for a variety of kernels that arise in applications. The rest of the volume focuses on state-of-the-art applications from diverse domains. By structuring the volume around these two areas, it presents a comprehensive view of the application landscape for high-performance computing, while also enabling readers to develop new applications using the kernels. Readers will learn how to choose the most suitable parallel algorithms for any given application, ensuring that theory and practicality are clearly connected. Applications using these techniques are illustrated in detail, including: Computational materials science and engineering Computational cardiovascular analysis Multiscale analysis of wind turbines and turbomachinery Weather forecasting Machine learning techniques Parallel Algorithms in Computational Science and Engineering will be an ideal reference for applied mathematicians, engineers, computer scientists, and other researchers who utilize high-performance computing in their work.

Scientific computing is the study of how to use computers effectively to solve problems that arise from the mathematical modeling of phenomena in science and engineering. It is based on mathematics, numerical and symbolic/algebraic computations and visualization. This book serves as an introduction to both the theory and practice of scientific computing, with each chapter presenting the basic algorithms that serve as the workhorses of many scientific codes; we explain both the theory behind these algorithms and how they must be implemented in order to work reliably in finite-precision arithmetic. The book includes many programs written in Matlab and Maple – Maple is often used to derive numerical algorithms, whereas Matlab is used to implement them. The theory is developed in such a way that students can learn by themselves as they work through the text. Each chapter contains numerous examples and problems to help readers understand the material "hands-on".

Focusing on five main groups of interdisciplinary problems, this book covers a wide range of topics in mathematical modeling, computational science and applied mathematics. It presents a wealth of new results in the development of modeling theories and methods, advancing diverse areas of applications and promoting interdisciplinary interactions between mathematicians, scientists, engineers and representatives from other disciplines. The book offers a valuable source of methods, ideas, and tools developed for a variety of disciplines, including the natural and social sciences, medicine, engineering, and technology. Original results are presented on both the fundamental and applied level, accompanied by an ample number of real-world problems and examples emphasizing the interdisciplinary nature and universality of mathematical modeling, and providing an excellent outline of today's challenges. Mathematical modeling, with applied and computational methods and tools, plays a fundamental role in modern science and engineering. It provides a primary and ubiquitous tool in the context making new discoveries, as well as in the development of new theories and techniques for solving key problems arising in

scientific and engineering applications. The contributions, which are the product of two highly successful meetings held jointly in Waterloo, Ontario, Canada on the main campus of Wilfrid Laurier University in June 2015, i.e. the International Conference on Applied Mathematics, Modeling and Computational Science, and the Annual Meeting of the Canadian Applied and Industrial Mathematics (CAIMS), make the book a valuable resource for any reader interested in a broader overview of the methods, ideas and tools involved in mathematical and computational approaches developed for other disciplines, including the natural and social sciences, engineering and technology.

This book presents the state-of-the-art in supercomputer simulation. It includes the latest findings from leading researchers using systems from the High Performance Computing Center Stuttgart (HLRS) in 2018. The reports cover all fields of computational science and engineering ranging from CFD to computational physics and from chemistry to computer science with a special emphasis on industrially relevant applications. Presenting findings of one of Europe's leading systems, this volume covers a wide variety of applications that deliver a high level of sustained performance. The book covers the main methods in high-performance computing. Its outstanding results in achieving the best performance for production codes are of particular interest for both scientists and engineers. The book comes with a wealth of color illustrations and tables of results.

This book constitutes the thoroughly refereed post-conference proceedings of the 4th International Conference on High Performance Computing in Science and Engineering, HPCSE 2019, held in Karolinka, Czech Republic, in May 2019. The 9 papers presented in this volume were carefully reviewed and selected from 13 submissions. The conference provides an international forum for exchanging ideas among researchers involved in scientific and parallel computing, including theory and applications, as well as applied and computational mathematics. The focus of HPCSE 2019 was on models, algorithms, and software tools that facilitate efficient and convenient utilization of modern parallel and distributed computing architectures, as well as on large-scale applications.

This is the first of three volumes providing a comprehensive presentation of the fundamentals of scientific computing. This volume discusses basic principles of computation, and fundamental numerical algorithms that will serve as basic tools for the subsequent two volumes. This book and its companions show how to determine the quality of computational results, and how to measure the relative efficiency of competing methods. Readers learn how to determine the maximum attainable accuracy of algorithms, and how to select the best method for computing problems. This book also discusses programming in several languages, including C++, Fortran and MATLAB. There are 80 examples, 324 exercises, 77 algorithms, 35 interactive JavaScript programs, 391 references to software programs and 4 case studies. Topics are introduced with goals, literature references and links to public software. There are descriptions of the

current algorithms in LAPACK, GSLIB and MATLAB. This book could be used for an introductory course in numerical methods, for either upper level undergraduates or first year graduate students. Parts of the text could be used for specialized courses, such as principles of computer languages or numerical linear algebra.

Scientific ComputingVol. I - Linear and Nonlinear EquationsSpringer

During the last years, scientific computing has become an important research branch located between applied mathematics and applied sciences and engineering. Highly efficient numerical methods are based on adaptive methods, higher order discretizations, fast linear and non-linear iterative solvers, multi-level algorithms, etc. Such methods are integrated in the adaptive finite element software ALBERTA. It is a toolbox for the fast and flexible implementation of efficient software for real life applications, based on modern algorithms. ALBERTA also serves as an environment for improving existent, or developing new numerical methods in an interplay with mathematical analysis and it allows the direct integration of such new or improved methods in existing simulation software.

This collection of selected papers presented at the 12th International Conference on Scientific Computing in Electrical Engineering, SCEE 2018, held in Taormina, Sicily, Italy, in September 2018, showcases the state of the art in SCEE. The aim of the SCEE 2018 conference was to bring together scientists from academia and industry, mathematicians, electrical engineers, computer scientists, and physicists, and to promote intensive discussions on industrially relevant mathematical problems, with an emphasis on the modeling and numerical simulation of electronic circuits and of electromagnetic fields. This extensive reference work is divided into five parts: Computational Electromagnetics, Device Modeling and Simulation, Circuit Simulation, Mathematical and Computational Methods, Model Order Reduction. Each part starts with a general introduction, followed by the respective contributions. The book will appeal to mathematicians and electrical engineers. Further, it introduces algorithm and program developers to recent advances in the other fields, while industry experts will be introduced to new programming tools and mathematical methods.

Data visualization is currently a very active and vital area of research, teaching and development. The term unites the established field of scientific visualization and the more recent field of information visualization. The success of data visualization is due to the soundness of the basic idea behind it: the use of computer-generated images to gain insight and knowledge from data and its inherent patterns and relationships. A second premise is the utilization of the broad bandwidth of the human sensory system in steering and interpreting complex processes, and simulations involving data sets from diverse scientific disciplines and large collections of abstract data from many sources. These concepts are extremely important and have a profound and widespread impact on the methodology of computational science and engineering, as well as on management and administration. The interplay between various application areas and their specific problem solving visualization techniques is emphasized in this book.

Reflecting the heterogeneous structure of Data Visualization, emphasis was placed on these topics: -Visualization Algorithms and Techniques; -Volume Visualization; -Information Visualization; -Multiresolution Techniques; -Interactive Data Exploration. Data Visualization: The State of the Art presents the state of the art in scientific and information visualization techniques by experts in this field. It can serve as an overview for the inquiring scientist, and as a basic foundation for developers. This edited volume contains chapters dedicated to surveys of specific topics, and a great deal of original work not previously published illustrated by examples from a wealth of applications. The book will also provide basic material for teaching the state of the art techniques in data visualization. Data Visualization: The State of the Art is designed to meet the needs of practitioners and researchers in scientific and information visualization. This book is also suitable as a secondary text for graduate level students in computer science and engineering.

The aim of the present book is to show, in a broad and yet deep way, the state of the art in computational science and engineering. Examples of topics addressed are: fast and accurate numerical algorithms, model-order reduction, grid computing, immersed-boundary methods, and specific computational methods for simulating a wide variety of challenging problems, problems such as: fluid-structure interaction, turbulent flames, bone-fracture healing, micro-electro-mechanical systems, failure of composite materials, storm surges, particulate flows, and so on. The main benefit offered to readers of the book is a well-balanced, up-to-date overview over the field of computational science and engineering, through in-depth articles by specialists from the separate disciplines.

This book constitutes the refereed post-conference proceedings of the 5th International Conference on Computer Science and Engineering in Health Services, COMPSE 2021, held in July 2021. Due to COVID-19 pandemic the conference was held virtually. The 17 full papers presented were carefully reviewed and selected from 46 submissions. The papers are grouped on thematic topics: application of tools delivered by the COVID-19 pandemic; health services; computer and data science; and industry 4.0 in logistics and supply chain.

This book comprises high-quality refereed research papers presented at the Third International Conference on Computer Science, Engineering and Education Applications (ICCSEEA2020), held in Kyiv, Ukraine, on 21–22 January 2020, organized jointly by National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", National Aviation University, and the International Research Association of Modern Education and Computer Science. The topics discussed in the book include state-of-the-art papers in computer science, artificial intelligence, engineering techniques, genetic coding systems, deep learning with its medical applications, and knowledge representation with its applications in education. It is an excellent source of references for researchers, graduate students, engineers, management practitioners, and undergraduate students interested in computer science and their applications in engineering and education.

In this book, the authors discuss some of the main challenges and new opportunities in science and engineering research, which involve combining computational and experimental approaches as a promising strategy for arriving at new insights into composition–structure–property relations, even at the nanoscale. From a practical

standpoint, the authors show that significant improvements in the material/biomolecular foresight by design, including a fundamental understanding of their physical and chemical properties, are vital and will undoubtedly help us to reach a new technological level in the future.

The conference has an interdisciplinary focus and aims to bring together scientists – mathematicians, electrical engineers, computer scientists, and physicists, from universities and industry – to have in-depth discussions of the latest scientific results in Computational Science and Engineering relevant to Electrical Engineering and to stimulate and inspire active participation of young researchers.

This textbook teaches the essential background and skills for understanding and quantifying uncertainties in a computational simulation, and for predicting the behavior of a system under those uncertainties. It addresses a critical knowledge gap in the widespread adoption of simulation in high-consequence decision-making throughout the engineering and physical sciences. Constructing sophisticated techniques for prediction from basic building blocks, the book first reviews the fundamentals that underpin later topics of the book including probability, sampling, and Bayesian statistics. Part II focuses on applying Local Sensitivity Analysis to apportion uncertainty in the model outputs to sources of uncertainty in its inputs. Part III demonstrates techniques for quantifying the impact of parametric uncertainties on a problem, specifically how input uncertainties affect outputs. The final section covers techniques for applying uncertainty quantification to make predictions under uncertainty, including treatment of epistemic uncertainties. It presents the theory and practice of predicting the behavior of a system based on the aggregation of data from simulation, theory, and experiment. The text focuses on simulations based on the solution of systems of partial differential equations and includes in-depth coverage of Monte Carlo methods, basic design of computer experiments, as well as regularized statistical techniques. Code references, in python, appear throughout the text and online as executable code, enabling readers to perform the analysis under discussion. Worked examples from realistic, model problems help readers understand the mechanics of applying the methods. Each chapter ends with several assignable problems. Uncertainty Quantification and Predictive Computational Science fills the growing need for a classroom text for senior undergraduate and early-career graduate students in the engineering and physical sciences and supports independent study by researchers and professionals who must include uncertainty quantification and predictive science in the simulations they develop and/or perform.

This book provides readers with a thorough understanding of various research areas within the field of data science. The book introduces readers to various techniques for data acquisition, extraction, and cleaning, data summarizing and modeling, data analysis and communication techniques, data science tools, deep learning, and various data science applications. Researchers can extract and conclude various future ideas and topics that could result in potential publications or thesis. Furthermore, this book contributes to Data Scientists' preparation and to enhancing their knowledge of the field. The book provides a rich collection of manuscripts in highly regarded data science topics, edited by professors with long experience in the field of data science. Introduces various techniques, methods, and algorithms adopted by Data Science experts Provides a detailed explanation of data science perceptions, reinforced by practical

examples Presents a road map of future trends suitable for innovative data science research and practice

This book constitutes the refereed post-conference proceedings of the 4th International Conference on Computer Science and Health Engineering in Health Services. Due to COVID-19 pandemic the conference was held virtually. The 16 full papers presented were carefully reviewed and selected from 39 submissions. The papers highlight the latest research innovations and applications of algorithms designed for optimization applications within the fields of science, computer science, engineering, information technology, economics, and health systems.

Science used to be experiments and theory, now it is experiments, theory and computations. The computational approach to understanding nature and technology is currently flowering in many fields such as physics, geophysics, astrophysics, chemistry, biology, and most engineering disciplines. This book is a gentle introduction to such computational methods where the techniques are explained through examples. It is our goal to teach principles and ideas that carry over from field to field. You will learn basic methods and how to implement them. In order to gain the most from this text, you will need prior knowledge of calculus, basic linear algebra and elementary programming.

The book of nature is written in the language of mathematics -- Galileo Galilei How is it possible to predict weather patterns for tomorrow, with access solely to today's weather data? And how is it possible to predict the aerodynamic behavior of an aircraft that has yet to be built? The answer is computer simulations based on mathematical models – sets of equations – that describe the underlying physical properties. However, these equations are usually much too complicated to solve, either by the smartest mathematician or the largest supercomputer. This problem is overcome by constructing an approximation: a numerical model with a simpler structure can be translated into a program that tells the computer how to carry out the simulation. This book conveys the fundamentals of mathematical models, numerical methods and algorithms. Opening with a tutorial on mathematical models and analysis, it proceeds to introduce the most important classes of numerical methods, with finite element, finite difference and spectral methods as central tools. The concluding section describes applications in physics and engineering, including wave propagation, heat conduction and fluid dynamics. Also covered are the principles of computers and programming, including MATLAB®.

This book presents cutting-edge concepts, paradigms, and research highlights in the field of computational materials science and engineering, and provides a fresh, up-to-date perspective on solving present and future materials challenges. The chapters are written by not only pioneers in the fields of computational materials chemistry and materials science, but also experts in multi-scale modeling and simulation as applied to materials engineering. Pedagogical introductions to the different topics and continuity between the chapters are provided to ensure the appeal to a broad audience and to address the

applicability of integrated computational materials science and engineering for solving real-world problems.

This book features a collection of high-quality, peer-reviewed research papers presented at the 7th International Conference on Innovations in Computer Science & Engineering (ICICSE 2019), held at Guru Nanak Institutions, Hyderabad, India, on 16–17 August 2019. Written by researchers from academia and industry, the book discusses a wide variety of industrial, engineering, and scientific applications of the emerging techniques in the field of computer science.

This book provides a broad and nuanced overview of the achievements and legacy of Professor William ("Bill") Goddard in the field of computational materials and molecular science. Leading researchers from around the globe discuss Goddard's work and its lasting impacts, which can be seen in today's cutting-edge chemistry, materials science, and biology techniques. Each section of the book closes with an outline of the prospects for future developments. In the course of a career spanning more than 50 years, Goddard's seminal work has led to dramatic advances in a diverse range of science and engineering fields. Presenting scientific essays and reflections by students, postdoctoral associates, collaborators and colleagues, the book describes the contributions of one of the world's greatest materials and molecular scientists in the context of theory, experimentation, and applications, and examines his legacy in each area, from conceptualization (the first mile) to developments and extensions aimed at applications, and lastly to de novo design (the last mile). Goddard's passion for science, his insights, and his ability to actively engage with his collaborators in bold initiatives is a model for us all. As he enters his second half-century of scientific research and education, this book inspires future generations of students and researchers to employ and extend these powerful techniques and insights to tackle today's critical problems in biology, chemistry, and materials. Examples highlighted in the book include new materials for photocatalysts to convert water and CO_2 into fuels, novel catalysts for the highly selective and active catalysis of alkanes to valuable organics, simulating the chemistry in film growth to develop two-dimensional functional films, and predicting ligand-protein binding and activation to enable the design of targeted drugs with minimal side effects.

This book presents the state-of-the-art in supercomputer simulation. It includes the latest findings from leading researchers using systems from the High Performance Computing Center Stuttgart (HLRS) in 2019. The reports cover all fields of computational science and engineering ranging from CFD to computational physics and from chemistry to computer science with a special emphasis on industrially relevant applications. Presenting findings of one of Europe's leading systems, this volume covers a wide variety of applications that deliver a high level of sustained performance. The book covers the main methods in high-performance computing. Its outstanding results in achieving the best

performance for production codes are of particular interest for both scientists and engineers. The book comes with a wealth of color illustrations and tables of results.

This book presents computer programming as a key method for solving mathematical problems. There are two versions of the book, one for MATLAB and one for Python. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows the students to write simple programs for solving common mathematical problems with numerical methods in engineering and science courses. The emphasis is on generic algorithms, clean design of programs, use of functions, and automatic tests for verification.

This book is published open access under a CC BY 4.0 license. This book presents computer programming as a key method for solving mathematical problems. This second edition of the well-received book has been extensively revised: All code is now written in Python version 3.6 (no longer version 2.7). In addition, the two first chapters of the previous edition have been extended and split up into five new chapters, thus expanding the introduction to programming from 50 to 150 pages. Throughout the book, the explanations provided are now more detailed, previous examples have been modified, and new sections, examples and exercises have been added. Also, a number of small errors have been corrected. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style employed is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows students to write simple programs for solving common mathematical problems with numerical methods in the context of engineering and science courses. The emphasis is on generic algorithms, clean program design, the use of functions, and automatic tests for verification.

There has been continuing interest in the improvement of the speed of Digital Signal processing. The use of Residue Number Systems for the design of DSP systems has been extensively researched in literature. Szabo and Tanaka have popularized this approach through their book published in 1967. Subsequently, Jenkins and Leon have rekindled the interest of researchers in this area in 1978, from which time there have been several efforts to use RNS in practical system implementation. An IEEE Press book has been published in 1986 which was a collection of Papers. It is very interesting to note that in the recent past since 1988, the research activity has received a new thrust with emphasis on VLSI design using non ROM based designs as well as ROM based designs as evidenced by the increased publications in this area. The main advantage in using RNS is that several small word-length Processors are used to perform

operations such as addition, multiplication and accumulation, subtraction, thus needing less instruction execution time than that needed in conventional 16 bitl32 bit DSPs. However, the disadvantages of RNS have b. een the difficulty of detection of overflow, sign detection, comparison of two numbers, scaling, and division by arbitrary number, RNS to Binary conversion and Binary to RNS conversion. These operations, unfortunately, are computationally intensive and are time consuming.

This book includes papers on the recent advances in state-of-the-art computational science and computing presented at the 2018 International Symposium on Computational Science and Computing (ISCSC 2018), held in Huangshan, China, from 28 to 29 July 2018. All the papers were rigorously peer-reviewed by experts in the area. It is a valuable resource for researchers, professors, graduate students, as well as R & D staff in the industry with a general interest in computational science and computing. This book is addressed to young researchers and engineers in the fields of Computational Science and Artificial Intelligence, ranging from innovative computational methods to digital machine learning tools and their coupling used for solving challenging industrial and societal problems.This book provides the latest knowledge from jointly academic and industries experts in Computational Science and Artificial Intelligence fields for exploring possibilities and identifying challenges of applying Computational Sciences and AI methods and tools in industrial and societal sectors. This book features high-quality, peer-reviewed research papers presented at the First International Conference on Computer Science, Engineering and Education Applications (ICCSEEA2018), held in Kiev, Ukraine on 18–20 January 2018, and organized jointly by the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" and the International Research Association of Modern Education and Computer Science. The state-of-the-art papers discuss topics in computer science, such as neural networks, pattern recognition, engineering techniques, genetic coding systems, deep learning with its medical applications, as well as knowledge representation and its applications in education. It is an excellent reference resource for researchers, graduate students, engineers, management practitioners, and undergraduate students interested in computer science and their applications in engineering and education. Computational engineering is the treatment of engineering tasks with computers. It is based on computational mathematics, which is presented here in a comprehensive handbook. From the existing rich repertoire of mathematical theories and methods, the fundamentals of engineering computation are here presented in a coherent fashion. They are brought into a suitable order for specific engineering purposes, and their significance for typical applications shown. The relevant definitions, notations and theories are presented in a durable form which is independent of the fast development of information and communication technology. When the 50th anniversary of the birth of Information Theory was celebrated at the 1998 IEEE International Symposium on Informa tion Theory in Boston, there was a great deal of reflection on the the year 1993 as a critical year. As the years pass and more perspec tive is gained, it is a fairly safe bet that we will view 1993 as the year when the "early years" of error control coding came to an end. This was the year in which Berrou, Glavieux and Thitimajshima pre sented "Near Shannon Limit Error-

Correcting Coding and Decoding: Turbo Codes" at the International Conference on Communications in Geneva. In their presentation, Berrou et al. claimed that a combi nation of parallel concatenation and iterative decoding can provide reliable communications at a signal to noise ratio that is within a few tenths of a dB of the Shannon limit. Nearly fifty years of striving to achieve the promise of Shannon's noisy channel coding theorem had come to an end. The implications of this result were immediately apparent to all -coding gains on the order of 10 dB could be used to dramatically extend the range of communication receivers, increase data rates and services, or substantially reduce transmitter power levels. The 1993 ICC paper set in motion several research efforts that have permanently changed the way we look at error control coding.