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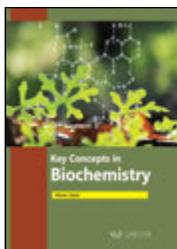
## Key Concepts in Biochemistry

Abeer Iqbal

About the Author

Abeer Iqbal (M.S Microbiology and Molecular Genetics) is a polished writer with strong scientific knowledge and keen interest in biosciences. She has authored books related to her field and have also been engaged in writing medical blogs/content. She has a passion for learning and writing about scientific advancements and her enthusiasm reflects in her work. She is a nature lover and admires the importance and beauty of little things in life.

This book offers to provide a brief explanation of the key terms and concepts of Biochemistry. Biochemistry is the study of chemical processes within and relating to living organisms. A sub-discipline of both chemistry and biology, biochemistry may be divided into three fields: structural biology, enzymology and metabolism.

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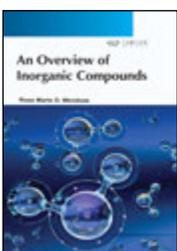
An Overview of Inorganic Compounds

Rose Marie O. Mendoza

About the Author

Dr. Rose obtained her PhD in Chemical Engineering from the University of the Philippines-Diliman in 2013, while her Masters in Chemical Engineering and BS Chemical Engineering degree was obtained from Adamson University. She is also a Professor in the Graduate School Department under the Master of Engineering Program at Adamson University since 2006. In 2017, she obtained her Post Doctorate Degree in Green Power: Hydrogen Generation and Fuel Cell Development from the University of California Merced, USA (in collaboration with the Energy Storage and Conversion Materials Laboratory of the University of the Philippines, Diliman). She is a visiting scientist to several universities abroad such as the University of California Merced in USA, Kindai University in Japan, National Taiwan University and Chia Nan University of Pharmacy and Science in Taiwan. She has published more than 20 research papers in water treatment and remediation, green technology, fuel cells, electrodialysis, nanomaterials, high voltage spatial electricity, batteries in peer-reviewed journals, and have more than 15 textbooks published in chemical engineering and processes. As an educator, she is very active in publishing her research to local peer reviewed journals. An advocate of Climate Action, a Climate Reality Leader Corp Member and a budding Sustainability and Circularity talent, Dr. Mendoza is also presently actively engaged in several local and international Green Federation as Board Member and Officer such as the Green Party of the Philippines, and Treasurer of the Asian Pacific Federation of Green Women's Network. She is also one of the Board of Directors of the Philippine Society of Engineering Educators, Mark Energy Revolution Corporation and one of the pioneering members of the Philippine Institute of Chemical Engineers, CaMaNaVa Chapter, and an Associate Member of the National Research Council of the Philippines (NRCP).

In chemical science, an inorganic compound is a chemical compound that does not include carbon–hydrogen bonds, i.e., one it is not an organic substance. The difference, however, is not well defined, and sources have various opinions on the matter. Inorganic chemistry is a branch of science that studies inorganic substances. Inorganic Compounds is a book about inorganic chemistry that covers the physical and chemical characteristics of individual compounds in depth, with stress on the use of physical laws, investigative procedures, and theoretical analysis of experimental findings. This book delves into the synthesis, characteristics, reactions, and structural geometries of a number of compounds chosen based on the fact that their research has made significant contributions to the practice and knowledge of inorganic chemistry. The specifics of experimental techniques are usually left out. This book is a valuable resource for undergraduate and postgraduate students interested in compound physicochemical studies and inorganic chemistry breakthroughs.

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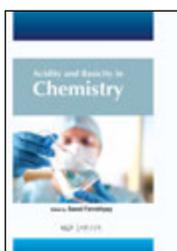
## Acidity and Basicity in Chemistry

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & material processing. He obtained his PhD from University of South Australia in 2005. He is currently a Technical Consultant in Australia. He has worked for more than 20 years at mineral and chemical industries, universities and research centers around the world. Dr Farrokhpay has published more than 90 papers in high ranked journals and conference proceedings. He has also edited several technical and scientific books, and served as an editorial board member of several international scientific journals.

Acids and bases are natural components that serve critical functions in health and business. They are used in the production of common household products such as salad dressings, carbonated soft drinks, bathroom and kitchen cleansers, and fertilizers. However, these chemicals may have dramatic effects, as seen in Venus' sulfuric acid clouds and grave wax, a natural material found in soil that mummifies human and animal remains. This book examines these interesting, yet diametrically contrasting compounds in further detail, providing solid, real-world examples and several vivid graphics. Based on the notion that the most, if not all, reactions in organic and inorganic chemistry can be explained using variants of fundamental acid–base principles, this book gives a framework for learning the topic that transcends memorization. By utilizing a variety of strategies to foster relational knowledge, it enables students to thoroughly grasp the fundamental ideas of organic chemistry.

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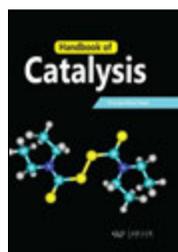
Handbook of Catalysis

Praveen Bhai Patel

About the Author

Praveen Bhai Patel is presently working as an Assistant Professor at Dept. of Chemical Engineering, University Institute of Engineering and Technology Chhatrapati Shahu Ji Maharaj University, Kanpur, India. He has over 15 years of teaching and research experience. He has completed his Ph.D from Motilal Nehru National Institute of Technology, Allahabad, UP, India. He has published several research papers in international and national journals and has also contributed chapters in books.

The Handbook of Catalysis covers the principles of catalysis as well as contemporary ideas and applications. It covers all critical areas of this vital subject, including as homogeneous, heterogeneous, and biocatalysis, as well as kinetics, catalyst characterization and production, reactor design. The book discusses the history of heterogeneous catalysis and its relevance in the present world, surfaces and adsorption, the catalyst (production and characterization), the reactors, and catalysis applications in many areas. The Handbook of Catalysis is an indispensable reference for chemists, chemical engineers, and graduate and postgraduate students studying catalysis and reaction engineering. The ideal source of information for undergraduate and graduate students of chemical engineering and chemistry, as well as for practicing scientists looking to brush up on their skills.

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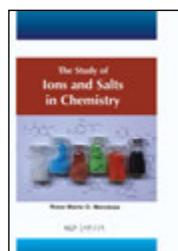
## The Study of Ions and Salts in Chemistry

Rose Marie O. Mendoza

About the Author

Dr. Rose obtained her PhD in Chemical Engineering from the University of the Philippines-Diliman in 2013, while her Masters in Chemical Engineering and BS Chemical Engineering degree was obtained from Adamson University. She is also a Professor in the Graduate School Department under the Master of Engineering Program at Adamson University since 2006. In 2017, she obtained her Post Doctorate Degree in Green Power: Hydrogen Generation and Fuel Cell Development from the University of California Merced, USA (in collaboration with the Energy Storage and Conversion Materials Laboratory of the University of the Philippines, Diliman). She is a visiting scientist to several universities abroad such as the University of California Merced in USA, Kindai University in Japan, National Taiwan University and Chia Nan University of Pharmacy and Science in Taiwan. She has published more than 20 research papers in water treatment and remediation, green technology, fuel cells, electrodialysis, nanomaterials, high voltage spatial electricity, batteries in peer-reviewed journals, and have more than 15 textbooks published in chemical engineering and processes. As an educator, she is very active in publishing her research to local peer reviewed journals. An advocate of Climate Action, a Climate Reality Leader Corp Member and a budding Sustainability and Circularity talent, Dr. Mendoza is also presently actively engaged in several local and international Green Federation as Board Member and Officer such as the Green Party of the Philippines, and Treasurer of the Asian Pacific Federation of Green Women's Network. She is also one of the Board of Directors of the Philippine Society of Engineering Educators, Mark Energy Revolution Corporation and one of the pioneering members of the Philippine Institute of Chemical Engineers, CaMaNaVa Chapter, and an Associate Member of the National Research Council of the Philippines (NRCP).

This book bridges the gap between food scientists and chemists by providing a practical foundation to ionic chemicals and salts. It stresses the link between structure at the atomic level and the symmetry and characteristics of ionic compounds, and it discusses the fundamental concepts of architecture and bonding in ionic compounds. This is an excellent resource for anyone interested in compound chemical and ionic characteristics. The book is especially useful for those who want to learn more about the chemistry of ionic compounds and salts, with a focus on their applications. Structure, kinetics, electrochemistry, thermodynamic characteristics, synthesis, and scientific studies of ions and salts are all covered in this book. Experimental and theoretical approaches for studying this data, as well as data collecting and processing methodologies, are discussed. This book is an important addition to the future of the chemistry discipline since it is the first serious debate on the transfer of these methodologies and techniques between the many application regimes.

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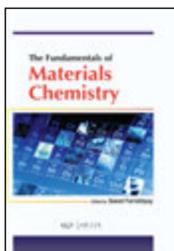
The Fundamentals of Materials Chemistry

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & material processing. He obtained his PhD from University of South Australia in 2005. He is currently a Technical Consultant in Australia. He has worked for more than 20 years at mineral and chemical industries, universities and research centers around the world. Dr Farrokhpay has published more than 90 papers in high ranked journals and conference proceedings. He has also edited several technical and scientific books, and served as an editorial board member of several international scientific journals.

The need for functional material is an important issue in the modern world as they play a significant role in our everyday life. New materials are used in technological advancements such as optical, magnetic, structural, or catalytic capabilities. Due to their high importance and significance in our life, many schools offer material chemistry courses and programs around the world. However, there is still a need for a textbook that covers different materials from both structure and property perspective. This book provides in-depth technical knowledge on material chemistry and their applications. It includes fundamental and history of material, as well as chemistry and application of common advanced materials. It has 8 chapters covering fundamentals of materials chemistry, solid materials, semiconductors, polymers, carbon materials, nanomaterials, composites and finally, common material characterization techniques. The information presented in this book is useful for chemistry, physics, and engineering students. It is also particularly valuable for industry researchers as a starting point for learning about materials.

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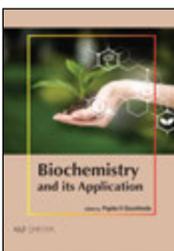
Biochemistry and its Application

Papita H Gourkhede

About the Editor

Dr.(Mrs). Papita H Gourkhede (1977) is presently serving as Assistant Professor, Department of Soil Science and Agriculture Chemistry, college of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. She obtained her B. Sc.(Ag.) in 2001 from College of Agriculture , Nagpur from Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. Pursued M. Sc. (Ag.) in 2007 and Ph. D. in Soil Science And Agriculture Chemistry in 2012 from Vasantrao Naik Marathwada Krishi Vidhyapeeth, Parbhani. She started her career as Assistant professor in 2012. Her field of specialization is soil fertility, nutrient management, micronutrients, heavy metal remediation, Remote Sensing and Organic Farming. She has published 05 books and 35 research paper in National and international journals of reputed. She has participated in many National, State Seminar and symposiums. She has written 06 practical manuals for under graduate course for the benefit of students besides this delivered several Radio talk, Lectures in farmer traning programme. Dr. Papita has also written 112 popular articles in Agroone, Shetibhati, RCFsheti patrika and other reputed Magazines. She has received young Scientists award in 2016, ICAR national Award for research innovation in Dryland Agriculture in 2018, women Scientists Award in 2019, Agrocare Award in 2017, State level Best program officer award in 2020.

Biochemistry is the foundation for solving the complexity of life on earth. All living organisms on earth contains nucleic acids, lipids, carbohydrates, proteins, enzymes and hormones that are crucial for survival. Biochemistry plays essential role in understanding the mechanism, action and regulation of biomolecules in different metabolic pathways. Several analytical techniques are reported to characterize, analyse and quantify the biomolecules present in living organism. This book covers the diversity of biomolecules present in living organisms, their characterization techniques, clinical biochemistry and genetic information transfer process. This book has been designed to suit the knowledge and pursuit of the researcher and scholars and to empower them with various aspects of biochemistry so that they are updated with the information.

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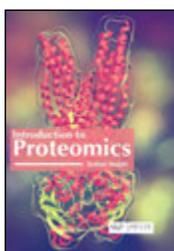
Introduction to Proteomics

Sudhir Awasthi

About the Author

Prof. Sudhir K. Awasthi did his M.Sc in Life Sciences securing first position in CSJM University, Kanpur. Thereafter he completed his PhD in the same discipline from CSJM University, Kanpur and joined the faculty of Life Sciences as Asstt. Professor in 1991. He became Professor in 2008 & presently working as Pro- Vice Chancellor & Dean , Faculty Life Sciences in this university . He is also holding the post of Director , Deendayal Shodh Kendra of the University campus from past one year he is also occupying the post of Co-ordinator, Recruitment & Assessment Cell (RAC) responsible for the recruitment & assessment of university faculty members. Prof. Awasthi has more than 30 years of teaching & research experience. His area of research has been Immuno-toxicology & Environmental Biochemistry. He has been widely recognized as one of those few researchers who did excellent work in the field of Mycobacterial Dormancy & the role of Heat Shock Proteins / Chaperons in its granuloma state. He has published more than 40 research papers & completed two research projects funded by DST & UPCST respectively. He is Principle Investigator of Centre of Excellence Project for Department of Life Sciences funded by UP Council of Higher Education. He is reckoned as prolific orator & popular article writer in different domains of knowledge related to higher education. He has been successful in advocating the importance of traditional Indian Knowledge System which is being re- explored in present context. He has participated in several conferences as Lead Speaker & Chaired the session in numerous seminars & symposia.

Introduction to Proteomics presents an overview of proteomics, including a discussion of the field's fundamental ideas, how to use various technologies and instruments, and examples of applications in human health and illness. This textbook provides new students and researchers with an easy-to-grasp, comprehensive review and knowledge of the concepts, guidelines, and especially the difficult instrumentation procedures in proteomics.

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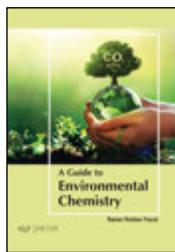
A Guide to Environmental Chemistry

Rainer Roldan Fiscal

About the Author

Rainer Roldan Fiscal is an Associate Professor I, Research Coordinator, and Innovation and Technology Support Representative at the Laguna State Polytechnic University Siniloan Campus, Philippines. He graduated Bachelor of Secondary Education major in General Science, Master of Arts in Teaching Science and Technology, and Doctor of Philosophy in Education major in Educational Leadership and Management. He teaches Biological Science, Physical Science, and Research courses in the undergraduate and graduate teacher education programs. He presented research papers at national and international conferences in the Philippines and other countries like Malaysia, Thailand, and Vietnam. He published research articles in international journals and has citations.

Environmental chemistry involves the study of biochemical factors that exist in nature. It includes a comprehension of how the unpolluted environment functions, which naturally existing compounds are available, in what amounts, and with what impacts. Without this, it may be difficult to concentrate on the impacts on people to the environment with the discharge of chemical elements. It is a multidisciplinary science that, notwithstanding chemistry, includes physical science, agriculture, public health, sanitary engineering, material science, etc. This volume researches the sources, responses, transport, impacts, and purpose of chemical species in the air, water, and lands, and the impact of human activities on different sections, like the hydrosphere, lithosphere, and biosphere. The goal of environmental chemistry education is to edify the general population about the significance of protecting our environment, and the need to limit human activities causing indiscriminate discharge of contaminants into the environment. Currently, different environmental factors exist that threaten the existence of humanity on the planet. Some environmental chemical issues include the 1952 London smog—killing around 4000 individuals, the Mediterranean Sea transforming into the Dead Sea during the 1950s—incapable of supporting sea life, and corrosion of the white Taj Mahal marble in India.

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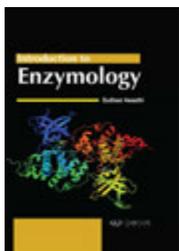
Modern Toxicology and Developments

Sudhir Awasthi

About the Author

Prof. Sudhir K. Awasthi did his M.Sc in Life Sciences securing first position in CSJM University, Kanpur. Thereafter he completed his PhD in the same discipline from CSJM University, Kanpur and joined the faculty of Life Sciences as Asstt. Professor in 1991. He became Professor in 2008 & presently working as Pro- Vice Chancellor & Dean , Faculty Life Sciences in this university . He is also holding the post of Director , Deendayal Shodh Kendra of the University campus from past one year he is also occupying the post of Co-ordinator, Recruitment & Assessment Cell (RAC) responsible for the recruitment & assessment of university faculty members. Prof. Awasthi has more than 30 years of teaching & research experience. His area of research has been Immuno-toxicology & Environmental Biochemistry. He has been widely recognized as one of those few researchers who did excellent work in the field of Mycobacterial Dormancy & the role of Heat Shock Proteins / Chaperons in its granuloma state. He has published more than 40 research papers & completed two research projects funded by DST & UPCST respectively. He is Principle Investigator of Centre of Excellence Project for Department of Life Sciences funded by UP Council of Higher Education. He is reckoned as prolific orator & popular article writer in different domains of knowledge related to higher education. He has been successful in advocating the importance of traditional Indian Knowledge System which is being re- explored in present context. He has participated in several conferences as Lead Speaker & Chaired the session in numerous seminars & symposia.

This book "Modern Toxicology and its Developments" provides an overview of toxicology, including the description of the essential theories, technologies and tools. Different examples of toxicology applications in human health are thoroughly discussed in this text. Toxicology is a scientific subject that overlaps with biology, chemistry, pharmacology, and medicine and entails the study of the harmful effects of chemical compounds on living organisms as well as the practice of detecting and treating toxins and toxicants exposures. Toxicology actively assists cancer research since some toxins may be used as medications to destroy tumor cells. Ribosome-inactivating proteins, which have been studied in leukemia treatment, are a classic example of this. This textbook presents new students and researchers with an easy-to-understand, complete overview and understanding of toxicological ideas, recommendations, and, in particular, complex instrumentation methods. This offers an authoritative perspective on the science and its future. The knoledge of toxicity and mechanisms of toxicity play an important role in different industries including pharmaceuiticals, food industry, agriculture, chemical industry. This handbook also illustrates the health impacts of metals, petroleum products, paper and pulp industry waste, air pollutants, and animal poisons. This book is equally beneficial for students, teachers and researchers in the field of toxicology. Moreover, this book is also a good resource for environmentalists and policy makers.

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Introduction to Enzymology

Sudhir Awasthi

About the Author

Prof. Sudhir K. Awasthi did his M.Sc in Life Sciences securing first position in CSJM University, Kanpur. Thereafter he completed his PhD in the same discipline from CSJM University, Kanpur and joined the faculty of Life Sciences as Asstt. Professor in 1991. He became Professor in 2008 & presently working as Pro- Vice Chancellor & Dean , Faculty Life Sciences in this university . He is also holding the post of Director , Deendayal Shodh Kendra of the University campus from past one year he is also occupying the post of Co-ordinator, Recruitment & Assessment Cell (RAC) responsible for the recruitment & assessment of university faculty members. Prof. Awasthi has more than 30 years of teaching & research experience. His area of research has been Immuno-toxicology & Environmental Biochemistry. He has been widely recognized as one of those few researchers who did excellent work in the field of Mycobacterial Dormancy & the role of Heat Shock Proteins / Chaperons in its granuloma state. He has published more than 40 research papers & completed two research projects funded by DST & UPCST respectively. He is Principle Investigator of Centre of Excellence Project for Department of Life Sciences funded by UP Council of Higher Education. He is reckoned as prolific orator & popular article writer in different domains of knowledge related to higher education. He has been successful in advocating the importance of traditional Indian Knowledge System which is being re- explored in present context. He has participated in several conferences as Lead Speaker & Chaired the session in numerous seminars & symposia.

Introduction to Enzymology provides an overview of enzymes, including a description of the field's essential concepts, how to use various technologies and equipment, and examples of applications in human health and disease. This textbook presents new students and researchers with an easy-to-understand, complete overview and understanding of proteomics ideas, guidelines, and, in particular, complex instrumentation techniques.

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Separation Technologies

Praveen Bhai Patel

About the Author

Praveen Bhai Patel is presently working as an Assistant Professor at Dept. of Chemical Engineering, University Institute of Engineering and Technology Chhatrapati Shahu Ji Maharaj University, Kanpur, India. He has over 15 years of teaching and research experience. He has completed his Ph.D from Motilal Nehru National Institute of Technology, Allahabad, UP, India. He has published several research papers in international and national journals and has also contributed chapters in books.

This book offers a convenient approach for readers to comprehend the key separation processes (e.g., distillation, solvent extraction, absorption, membrane processes, etc.) using a reader-friendly writing style. Various separation technologies have emerged as promising candidates to fight the water crisis and poor sanitation. Although there are many books that discuss different separation technologies but this book contains latest and comprehensive overview of the contemporary separation techniques. Different chapters of the book provide a unique information that focusses on the rising importance of the separation techniques. The conventional separation processes include distillation, adsorption, absorption, filtration, chromatography, etc. These separation technologies have been in practice for decades and their pertinent methodologies are being upgraded regularly. On the contrary, novel separation technologies such as membrane processes, super critical fluid extraction and membrane bioreactors are getting reputation in modern plants. This book is predominantly designed to highlight these innovative separation technologies. Students, researchers, industrialist, and pro0fessors from the fields of chemical engineering, membrane engineering, and environmental engineering can benefit from the book. This book is also equally beneficial for people from multi-disciplinary backgrounds who want to equip themselves with fundamentals of separation processes.

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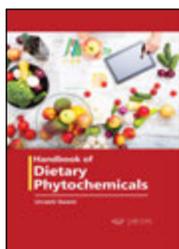
Handbook of Dietary Phytochemicals

Urvashi Swami

About the Authors

Dr. Urvashi is a microbiologist. She completed her Masters from Chaudhary Charan Singh Haryana Agricultural University, Hisar, after which she joined Panjab University, Chandigarh for completing doctorate. Her main area of research was fermentation and phytotherapy. After completion of PhD, she moved to Kuwait where she is running her own business of medical writing and editing.

The handbook of dietary phytochemicals explains the significance and types of phytochemicals. This book also outlines the various sources of antioxidants and their role in disease prevention. It highlights the complex chemistry and classifications of dietary phytochemicals, along with the pharmacology of phytochemicals. It explains the concept of antimicrobial and antiviral properties of phytochemicals. This book addresses the role of dietary pohytochemicals in health and nutrition.

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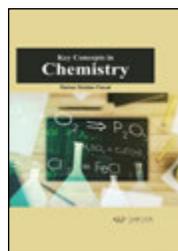
Key Concepts in Chemistry

Rainer Roldan Fiscal

About the Author

Rainer Roldan Fiscal is an Associate Professor I at the Laguna State Polytechnic University, Philippines. He finished Bachelor of Secondary Education major in General Science, Master of Arts in Teaching Science and Technology and Doctor of Philosophy in Education major in Educational Leadership and Management. He teaches Biological and Physical Science courses and Advanced Methods of Research both in the undergraduate and graduate teacher education programs. He presented his papers in national and international conferences in the Philippines and abroad like Malaysia, Thailand, and Vietnam. He published research articles in several international journals and some of them have citations.

The book 'Thermochemistry' takes the readers through the various aspects related to the areas in which thermodynamics finds its application in the field of chemistry. When the reactions take place, there is definite exchange of heat between the chemicals and the surroundings. Thermochemistry deals with the heat related aspects of the various chemical processes and finds the ways in which these processes can be applied for good and constructive use in the industry. This book makes the readers aware about the basic concepts of thermochemistry.

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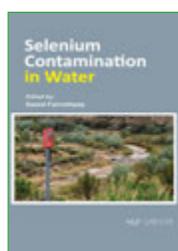
Selenium Contamination in Water

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & chemical processing. He obtained his PhD from Ian Wark Research Institute, University of South Australia in 2005. He is currently a Consultant in Australia and provides technical services and consultancy to improve complex mineral and chemical processing performance. He has worked as a Senior Researcher at different universities and research centers around the world. Dr Farrokhpay has published more than 80 papers in high ranked journals and conference proceedings and has served as an editorial board member of several international journals.

The need for high quality water to sustain different ecosystems is an important issue and there is a need for preservation of these natural ecosystems for better access of future generations. Selenium is one of the chemicals which is distributed widely in nature and is found in most rocks and soils at concentrations. It also transported via different ways such as water system of farming, coal burning, silver, gold, coal and phosphate mining, metal purifying, and city landfills. This book provides in-depth technical knowledge on the selenium contamination in water. It starts with a presentation of selenium science, dissemination and health dangers due to this chemical. It has 10 chapters about water quality and its indicators, a background history of selenium, its chemistry and toxicology, its contamination issues, and selenium health benefit as well its hazardous for the human beings. It also explains how to remove selenium from water, and what are the future directions in selenium removal technologies.

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Biochemistry

Khushboo Chaudhary

About the Author

Dr. Khushboo Chaudhary is presently working as a Technical officer-I in Translational Health Science and Technology Institute, Faridabad Haryana, India and having one year of teaching experience and eight years of research experience. Previously, she worked on the PPR virus and New Castle Disease virus and isolates many other viruses from animal outbreak samples. She has published several research papers in international and national journals. She has published five international textbooks. She has got seven best paper and poster presentation awards from the Indian Society of Genetics and Biotechnology Research and Development and received the president appreciation awards also in the International conference. She has got the best poster award by ISSGPU Central Institute Research on Goats, Makhdoom. She has published several gene banks in NCBI Pubmed. She has also published a research article in a virology journal. She is likely to be a co-author in several of the publications and coauthor in J. Virological Methods.

By using chemical information and procedures, biochemists can understand and solve biological problems. It helps us understand the chemical aspects of biological processes such as digestion, hormonal action, and muscle contraction-relaxation. This book has covered a range of syllabus and the student has an easy way to go through this book content. The book "Biochemistry" has been written to serve as a guide book for undergraduate, postgraduate and research scholars of different universities in the world. The chapters have been so arranged to give a sequential knowledge of the introductory biological chemistry, biophysical chemistry, cell biology and genetics, biostatistics and computers and molecular biology and genetic engineering in this book with practical approaches.

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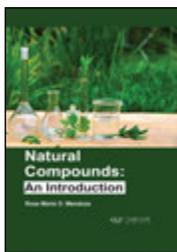
Natural Compounds: An Introduction

Rose Marie O. Mendoza

About the Authors

Dr. Rose obtained her PhD in Chemical Engineering from the University of the Philippines-Diliman in 2013, Her Masters in Chemical Engineering and BS Chemical Engineering degree from Adamson University. She is also a Professor in the Graduate School Department under the Master of Engineering Program at Adamson University since 2006, and is a Visiting Research Fellow at the Department of Environmental Engineering and Science, and the Department of Environmental Resource Management in Chia Nan University of Pharmacy and Science, Tainan Taiwan since 2010. She obtained her Post Doctorate Degree in Green Power: Hydrogen Generation and Fuel Cell Development from the University of California Merced, USA (in collaboration with the Energy Storage and Conversion Materials Laboratory of the University of the Philippines, Diliman) and is presently also a collaborating researcher at the Kindai University, Nara Japan, focusing on applications of electric and electrostatic field. Dr. Mendoza has several international and local researches covering Fuel cells and solid oxide electrolysis cells (SOECs), green energy and green technology, biomedical and natural products, fuels and fuel development, at water and wastewater treatment, recovery and remediation. She also published several international textbooks on water management, introductory chemical engineering and chemistry. Presently, Dr. Mendoza is the Chief Science Officer of Mark-Energy Revolution Corporation, Philippines.

The book introduces Natural Products in the most comprehensive and practical manner. Ranging from the historical development to modern preparation, synthesis and application, this book presents a detailed account of the nature of natural products, its classification as well as the major categories of compounds in natural products, and the processes employed to obtain the natural product itself, the active ingredient or the specific bioactive material. These processes included but is not to limited isolation, extraction, fractionation, structure elucidation and determination of pharmacological characteristics and its interaction with other compounds. The chapters are carefully crafted to serve as a quick reference for Natural Products. This book will be beneficial to both students and academicians from diverse scientific fields including chemistry, biology, and allied biomedicine disciplines as well as to those with industrial background such as environmentalists, engineers and manufacturing practitioners in the government and private institutions.

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An Introduction to Cold and Ultracold Chemistry
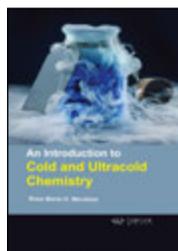
Rose Marie O. Mendoza

About the Author

Dr. Rose obtained her PhD in Chemical Engineering from the University of the Philippines-Diliman in 2013, Her Masters in Chemical Engineering and BS Chemical Engineering degree from Adamson University. She is also a Professor in the Graduate School Department under the Master of Engineering Program at Adamson University since 2006, and is a Visiting Research Fellow at the Department of Environmental Engineering and Science, and the Department of Environmental Resource Management in Chia Nan University of Pharmacy and Science, Tainan Taiwan since 2010. She obtained her Post Doctorate Degree in Green Power: Hydrogen Generation and Fuel Cell Development from the University of California Merced, USA (in collaboration with the Energy Storage and Conversion Materials Laboratory of the University of the Philippines, Diliman) and is presently also a collaborating researcher at the Kindai University, Nara Japan, focusing on applications of electric and electrostatic field. Dr. Mendoza has several international and local researches covering Fuel cells and solid oxide electrolysis cells (SOECs), green energy and green technology, biomedical and natural products, fuels and fuel development, at water and wastewater treatment, recovery and remediation. She also published several international textbooks on water management, introductory chemical engineering and chemistry. Presently, Dr. Mendoza is the Chief Science Officer of Mark-Energy Revolution Corporation, Philippines.

This book delivers a detailed overview of the essentials of cold and ultracold chemistry for advanced graduate students. Beginning with descriptions of cold and ultracold temperatures in chemistry, the chapters of the book then take the students through the fundamentals of scattering theory, light-matter interaction, reaction dynamics and interactions of cold molecules and atoms. The author focusses on the fruitfulness of the topic while inspiring readers to comprehend the basics of these fascinating reactions and their underlying interactions. This book essentially includes the material which was formerly available in special review articles. This book offers readers, working in the arenas of ultracold gases, physical chemistry and chemical physics, the tools they require to submerge themselves in the world of cold and ultracold chemistry. This book unlocks the exhilarating chemical laws governing chemistry at a low temperature.

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Implementing Automated Software Testing

Neha Kaul

About the Author

Neha Kaul is an experienced software consultant and technical author currently residing in Sydney, Australia. She is the author of five technical books: Object Oriented Programming with Java, Logging Frameworks in Java, Applications of Data Mining in Engineering, Management and Medicine, Software Security: Building Secure Software Applications and Analytic Methods of Systems and Software Testing. She received her double Master's Degree in Computer and Communication Networks and Information Technology from Telecom SudParis and University Paris-Saclay in 2016. She is a recipient of the prestigious Telecom Scholarship for Excellence provided by Fondation Telecom, France. She received the Bachelor of Engineering degree in Computer Engineering from the University of Pune, India in 2011. From 2011 to 2014, she was employed as a Software Engineer with Geometric Ltd, Pune, India. Her major avenues of research include Advanced Java/J2EE frameworks, Automation Testing, Software Quality, Software Security, Logging Frameworks, Project Management and Leadership.

The field of software testing has grown considerably since its origin in the early 1900s. The relevance of software will only increase in the future. Software will continue to increase in complexity as it is going to be used to solve the biggest problems faced by the world. Effective testing is thought of as a measure of efficiency and quality of software. Testing is a vital non-skippable step in the software development lifecycle. The implementation of different automated software systems will be presented in detail. Detailed practical implementations of automated software applications covering different types of testing scenarios have been provided in this book.

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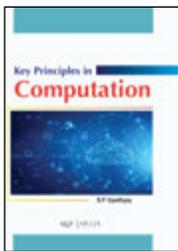
Key Principles in Computation

S.P. Upadhyay

About the Author

Dr. Satya Prakash Upadhyay holds Ph.D. in Computer Science from DDU Gorakhpur University, Gorakhpur (U.P.), 2013. He has Technical/Teaching Experience (15 Years 08 Months) in DDU Gorakhpur University, Gorakhpur(UP). He has been the member of Academic/Administrative Committees. He has also participated in a large number on seminars/workshops/conferences, presented papers/keynote address and chaired technical sessions. He has authored several books. His areas of interest are Integrating University Administration with IT, Research on Pattern Recognition/Optimization of Algorithms/Big data analysis, and Innovation in Examination System.

A new framework for computing understanding: a consistent set of principles that spans technologies, domains, algorithms, architectures, and designs. This novel textbook introduces the fundamental principles necessary for a one-semester undergraduate course in computing theory. It provides the most accessible and motivating course material for undergraduate computer theory classes available. Aimed at students who may struggle to grasp the course's relevance to their future jobs, the text assists them in becoming more acquainted with the procedures necessary for advanced study of computer science. Students will be motivated by the book's numerous examples, exercises, and comprehensive proofs that simplify complicated theory.

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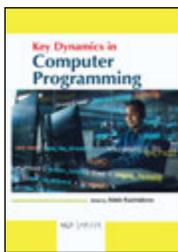
## Key Dynamics in Computer Programming

Adele Kuzmiakova

About the Editor

Adele Kuzmiakova is a machine learning engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele currently works as a senior machine learning engineer at Ifolor focusing on creating engaging photo stories and products. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. Some of the deep learning problems Adele worked on include predicting air quality from public webcams, developing a real-time human movement tracking, and using 3D computer vision to create 3D avatars from selfies in order to bring online clothes shopping closer to reality. She is also passionate about exchanging ideas and inspiring other people and acted as a workshop organizer at Women in Data Science conference in Geneva, Switzerland.

The Key Dynamics in Computer Science gives readers an integrated and rigorous tour into the overall computer architecture, including its hardware and software components. The book takes a refreshing, ground-level approach to allow the students to gain a clear picture of how computers work. Designed and supported with numerous real-world illustrations, the book leads students through 8 chapters that gradually build a basic hardware platform coupled with modern operating system hierarchy from the ground up. Additionally, this volume delved deeper into modern programming languages, including Python and C. All in all, it is a fantastic reference for emerging technical professions and supports them to gain a thorough understanding of the modern computer hardware and software components.

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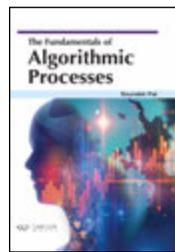
## The Fundamentals of Algorithmic Processes

Sourabh Pal

About the Author

Saurabh Pal received his M.Sc. in Computer Science in 1996 and obtained his Ph.D in 2002. He then joined the Department of Computer Applications, VBS Purvanchal University, Jaunpur as a Lecturer. Currently, he is working as Professor. He has authored more than 100 research papers in SCI/Scopus in international/national conference/journals as well as authored four books and also guided many research scholars in computer science/applications. He is an active member of CSI, Society of Statistics and Computer Applications and working as editor, member of editorial board for more than 15 international journals. His research interests include bioinformatics, machine learning, data mining, and artificial intelligence.

This book focuses on the creative elements of algorithmic design by delving into the phases involved in algorithm creation. The conceptual underpinnings of this creative process are analogous to the invention and development of mathematical theorems that result in the induction of combinatorial algorithms. Numerous issue examples are included in the book. It is intended to enhance readers' problem-solving abilities by imparting a grasp of the fundamental ideas behind algorithmic design. This book summarizes the most widely used computer algorithms and provides a comprehensive overview of algorithms and data structures for searching, sorting, and graph processing. The algorithms presented in this book represent a body of knowledge that has developed over the previous five decades and has become critical not just for professional programmers and computer scientists, but also for all students interested in mathematics, data science, and engineering. The reader of this book is meant to get knowledge about known ways for successfully resolving difficulties. They will become acquainted with various cutting-edge data structures and novel methods for utilizing data structures to improve the efficacy of algorithms. Because the book is virtually self-contained, it may be used as a course book, reference book, or self-study resource.

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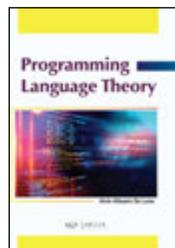
Programming Language Theory

Alvin Albuero De Luna

About the Author

Alvin Albuero De Luna is an IT educator at the Laguna State Polytechnic University under the College of Computer Studies, which is located in the Province of Laguna, in Philippines. He earned his Bachelor of Science in Information Technology from STI College and his Master of Science in Information Technology from Laguna State Polytechnic University. He was also a holder of two (2) National Certifications from TESDA (Technical Education and Skills Development Authority), namely NC II - Computer Systems Servicing, and NC III - Graphics Design. And he is also a Passer of Career Service Professional Eligibility given by the Civil Service Commission of the Philippines.

The book "Theory of Programming Language" thoroughly examines the subject and various real-world applications of computer technology. Programming language theory is an area of computer science that focuses on the creation, execution, analysis, characterization, and classification of formal programming languages. This comprehensive text introduces the ideas, methods, and sophisticated instrumentation techniques used in programming for beginning computer science students and researchers. This book also provides a reliable study of the programming language and projects its future evolution. It does a fantastic job of giving an overview of the numerous issues addressed in the theory that underpins programming languages. The readers of this handbook can easily understand the fundamental principles that constitute the basis for the philosophy of programming languages. This is because the material is organized and presented in a reader-friendly way. This book is a valuable resource for students, professors, and developers interested in programming language and its theory.

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Dissecting Computer Architecture

Alvin Albuero De Luna

About the Author

Alvin Albuero De Luna is an IT educator at the Laguna State Polytechnic University under the College of Computer Studies, which is located in the Province of Laguna, in Philippines. He earned his Bachelor of Science in Information Technology from STI College and his Master of Science in Information Technology from Laguna State Polytechnic University. He was also a holder of two (2) National Certifications from TESDA (Technical Education and Skills Development Authority), namely NC II - Computer Systems Servicing, and NC III - Graphics Design. And he is also a Passer of Career Service Professional Eligibility given by the Civil Service Commission of the Philippines.

This book explains the fundamental technologies and components used in modern processors and computer architectures and how varied architectural choices culminate in computer configurations that are optimal for certain applications. To put it nicely, modern computers are sophisticated gadgets. Nevertheless, when examined hierarchically, the roles of each degree of complexity become apparent. We will cover a large number of subjects in this book and will only be able to investigate each of them to a limited extent due to space constraints. Our objective is to present a comprehensive overview of each significant technology and subsystem found in a modern digital device and to explain how they interact with other system components.

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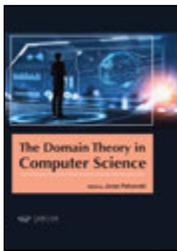
The Domain Theory in Computer Science

Jovan Pehcevski

About the Editor

Jovan currently works as a presales Technology Consultant at Dell Technologies. He is a result-oriented technology leader with demonstrated subject matter expertise in planning, architecting and managing ICT solutions to reflect business objectives and achieve operational excellence. Jovan has broad deep technical knowledge in the fields of data center and big data technologies, combined with consultative selling approach and exceptional client-facing presentation skills. Before joining Dell Technologies in 2017, Jovan spent nearly a decade as a researcher, university professor and IT business consultant. In these capacities, he served as a trusted advisor to a multitude of customers in financial services, health care, retail, and academic sectors. He holds a PhD in Computer Science from RMIT University in Australia and worked as a post-doctoral visiting scientist at the renowned INRIA research institute in France. He is a proud father of two, an aspiring tennis player, and an avid Science Fiction/Fantasy book reader."

This book covers different topics from domain theory in computer science, including: partial orders and groups, power domains and metrics, recursive data types (binary trees) and algebraicity and Boolean algebras. Section 1 focuses on partial orders and groups, describing characterizations and properties of a new partial order, natural partial orders on transformation semigroups with fixed sets, cyclic soft groups and their applications on groups, and factorization of groups involving symmetric and alternating groups. Section 2 focuses on power domains and metrics, describing FS+ domains, topology of GB-metric spaces, incoherency problems in a combination of description logics and rules, and metrics for multiset-theoretic subgraphs. Section 3 focuses on recursive data types (binary trees), describing binary tree's recursion traversal algorithm and its improvement, the design of the minimum spanning tree algorithms, generating tree-lists by fusing individual tree detection and nearest neighbor imputation using airborne LIDAR data, a recursive approach to the Kauffman bracket, and a novel multiway splits decision tree for multiple types of data. Section 4 focuses on algebraicity and Boolean algebras, describing the deformation theory of structure constants for associative algebras, the Boolean algebra and central Galois algebras, the addition of sets in Boolean space as well as algebra and geometry of sets in Boolean space, and a multipath detection using Boolean satisfiability techniques.

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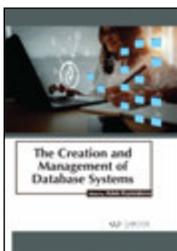
## The Creation and Management of Database Systems

Adele Kuzmiakova

About the Editor

Adele Kuzmiakova is a machine learning engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele currently works as a senior machine learning engineer at Ifolor focusing on creating engaging photo stories and products. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. Some of the deep learning problems Adele worked on include predicting air quality from public webcams, developing a real-time human movement tracking, and using 3D computer vision to create 3D avatars from selfies in order to bring online clothes shopping closer to reality. She is also passionate about exchanging ideas and inspiring other people and acted as a workshop organizer at Women in Data Science conference in Geneva, Switzerland.

This book on creation and management of database systems provides an in-depth analysis of several real-world examples of database applications. This textbook offers a clear and comprehensive overview of the fundamentals, principles, and, in particular, sophisticated instrumentation techniques used in database systems. It discusses the database as an essential component of a software system, as well as a valuable, mission critical corporate resource. The book examines different database concepts, principles, design, implementation, and management challenges. Each chapter is carefully divided into concise, reader-friendly chunks, with itemization of the key elements to remember. It solves database system challenges in a methodical and pragmatic manner. Diagrams and pictures can also be used to summarise key topics in order to improve learning. This book does an outstanding job of providing an overview of the many different aspects of database systems. The book is intended for all the readers from multidisciplinary backgrounds.

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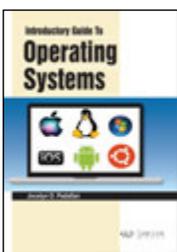
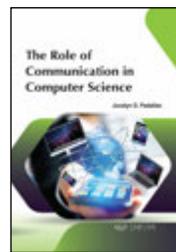## Introductory Guide to Operating Systems

Jocelyn O. Padallan

About the Author

Ms. Jocelyn O. Padallan is a graduate of the Bachelor of Science in Computer Science and finished her Certificate of Teaching Proficiency Program at Laguna State Polytechnic University - Los Banos Laguna. She also completed her Master in Educational Management. Currently, Ms. Jocelyn O. Padallan is an IT Professor at the Laguna State Polytechnic University - Los Banos Campus under the College of Computer Studies (CCS) where she holds different professional courses such as Effective and Business Communication and Programming Languages. She is actively involved in the college extension services programs including Life Project 4 Youth and ITeach 4 Heroes.

An operating system (OS) consists of programs that regulate the implementation of application programs, and serving as a go between of the client and PC hardware. The operating system manages the computer hardware systems well as giving a structure for applications to run. A few examples referenced in the volume are: Windows, Windows/NT, OS/2 and MacOS. The volume presents OS as advantageous and simple to use for the client, and makes handling client issues simpler. For a PC to begin running-for example, when it is organized or rebooted-it must have a primary program to run. This core system, or bootstrap program, will in general be straightforward. Normally, it is put in read-only memory (ROM) or digitally erasable read-only memory (EEPROM), referred by overall term firmware, inside the PC equipment. It launches all parts of the framework, from CPU catalogs to device regulators to memory elements. In multiprogramming systems, the OS determines which cycle gets the processor when and the duration. This capacity is known as process planning. The volume discusses an Operating System as doing these activities: • Keeps check of processor and process status of interaction. • Allocates the processor (CPU) to a function, and • De-assigns processors whenever a cycle is not generally needed.

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The Role of Communication in Computer Science

Jocelyn O. Padallan

About the Author

Ms. Jocelyn O. Padallan is a graduate of the Bachelor of Science in Computer Science and finished her Certificate of Teaching Proficiency Program at Laguna State Polytechnic University - Los Banos Laguna. She also completed her Master in Educational Management. Currently, Ms. Jocelyn O. Padallan is an IT Professor at the Laguna State Polytechnic University - Los Banos Campus under the College of Computer Studies (CCS) where she holds different professional courses such as Effective and Business Communication and Programming Languages. She is actively involved in the college extension services programs including Life Project 4 Youth and ITeach 4 Heroes.

"The book on the role of communication in computer science gives an in-depth information about the roles of communication in computer science. The process of transmitting data, instructions, and information from one computer to another or between several computers is referred to as ""computer communications."" The process of transmitting data, instructions, or information is started by the devices that are doing the sending. This textbook offers an understandable introduction to the concepts, rules, and, in particular, the sophisticated instrumentation techniques used in computer communication, making it ideal for students and researchers just starting in the field. This book also comprehensively reviews the current and future developments in computer communications. This book differs significantly from previous standard works on computer communications in numerous ways. To understand computer communications, the first step is to learn the fundamentals of computer communication, which is heavily influenced by human interaction. The second step is to apply these concepts in increasingly realistic scenarios. The approach of this textbook has various advantages, but arguably the most important is that it provides information that will remain relevant for decades."

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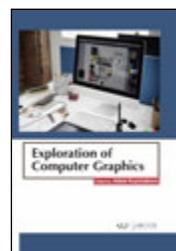
Exploration of Computer Graphics

Adele Kuzmiakova

About the Editor

Adele Kuzmiakova is a machine learning engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele currently works as a senior machine learning engineer at Ifolor focusing on creating engaging photo stories and products. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. Some of the deep learning problems Adele worked on include predicting air quality from public webcams, developing a real-time human movement tracking, and using 3D computer vision to create 3D avatars from selfies in order to bring online clothes shopping closer to reality. She is also passionate about exchanging ideas and inspiring other people and acted as a workshop organizer at Women in Data Science conference in Geneva, Switzerland.

"The book ""Exploration of Computer Graphics"" walks students through the process of creating their own interactive graphics application. The text demonstrates step-by-step how to apply computer graphics concepts and theory to real-world practical applications. Each chapter focuses on a different component of computer graphics, such as 3D modelling and lighting. This book delivers extensive knowledge since it follows the straight and narrow path through what is essential for understanding how images are displayed on screens using the complementary approaches of ray tracing and rasterization. Ray tracing is the simplest method for producing images of 3D situations, and it is addressed first, followed by the mathematical machinery required for the graphics pipeline, and lastly, the channel itself. This handbook teaches students how to handle 3D geometric transformations, texturing, complicated lighting effects, and other topics. This hands-on technique encourages students to sketch the elements and effects required to make a visually appealing application, such as computer games or software. This book is suitable for the readers from diverse backgrounds. Teachers, students, graphic designers, and software houses cxan benefit from the comntents of this book.

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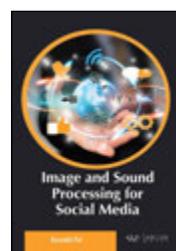
Image and Sound Processing for Social Media

Sourabh Pal

About the Author

Saurabh Pal received his M.Sc. in Computer Science in 1996 and obtained his Ph.D in 2002. He then joined the Department of Computer Applications, VBS Purvanchal University, Jaunpur as a Lecturer. Currently, he is working as Professor. He has authored more than 100 research papers in SCI/Scopus in international/national conference/journals as well as authored four books and also guided many research scholars in computer science/applications. He is an active member of CSI, Society of Statistics and Computer Applications and working as editor, member of editorial board for more than 15 international journals. His research interests include bioinformatics, machine learning, data mining, and artificial intelligence.

Image and Sound Processing for Social Media is an essential guide for anyone looking to understand the basics of picture and sound processing. This book provides a comprehensive overview of the topic, covering everything from the foundations of image and sound processing to the latest developments in the field. With eight informative chapters, Image & Sound Processing is a must-read for anyone interested in this fascinating subject. The key objective of this book is to provide an introduction to fundamental concepts and methods for image and sound processing for social media and to lay the framework for future study and research in this area. This book is suitable for audience from all fields who are involved in social media image and sound processing.

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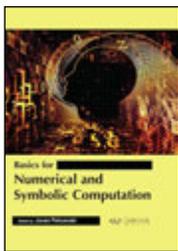
Basics for Numerical and Symbolic Computation

Jovan Pehcevski

About the Editor

Jovan currently works as a presales Technology Consultant at Dell Technologies. He is a result-oriented technology leader with demonstrated subject matter expertise in planning, architecting and managing ICT solutions to reflect business objectives and achieve operational excellence. Jovan has broad deep technical knowledge in the fields of data center and big data technologies, combined with consultative selling approach and exceptional client-facing presentation skills. Before joining Dell Technologies in 2017, Jovan spent nearly a decade as a researcher, university professor and IT business consultant. In these capacities, he served as a trusted advisor to a multitude of customers in financial services, health care, retail, and academic sectors. He holds a PhD in Computer Science from RMIT University in Australia and worked as a post-doctoral visiting scientist at the renowned INRIA research institute in France. He is a proud father of two, an aspiring tennis player, and an avid Science Fiction/Fantasy book reader."

This book covers topics from numerical and symbolic computing, including the main numerical and symbolic methods, schemes and applications. Section 1 focuses on numerical computing methods, describing matrix differential equations for solving systems of linear algebraic equations, a numerical problem encryption for high-performance computing applications, a numerical verification method of solutions for elliptic variational inequalities, a trigonometric numerical integrator for solving first order ordinary differential equation, and augmented Lagrangian methods for numerical solutions to higher order differential equations. Section 2 focuses on symbolic computing methods, describing a learning network assisted by means of symbolic computation, multiple factorial analysis of symbolic data, combining symbolic tools with interval analysis, and application to solve robust control problems, symbolic and graphical computations of a class of slightly perturbed equations. Section 3 focuses on numerical computing applications, describing non-negativity preserving numerical algorithms for problems in mathematical finance, a continuum approach using numerical simulations of microscale gas flows, numerical methods in electro-cardiology, numerical simulation of the blood flow through a brain vascular aneurysm with an artificial stent using the SPH method, and numerical modeling of soil water flow and nitrogen dynamics in a tomato field irrigated with municipal wastewater. Section 4 focuses on symbolic computing applications, describing symbolic time series analysis and its application in social sciences, application of symbolic computation in nonlinear differential-difference equations, symbolic modelling of dynamic human motions, and a framework for bridging the gap between symbolic and non-symbolic AI.

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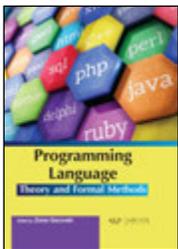
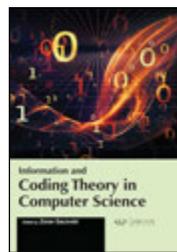## Programming Language Theory and Formal Methods

Zoran Gacovski

About the Editor

Dr. Zoran Gacovski's current position is a full professor at the Faculty of Technical Sciences, "Mother Tereza" University, Skopje, Macedonia. His teaching subjects include Software engineering and Intelligent systems, and his areas of research are: information systems, intelligent control, machine learning, graphical models (Petri, Neural and Bayesian networks), and human-computer interaction. Prof. Gacovski has earned his PhD degree at Faculty of Electrical engineering, UKIM, Skopje. In his career he was awarded by Fulbright postdoctoral fellowship (2002) for research stay at Rutgers University, USA. He has also earned best-paper award at the Baltic Olympiad for Automation control (2002), US NSF grant for conducting a specific research in the field of human-computer interaction at Rutgers University, USA (2003), and DAAD grant for research stay at University of Bremen, Germany (2008 and 2012). The projects he took an active participation in, are: "A multimodal human-computer interaction and modelling of the user behaviour" (for Rutgers University, 2002-2003) - sponsored by US Army and Ford; "Development and implementation of algorithms for guidance, navigation and control of mobile objects" (for Military Academy – Skopje, 1999-2002); "Analytical and non-analytical intelligent systems for deciding and control of uncertain complex processes" (for Macedonian Ministry of Science, 1995-1998). He is the author of 3 books (including international edition "Mobile Robots"), 20 journal papers, over 40 Conference papers, and he is also a reviewer/ editor for IEEE journals and Conferences.

In this book - we present topics from: formal grammars in programming, programming languages semantics, finite automata, and formal methods and semantics in distributed software. Section 1 focuses on formal methods in programming, describing integrating formal methods in XP (extreme programming) - a conceptual solution, formal methods for commercial, applications issues vs. solutions, why formal methods are considered for safety critical systems, and integration of UML sequence diagram with formal specification methods-a formal solution based on Z. Section 2 focuses on programming languages semantics, describing declarative programming with temporal constraints, in the language CG, Lolisa: formal syntax and semantics for a subset of the solidity programming language in mathematical tool coq, ontology of domains. ontological description software engineering domain - the standard life cycle, guidelines based software engineering for developing software components, intelligent agent based mapping of software requirement specification to design model. Section 3 focuses on finite automata, describing the equivalent conversion between regular grammar and finite automata, controllability, reachability, and stabilizability of finite automata: a controllability matrix method, bounded model checking of ETL cooperating with finite and looping automata connectives, an automata-based approach to pattern matching, tree automata for extracting consensus from partial replicas of a structured document. Section 4 focuses on formal methods and semantics in distributed software, describing building requirements semantics for networked software interoperability, formal semantics of OWL-s with rewrite logic, web semantic and ontology, web services conversation adaptation using conditional substitution semantics of application domain concepts.

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## Information and Coding Theory in Computer Science

Zoran Gacovski

About the Editor

Dr. Zoran Gacovski's current position is a full professor at the Faculty of Technical Sciences, "Mother Tereza" University, Skopje, Macedonia. His teaching subjects include Software engineering and Intelligent systems, and his areas of research are: information systems, intelligent control, machine learning, graphical models (Petri, Neural and Bayesian networks), and human-computer interaction. Prof. Gacovski has earned his PhD degree at Faculty of Electrical engineering, UKIM, Skopje. In his career he was awarded by Fulbright postdoctoral fellowship (2002) for research stay at Rutgers University, USA. He has also earned best-paper award at the Baltic Olympiad for Automation control (2002), US NSF grant for conducting a specific research in the field of human-computer interaction at Rutgers University, USA (2003), and DAAD grant for research stay at University of Bremen, Germany (2008 and 2012). The projects he took an active participation in, are: "A multimodal human-computer interaction and modelling of the user behaviour" (for Rutgers University, 2002-2003) - sponsored by US Army and Ford; "Development and implementation of algorithms for guidance, navigation and control of mobile objects" (for Military Academy – Skopje, 1999-2002); "Analytical and non-analytical intelligent systems for deciding and control of uncertain complex processes" (for Macedonian Ministry of Science, 1995-1998). He is the author of 3 books (including international edition "Mobile Robots"), 20 journal papers, over 40 Conference papers, and he is also a reviewer/ editor for IEEE journals and Conferences.

This book covers different topics from information theory methods and approaches, block and stream coding, lossless data compression, and information and Shannon entropy. Section 1 focuses on information theory methods and approaches, describing information theory of cognitive radio system, information theory and entropies for quantized optical waves in complex time-varying media, some inequalities in information theory using Tsallis entropy, and computational theory of intelligence: information entropy. Section 2 focuses on block and stream coding, describing block-split array coding algorithm for long-stream data compression, bit-error aware lossless image compression with 2d-layer-block coding, beam pattern scanning (BPS) versus space-time block coding (STBC) and space-time trellis coding (STTC), partial feedback based orthogonal space-time block coding with flexible feedback bits, and rate-less space-time block codes for 5g wireless communication systems. Section 3 focuses on lossless data compression, describing lossless image compression technique using combination methods, new results in perceptually lossless compression of hyperspectral images, lossless compression of digital mammography using base switching method, and lossless image compression based on multiple-tables arithmetic coding. Section 4 focuses on information and Shannon entropy, describing entropy as universal concept in sciences, Shannon entropy - axiomatic characterization and application, Shannon entropy in distributed scientific calculations on mobiles ad-hoc networks (MANETs), the computational theory of intelligence: information entropy, and advancing Shannon entropy for measuring diversity in systems.

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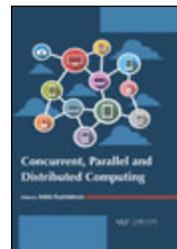
Concurrent, Parallel and Distributed Computing

Adele Kuzmiakova

About the Editor

Adele Kuzmiakova is a machine learning engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele currently works as a senior machine learning engineer at Ifolor focusing on creating engaging photo stories and products. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. Some of the deep learning problems Adele worked on include predicting air quality from public webcams, developing a real-time human movement tracking, and using 3D computer vision to create 3D avatars from selfies in order to bring online clothes shopping closer to reality. She is also passionate about exchanging ideas and inspiring other people and acted as a workshop organizer at Women in Data Science conference in Geneva, Switzerland.

The book "Concurrent, Parallel, and Distributed Computing" offers an excellent overview of the various areas of the computing field. There is a lot of overlap between the words "concurrent computing," "parallel computing," and "distributed computing," and there is no obvious differentiation between them. The same system can be described as "parallel" and "distributed"; in a typical distributed system, the processors run concurrently in parallel. The content in the book is presented in such a way that even a reader with no prior knowledge of computers may understand it and become acquainted with the fundamental concepts of computing. It offers numerous small examples, demonstration materials, and sample exercises that teachers can use to teach parallel programming principles to students who have just recently been introduced to basic programming concepts. It focuses on Python multiprocessing features like fork/join threading, message passing, sharing resources between threads, and using locks. Parallelism's utility can be seen in applications like searching, sorting, and simulations. Students and researchers can get an accessible and comprehensive explanation of the concepts, guidelines, and, in particular, the complex instrumentation techniques used in computing.

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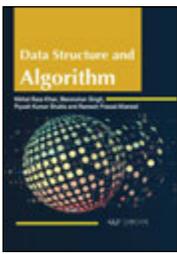
Data Structure and Algorithm

Nikhat Raza Khan, Manmohan Singh, Piyush Kumar Shukla and Ramesh Prasad Aharwal

About the Authors

Dr Nikhat Raza Khan, Associate Professor & Head, working in dept. of computer science and Engineering, IES College of Technology Bhopal. Her Experience is more than 17+ yrs and since last 10 yrs serves her work in the field of research, She is a member of CSI, IEEE, ISTE, REST, computer society and various others journals since 2009, She has published more than 35 research papers in reputed International and National journals. Her main research work focuses on Mobile ADHOC Network, Cryptography Algorithms, Network Security, Cloud Security and Privacy, Big Data Analytics, IoT and Computational Intelligence based education. Dr. Nikhat Won best women research award in feb.2019.

Dr. Manmohan Singh, Professor, Department of Computer Science and Engineering, IES College of Technology Bhopal M.P India, his Experience is more than 15+ yrs and since last 10 yrs serves work in the field of research, he is a member of various professional bodies, he has published more than 25 research papers in reputed International and National journals

Dr. Piyush Kumar Shukla, PDF (Computer Engineering) & PhD (Computer Science & Engineering), Department of Computer Science & Engineering, UIT- Rajiv Gandhi Proudyogiki Vishwavidyalaya, (Technological University of Madhya Pradesh), India.

Dr. Ramesh Prasad Aharwal, Asstt. Prof. Department of Mathematics, Govt P.G. College Damoh M.P India.

Data structure and algorithms are two of the most important aspects of computer science. Data structure and algorithms help in understanding the nature of the problem at a deeper level and thereby a better understanding of the world. Learning data structure and algorithms will help you become a better programmer. This book provides a comprehensive introduction to the modern study of computer algorithms. It presents many algorithms and covers them in considerable depth, which makes their design and analysis accessible to all levels of readers. This book provides with an enjoyable introduction to the field of algorithms.

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Data Analysis and Information Processing

Jovan Pehcevski

About the Editor

Jovan currently works as a presales Technology Consultant at Dell Technologies. He is a result-oriented technology leader with demonstrated subject mat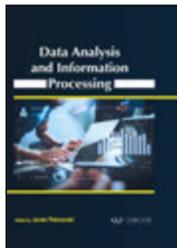ter expertise in planning, architecting and managing ICT solutions to reflect business objectives and achieve operational excellence. Jovan has broad deep technical knowledge in the fields of data center and big data technologies, combined with consultative selling approach and exceptional client-facing presentation skills. Before joining Dell Technologies in 2017, Jovan spent nearly a decade as a researcher, university professor and IT business consultant. In these capacities, he served as a trusted advisor to a multitude of customers in financial services, health care, retail, and academic sectors. He holds a PhD in Computer Science from RMIT University in Australia and worked as a post-doctoral visiting scientist at the renowned INRIA research institute in France. He is a proud father of two, an aspiring tennis player, and an avid Science Fiction/Fantasy book reader."

This book covers different topics from data analysis and information processing, including data analytics methods, big data methods, data mining methods, and information processing methods. Section 1 focuses on data analytics methods, describing data analytics in mental healthcare, a case study on data analytics and machine learning accuracy, a survey from a big data perspective on data modeling and data analytics, big data analytics for business intelligence in accounting and audit, and a knowledge-based approach on big data analytics in immunology. Section 2 focuses on big data methods, describing an integrated real-time big data stream sentiment analysis service, the influence of big data analytics in the industry, big data usage in the marketing information systems, a review of big data for organizations, and an application research of big data technology in audit field. Section 3 focuses on data mining methods, describing a short review of classification algorithms accuracy for data prediction in data mining applications, different data mining approaches based on medical text data, the benefits and challenges of data mining in electronic commerce, and a research study on realization of petrophysical data mining based on big data technology. Section 4 focuses on information processing methods, describing application of spatial digital information fusion technology in information processing of national traditional sports, effects of quality and quantity of information processing on design coordination performance, a neural network optimization method and its application in information processing, and information processing features that can detect behavioral regimes of dynamical systems.

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Intelligent Control and Automation
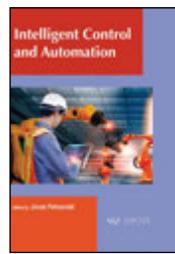
Jovan Pehcevski

About the Editor

Jovan currently works as a presales Technology Consultant at Dell Technologies. He is a result-oriented technology leader with demonstrated subject matter expertise in planning, architecting and managing ICT solutions to reflect business objectives and achieve operational excellence. Jovan has broad deep technical knowledge in the fields of data center and big data technologies, combined with consultative selling approach and exceptional client-facing presentation skills. Before joining Dell Technologies in 2017, Jovan spent nearly a decade as a researcher, university professor and IT business consultant. In these capacities, he served as a trusted advisor to a multitude of customers in financial services, health care, retail, and academic sectors. He holds a PhD in Computer Science from RMIT University in Australia and worked as a post-doctoral visiting scientist at the renowned INRIA research institute in France. He is a proud father of two, an aspiring tennis player, and an avid Science Fiction/Fantasy book reader."

This book covers different topics from intelligent control and automation, including intelligent control methods, fuzzy control techniques, neural networks-based control, and intelligent control applications. Section 1 focuses on intelligent control methods, describing automatic intelligent control system based on intelligent control algorithm, intelligent multi-agent based information management methods to direct complex industrial systems, a design method of intelligent ropeway type line changing robot based on lifting force control and synovial film controller, and a summary of PID control algorithms based on AI-enabled embedded systems. Section 2 focuses on fuzzy control techniques, describing an adaptive fuzzy sliding mode control scheme for robotic systems, an adaptive backstepping fuzzy control based on type-2 fuzzy system, a fuzzy PID control for respiratory systems, a parameter varying PD control for fuzzy servo mechanism, and a robust fuzzy tracking control scheme for robotic manipulators with experimental verification. Section 3 focuses on neural networks-based control, describing neural network supervision control strategy for inverted pendulum tracking control, a neural PID control strategy for networked process control, a control loop sensor calibration using neural networks for robotic control, a feedforward nonlinear control using neural gas network, and a stable adaptive neural control of a robot arm. Section 4 focuses on intelligent control applications, describing ship steering control based on quantum neural network, a human-simulating intelligent PID control, an intelligent situational control of small turbojet engines, and a technical review of an antilock-braking systems (ABS) control.

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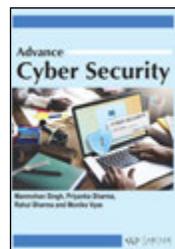
Advance Cyber Security

Manmohan Singh, Priyanka Sharma, Rahul Sharma and Monika Vyas

About the Authors

Dr. Manmohan Singh, working as Professor in Department of Computer Science and Engineering at IES College of Technology Bhopal India M.P. Prior to that he has more than 12+ years of teaching experience in several engineering colleges as Chameli Devi Group of Institution, Indore and Dr. A.P.J. Abdul Kalam University, he completed His academic qualifications include Master in Computers engineering, Ph.D. in Computer Science and engineering. His research includes Data Mining, AI, Data Science He is having 25 + research publications in reputed International journal, Internation-al- National conferences and 9 - patents (5 published- 4 Registered). He is publishing more than 10+book is field of computer science. He is completed one DST sponsor project.

Priyanka Sharma, PhD, is currently working as a Professor (IT) and Dean (Research and Publications) at Rashtriya Raksha University. She has also worked as I/C Director (Research and Development), Raksha Shakti University and Head of IT and TC Department, and Director of SITAICS. She has more than 22 years of experience in teaching, admin, and research at the PG level. Also, she has served as visiting faculty at a few eminent institutes like Gujarat Police Academy Karai, Gujarat University, Nirma University, SIRD, etc. Her academic qualifications include a Master's in Computer Applications, a PhD and DSc in Computer Science, and a Certificate Program in Computer Language and Cyberlaw from Symbiosis University. Recently she has attended a very significant training, "Leadership for advancing higher education in India," Harvard graduate school of education, BOSTON USA, sponsored by MHRD Government of India. More than 10 PhDs have been awarded under her supervision, and 5 are pursuing PhD at present. She is empaneled member at many universities like GTU, BISAG, DDIT, MSU, and others. Assed Thesis and Synopsis of PhD for universities like Laurentian University Canada KIIT, GTU, Banasthali Vidhyapith, C. V. Raman Global University, etc., and guided MPhil and Master's Dissertation work at RSU, Guj. Uni. Benet University, etc. She has carried out research projects and organized events sponsored by UGC, ICSSR, DSTGUJCOST, AICTE-ATAL, and RSU. Travel grant received from ICS MHRD for visiting NTU Singapore. She received Grant from ICSSR to organize a national-level Research Methodology Course for Researchers. She also has to her credit Patents and Copyright. She has also contributed research papers in international journals, books, book chapters, and articles. Her research work on the cyberlaw framework has been submitted to Justice BN Srikrishna Committee on Data Protection Framework. She is also serving as Chairperson of Publication Cell and IPR Cell of RSU and holds the position of editor-in-chief of International Research Journal of Police Science, Kavach magazine of the University. Also, editors and reviewers of various other journals and conferences. She has been a member of the steering committee and chaired a session at Nanyang Technological University Singapore, Metropolitan University London, Jawaharlal Nehru University, Rajasthan University, etc. Invited for Expert talks at Florida University, University of Houston, International Police Expo, NICFS, IIT Bombay, IIT Gandhi Nagar, UGC, AICTE, ISTE, NAAC sponsored workshops, MDS, RTU, SIRD, GNLU, SPU, GU, GTU, Nirma University, Vibrant Gujarat, National level Hackathon, MSU, DDIT, BVM, MBCIT, GEC, United School. She has participated in the 14th United Congress on Crime Prevention and Criminal Justice, Kyoto, Japan. She has organized conferences, Tech Fest, Cyber awareness programs, Workshops, Value added courses events at the international, national, and state levels. She was awarded the Best research paper award, First Prize in Cyber Awareness, Women researcher award by ACM and CSI, EXCELLENCE AWARDS, Innovation in teaching Trainer Award Competition, and others.

Mr. Rahul Sharma , working as Assistant Professor in Department of Computer Science and Engineering at Parul Institute of Technology, Parul University Vadodara , Gujarat. Prior to that he has more than 5 years of teaching experience in several engineering colleges as Chameli Devi Group of Institution, Indore and Dr. A.P.J. Abdul Kalam University, he completed B.Tech (CSE) from Patel College of Science and Technology, Indore (M.P.) and M.Tech (NM&IS) from SCSIT, DAVV, Indore (M.P.). And Pursuing PhD degree in Computer Science and Engineering from Rabindranath Tagore University Bhopal (M.P.). His research includes Computer Network, Network Security, Cryptography, and Data Mining. He is having 13 research publications in reputed International journal, International- National conferences and 6 - patents (2 published- 4 Registered). He also have qualified GATE (CSE) in 2015. He is publishing more than 7+ books in the field of computer science and Engineering.

Dr Monika vyas is working as head of Civil Engineering Department in IES College of Technology. She did her graduation in Civil Engineering, Post-graduation in Environmental and Pollution control. She completed her PhD from NIT Bhopal in Environmental Modelling, She has several publications and books in the field of Environmental Modelling, ANN, Water policy, water food Nexus etc.

Now a Days, cyber security is widely viewed as a matter of pressing national importance. Many elements of cyberspace are notoriously vulnerable to an expanding range of attacks by a spectrum of hackers, criminals, terrorists, and state actors. For example, government agencies and private-sector companies both large and small suffer from cyber thefts of sensitive information, cyber vandalism (e.g., defacing of Web sites), and denial-of-service attacks. The nation's critical infrastructure, including the electric power grid, air traffic control system, financial systems, and communication networks, depends extensively on information technology for its operation. National policy makers have become increasingly concerned that adversaries backed by considerable resources will attempt to exploit the cyber vulnerabilities in the critical infrastructure, thereby inflicting substantial harm on the nation. Numerous policy proposals have been advanced, and a number of bills have been introduced in Congress to tackle parts of the cyber security challenge. This book is designed to serve as the textbook for a semester course devoted to cyber security. It is focused on helping students acquired the skills sought in the professional workforce.

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Introduction to R Programming Language

Mohsen Nady

About the Author

Mohsen Nady is a pharmacist with a M.D. in Microbiology and a diploma in Industrial Pharmacy. In addition, Mohsen has more than 4 years experience using R programming language. Mohsen has applied his skills in R programming to different projects related to Genomics, Microbiology, Biostatistics, Six Sigma, Data Analytics, Data Visualization, Building Apps, Geography, Market Analysis, Business Analysis,…...etc. Mohsen also published his thesis in high impact journal that attracted many citations, where all the statistical analysis were performed by him in addition to the methodological part. Furthermore, Mohsen has earned additional certificates, from top universities (Harvard, Johns Hopkins, Denmark,...etc) in R programming, Python, Excel, and Minitab that highlight his outstanding programming skills.

This book covers some introductory steps in using R programming language as a data science tool. The data science field has evolved so much recently with incredible quantities of generated data. To extract value from those data, one needs to be trained in the proper data science skills like statistical analysis, data cleaning, data visualization, and machine learning. R is now considered the centerpiece language for doing all these data science skills because it has many useful packages that not only can perform all the previous skills, but also, has additional packages that was developed by different scientists in diverse fields. These fields include, but are not limited to, business, marketing, microbiology, social science, geography, genomics, environmental science, etc. Furthermore, R is free software and can run on all major platforms: Windows, Mac Os, and UNIX/Linux. The first two chapters involve installing and using R and RStudio. RStudio is an IDE (integrated development environment) that makes R easier to use and is more similar to SPSS or Stata. Chapters 3–8 covers the different R objects and how to manipulate them including the very popular one, dataframes. Chapter 9 is about importing different files into your R working session like text or excel files. Chapters 10 and 11 are dealing with different tidyverse packages that can do interesting summaries of different dataframes including different types of data visualizations. In the last chapter, it introduces how functions are created in R along with some control structures and useful functions. In all these chapters, many examples along with different codes and outputs are given to help your understanding of this powerful programming language. I hope this book will be great addition to your future data analysis projects.

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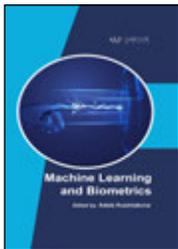
Machine Learning and Biometrics

Adele Kuzmiakova

About the Author

Adele Kuzmiakova is a computational engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. While at Cornell, she developed close relationships with professors, which enabled her to get involved in academic research to get hands-on experience with solving computational problems. She was also selected to be Accel Roundtable on Entrepreneurship Education (REE) Fellow at Stanford University and spent 3 months working on entrepreneurship projects to get a taste of entrepreneurship and high-growth ventures in engineering and life sciences. The program culminated in giving a presentation on the startup technology and was judged by Stanford faculty and entrepreneurship experts in Silicon Valley. After graduating from Cornell, Adele worked as a data scientist at Swiss Federal Institute of Technology in Lausanne, Switzerland where she focused on developing algorithms and graphical models to analyze chemical pathways in the atmosphere. Adele also pursued graduate studies at Stanford University in the United States where she entered as a recipient of American Association of University Women International Fellowship. The Fellowship enabled her to focus on tackling important research problems in machine learning and computer vision. Some research problems she worked on at Stanford include detecting air pollution from outdoor public webcam images. Specifically, she modified and set up a variety of pre-trained architectures, such as DehazeNet, VGG, and ResNet, on public webcam images to evaluate their ability to predict air quality based on the degree of haze on pictures. Other deep learning problems Adele worked on include investigating the promise of second-order optimizers in deep learning and using neural networks to predict sequences of data in energy consumption. Adele also places an emphasis on continual education and served as a Student Leader in PyTorch scholarship challenge organized by Udacity. Her roles as the Student Leader were helping students debug their code to train neural networks with PyTorch and providing mentorship on technical and career aspects. Her hobbies include skiing, playing tennis, cooking, and meeting new people.

This comprehensive guide provides a detailed overview of modern biometrics, which allows a person to be identified and authenticated based on recognizable, unique, and verifiable data. Biometrics technologies include detection of dormant fingerprints, iris, gait, or facial and voice recognition. Today, biometrics powers cutting-edge security algorithms. Biometrics is used for access into banks, airports or personal smartphones, which means that your money and personal information can be stored safely. Each chapter starts with a comprehensive review of the biometrics technology and its algorithmic description, describes how it works, and outlines all of the applicable and modern use cases of that technology. This book will be an invaluable companion guide to students wishing to become system designers, micro-engineers, security algorithms creators, security experts, and electronic security system manufacturers working on controls or microchips.

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Wireless Mesh Networks

Alvin Albuero De Luna

About the Author

Alvin Albuero De Luna is an instructor at a Premier University in the Province of Laguna, Philippines - the Laguna State Polytechnic University (LSPU). He finished his Bachelor's degree in Information Technology at STI College and took his Master of Science in Information Technology at LSPU. He isnhandling Programming Languages, Cyber Security, Discrete Mathematics, CAD, and other Computer related courses under the College of Computer Studies

In this 21st century era, people tend to find another space for improving everything, including technology. This includes the possibility of reaching out more using routers and gadgets. Even businesses and mode of transportation involves a high demand on using a WMN or Wireless Mesh Network. WMN which is commonly known as one of the primary technology nowadays. This also helps in terms of understanding the network connectivity at any time, at a low cost. In Wireless Mesh Network, there are two kinds of a technique used, the Mesh Nodes and Mesh Clients. This two are known to be the backbone, the bridge, the way of reaching out for connectivity. One key challenge in adopting wireless mesh networking is the capacity of effective throughout that can be offered to the clients. Due to the broadcast nature of the wireless medium, signals transmitted from different devices over the same channel will result in a probable connection loss. Despite the probability of problems that may occur, the WMN is starting to grow its volume into a larger scale of communication. This book is a significant platform to discuss its future competencies and proficiencies in the communication of a greater ecosystem using Wireless Mesh Network.

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Security Designs for the Cloud, IoT, and Social Networking

Adele Kuzmiakova

About the Author

Adele Kuzmiakova is a computational engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. While at Cornell, she developed close relationships with professors, which enabled her to get involved in academic research to get hands-on experience with solving computational problems. She was also selected to be Accel Roundtable on Entrepreneurship Education (REE) Fellow at Stanford University and spent 3 months working on entrepreneurship projects to get a taste of entrepreneurship and high-growth ventures in engineering and life sciences. The program culminated in giving a presentation on the startup technology and was judged by Stanford faculty and entrepreneurship experts in Silicon Valley. After graduating from Cornell, Adele worked as a data scientist at Swiss Federal Institute of Technology in Lausanne, Switzerland where she focused on developing algorithms and graphical models to analyze chemical pathways in the atmosphere. Adele also pursued graduate studies at Stanford University in the United States where she entered as a recipient of American Association of University Women International Fellowship. The Fellowship enabled her to focus on tackling important research problems in machine learning and computer vision. Some research problems she worked on at Stanford include detecting air pollution from outdoor public webcam images. Specifically, she modified and set up a variety of pre-trained architectures, such as DehazeNet, VGG, and ResNet, on public webcam images to evaluate their ability to predict air quality based on the degree of haze on pictures. Other deep learning problems Adele worked on include investigating the promise of second-order optimizers in deep learning and using neural networks to predict sequences of data in energy consumption. Adele also places an emphasis on continual education and served as a Student Leader in PyTorch scholarship challenge organized by Udacity. Her roles as the Student Leader were helping students debug their code to train neural networks with PyTorch and providing mentorship on technical and career aspects. Her hobbies include skiing, playing tennis, cooking, and meeting new people.

Along with providing an overview of cloud computing, this book talks about the various other dimensions involved in it such as the risk issues and security challenges in cloud computing. It highlights the appplication safety and service vulnerability in cloud network. It also gives an introduction to IoT security and its open challenges, IoT architecture security and the introduction into the social network and its security issues, as well as the cyberspace security in the digital age.

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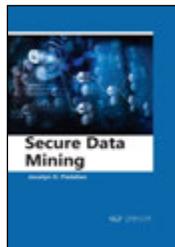
Secure Data Mining

Jocelyn O. Padallan

About the Author

Jocelyn O. Padallan is Assistant Professor II from Laguna State Polytechnic University, Philippines and she is currently pursuing her Master of Science in Information Technology at Laguna State Polytechnic University San Pablo Campus and has Master of Arts in Education from the same University. She has passion for teaching and has been Instructor and Program Coordinator at Laguna State Polytechnic University

This era of information technology has a distinctive features of enormous amount of data being produced and stored by all forms human activities. Computers are used to store a huge portion of this database called computer databases, making the data accessible by the computer technology. However, enormous amount of data creates a problem of extraction of valuable knowledge from the database. This books gives a secure method of data mining techniques taking into account the privacy and security of the data. Even in the disturbed environment, this approach can keep up the validity and authenticity of the data to produce the data after computation.

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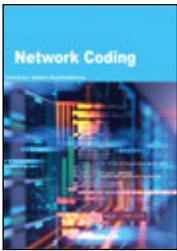
Network Coding

Adele Kuzmiakova

About the Author

Adele Kuzmiakova is a computational engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. While at Cornell, she developed close relationships with professors, which enabled her to get involved in academic research to get hands-on experience with solving computational problems. She was also selected to be Accel Roundtable on Entrepreneurship Education (REE) Fellow at Stanford University and spent 3 months working on entrepreneurship projects to get a taste of entrepreneurship and high-growth ventures in engineering and life sciences. The program culminated in giving a presentation on the startup technology and was judged by Stanford faculty and entrepreneurship experts in Silicon Valley. After graduating from Cornell, Adele worked as a data scientist at Swiss Federal Institute of Technology in Lausanne, Switzerland where she focused on developing algorithms and graphical models to analyze chemical pathways in the atmosphere. Adele also pursued graduate studies at Stanford University in the United States where she entered as a recipient of American Association of University Women International Fellowship. The Fellowship enabled her to focus on tackling important research problems in machine learning and computer vision. Some research problems she worked on at Stanford include detecting air pollution from outdoor public webcam images. Specifically, she modified and set up a variety of pre-trained architectures, such as DehazeNet, VGG, and ResNet, on public webcam images to evaluate their ability to predict air quality based on the degree of haze on pictures. Other deep learning problems Adele worked on include investigating the promise of second-order optimizers in deep learning and using neural networks to predict sequences of data in energy consumption. Adele also places an emphasis on continual education and served as a Student Leader in PyTorch scholarship challenge organized by Udacity. Her roles as the Student Leader were helping students debug their code to train neural networks with PyTorch and providing mentorship on technical and career aspects. Her hobbies include skiing, playing tennis, cooking, and meeting new people.

A basic introduction into the network coding , the theoretical frameowork for network coding, its implementation in the wireless systems are the different topics that have been illustrated in great detail in this book. It further talks about the multicast network coding, its use in application layer multicast together with the benefits, applications and challenges of network coding, and also discusses security against adversarial errors.

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Introduction to Virtual Reality

Alvin Albuero De Luna

About the Author

Alvin Albuero De Luna is an instructor at a Premier University in the Province of Laguna, Philippines - the Laguna State Polytechnic University (LSPU). He finished his Bachelor's degree in Information Technology at STI College and took his Master of Science in Information Technology at LSPU. He isnhandling Programming Languages, Cyber Security, Discrete Mathematics, CAD, and other Computer related courses under the College of Computer Studies

The book provides an overview of the virtual reality, along with various virtual reality systems. This book also explains the basic concepts of visual, acoustic, and haptic modality in virtual reality. It oulines the differences between Augmented Reality and Virtual Reality, with their benefits and applications. In addition to this, this book also highlights the importance of virutal reality in the coming future.

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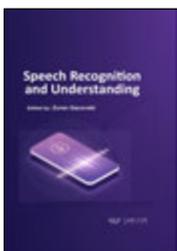
Speech Recognition and Understanding

Zoran Gacovski

About the Author

Dr. Zoran Gacovski has earned his PhD degree at Faculty of Electrical engineering, Skopje. His research interests include Intelligent systems and Software engineering, fuzzy systems, graphical models (Petri, Neural and Bayesian networks), and IT security. He has published over 50 journal and conference papers, and he has been reviewer of renowned Journals. Currently, he is a professor in Computer Engineering at European University, Skopje, Macedonia.

This book entitled, "Introduction to Speech and Language Therapy", has been designed to add to the knowledge of researchers, scholars and the students of second language learners to enlighten them with various aspects of the speech, the language and the methods and techniques of its acquisition. It takes the readers through an overview of speech and language therapy and how these concepts assist the children and the adults in gaining the intricate nuances of the language. It also talks about the role and technique of speech and language proper and its assessment in the teaching of second language. Additionally, the book sheds light on the linguistic theories of speech, the teaching of language for children and the techniques of vocabulary development.

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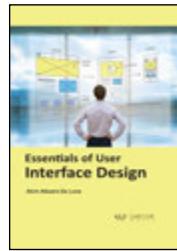
Essentials of User Interface Design

Alvin Albuero De Luna

About the Author

Alvin Albuero De Luna is an instructor at a Premier University in the Province of Laguna, Philippines - the Laguna State Polytechnic University (LSPU). He finished his Bachelor's degree in Information Technology at STI College and took his Master of Science in Information Technology at LSPU. He isnhandling Programming Languages, Cyber Security, Discrete Mathematics, CAD, and other Computer related courses under the College of Computer Studies

This book explains the various stages of the user interface, from tracing it's history to bridging the gap from user requirements to design to UIDs built for programmers. It also focuses on the visual interface design, to defining the patterns used as tools for user interface. It highlights the importance of communication and languages to further defining the challenges and opportunities and the role of UIDs in the coming year. This book sheds light on the several aspects of user interface such as the history, the golden rules, the levels, how it connects users to designs, and the different methods to do so. It also discusses the interaction between human and a computer, along with defining the prototyping, the color theory to patterns. In the later chapters it gives an insight into how visual communication is vital to make conversational interface design. The problems and opportunities and the use of UI in the future are also discussed towards the end.

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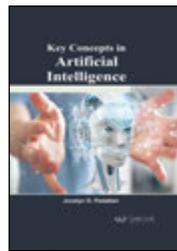
## Key Concepts in Artificial Intelligence

Jocelyn O. Padallan

About the Author

Jocelyn O. Padallan is Assistant Professor II from Laguna State Polytechnic University, Philippines and she is currently pursuing her Master of Science in Information Technology at Laguna State Polytechnic University San Pablo Campus and has Master of Arts in Education from the same University. She has passion for teaching and has been Instructor and Program Coordinator at Laguna State Polytechnic University

This book explains numerous key terms that are related to Artificial Intelligence. Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.

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Key Concepts in Computer Science

Adele Kuzmiakova

About the Author

Adele Kuzmiakova is a computational engineer focusing on solving problems in machine learning, deep learning, and computer vision. Adele attended Cornell University in New York, United States for her undergraduate studies. She studied engineering with a focus on applied math. While at Cornell, she developed close relationships with professors, which enabled her to get involved in academic research to get hands-on experience with solving computational problems. She was also selected to be Accel Roundtable on Entrepreneurship Education (REE) Fellow at Stanford University and spent 3 months working on entrepreneurship projects to get a taste of entrepreneurship and high-growth ventures in engineering and life sciences. The program culminated in giving a presentation on the startup technology and was judged by Stanford faculty and entrepreneurship experts in Silicon Valley. After graduating from Cornell, Adele worked as a data scientist at Swiss Federal Institute of Technology in Lausanne, Switzerland where she focused on developing algorithms and graphical models to analyze chemical pathways in the atmosphere. Adele also pursued graduate studies at Stanford University in the United States where she entered as a recipient of American Association of University Women International Fellowship. The Fellowship enabled her to focus on tackling important research problems in machine learning and computer vision. Some research problems she worked on at Stanford include detecting air pollution from outdoor public webcam images. Specifically, she modified and set up a variety of pre-trained architectures, such as DehazeNet, VGG, and ResNet, on public webcam images to evaluate their ability to predict air quality based on the degree of haze on pictures. Other deep learning problems Adele worked on include investigating the promise of second-order optimizers in deep learning and using neural networks to predict sequences of data in energy consumption. Adele also places an emphasis on continual education and served as a Student Leader in PyTorch scholarship challenge organized by Udacity. Her roles as the Student Leader were helping students debug their code to train neural networks with PyTorch and providing mentorship on technical and career aspects. Her hobbies include skiing, playing tennis, cooking, and meeting new people.

This volume synthesize and explains the most common computer science terms spanning a wide of range of computer science areas, including hardware, software, multimedia, computer applications, networking, and personal computing. This glossary volume defines complex terms in an easy-to-understand fashion, which makes the book valuable for non-technical and technical audience alike. Terms are defined in a jargon-free and concise manner. The technical terms are illustrated with specific examples whenever appropriate. After reading this book, you will be able to understand computer concepts without going in circles with definitions

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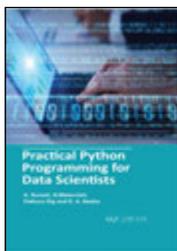
Practical Python Programming for Data Scientists

A. Suresh, N.Malarvizhi, Pethuru Raj and E. A. Neeba

About the Authors

*A. Suresh, Ph.D. works as the Associate Professor, Department of the Computer Science and Engineering in SRM Institute of Science & Technology, Kattankulathur, Chengalpattu Dist., Tamil Nadu, India. He has been nearly two decades of experience in teaching and his areas of specializations are Data Mining, Artificial Intelligence, Image Processing, Multimedia and System Software. He has published three patents and 90 papers in International*al journals. He has book authored "Industrial IoT Application Architectures and use cases" published in CRC press and edited book entitled "Deep Neural Networks for Multimodal Imaging and Biomedical Application" published in IGI Global. He has currently editing three books namely "Deep learning and Edge Computing solutions for High Performance Computing" in EAI/Springer Innovations in Communications and Computing, "Sensor Data Management and Analysis: The Role of Deep Learning" and "Bioinformatics and Medical Applications: Big Data using Deep Learning Algorithms" in Scrivener-Wiley publisher. He has published 15 chapters in the book title An Intelligent Grid Network Based on Cloud Computing Infrastructures in IGI Global Publisher and Internet of Things for Industry 4.0 in EAI/Springer Innovations in Communication and Computing. He has published more than 40 papers in National and International Conferences. He has served as editor / reviewer for Springer, Elsevier, Wiley, IGI Global, IoS Press, Inderscience journals etc... He is a member of IEEE (Senior Member), ISTE, MCSI, IACSIT, IAENG, MCSTA and Global Member of Internet Society (ISOC). He has organized several National Workshop, Conferences and Technical Events. He is regularly invited to deliver lectures in various programmes for imparting skills in research methodology to students and research scholars. He has published four books in Indian publishers, in the name of Hospital Management, Data Structures & Algorithms, Computer Programming, Problem Solving and Python Programming and Programming in "C". He has hosted two special sessions for IEEE sponsored conference in Osaka, Japan and Thailand.*

Pethuru Raj has been working as the chief architect in the Site Reliability Engineering (SRE) Center of Excellence, Reliance Jio Platforms., Bangalore. He previously worked as a cloud infrastructure architect in the IBM Global Cloud Center of Excellence (CoE), IBM India Bangalore for four years. Prior to that, He had a long stint at TOGAF-certified enterprise architecture (EA) consultant in Wipro Consulting Services (WCS) Division. He also worked as a lead architect in the corporate research (CR) division of Robert Bosch, Bangalore. In total, He have gained more than 17 years of IT industry experience and 8 years of research experience. He obtained his PhD through CSIR-sponsored PhD degree in Anna University, Chennai and continued the UGC-sponsored postdoctoral research in the department of Computer Science and Automation, Indian Institute of Science, Bangalore. Thereafter, He was granted a couple of international research fellowships (JSPS and JST) to work as a research scientist for 3.5 years in two leading Japanese universities. Regarding the publications, He have published more than 30 research papers in peer-reviewed journals such as IEEE, ACM, Springer-Verlag, Inderscience, etc. He has authored 7 books thus far and He focus on some of the emerging technologies such as IoT, Cognitive Analytics, Blockchain, Digital Twin, Docker-enabled Containerization, Data Science, Microservices Architecture, etc. He has contributed 25 book chapters thus far for various technology books edited by highly acclaimed and accomplished professors and professionals. The CRC Press, USA had also released his first book titled as "Cloud Enterprise Architecture" in the year 2012 and you can find the book details in the page http://www.crcpress.com/product/isbn/9781466502321 He has edited and authored a book on the title" Cloud Infrastructures for Big Data Analytics" published by IGI International USA in March 2014. A new book on the title" Smarter Cities: the Enabling Technologies and Tools" by CRC Press, USA, is to hit the market in the month of June 2015. He has collaborating with a few authors to publish a book on the title" High-Performance Big Data Analytics" to be published by Springer-Verlag in the year 2015.

E. A. Neeba, currently working as an Assistant Professor in the Department of Information Technology at Rajagiri School of Engineering & Technology, Kochi, Kerala, which is affiliated to the A.P.J Abdul Kalam Technological University, Kerala. She received her doctoral degree from Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, Tamil Nadu. She completed her Masters in Computer Science & Engineering from SRM Institute of Science and Technology, Chennai. Her research interests include Analysis of data, Data Mining and Big Data, knowledge representation, and ontology, both from the theoretical perspective and their application to natural language understanding, reasoning, information visualization, and interoperability. Having a rich industrial experience of around 10 years prior to joining academia, and also, she has publications in around 10 SCI/ SCIE/ Scopus indexed international journals and a few national journals. An active participant in various conferences and workshops on data mining, she is currently involved in several projects in this field. She was entrusted with leadership positions such as the Accreditation coordinator for the college, and Head of the Quality Cell, besides organizing various national and international events.

Data science plays a very vital role in shaping up the process of transitioning data into information and into knowledge. As business enterprises, organizations, governments, IT companies, and service providers are keenly becoming data-driven, the role and responsibility of data scientists are bound to go up significantly. Python is emerging as the leading programming language for data science projects. The aim of the book is to clearly explain how Python simplifies and speeds up the realization of next-generation data science applications.

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Advances in Multimedia

Jovan Pehcevski

About the Author

Jovan obtained his PhD in Computer Science from RMIT University in Melbourne, Australia in 2007. His research interests include big data, business intelligence and predictive analytics, data and information science, information retrieval, XML, web services and service-oriented architectures, and relational and NoSQL database systems. He has published over 30 journal and conference papers and he also serves as a journal and conference reviewer. He is currently working as a Dean and Associate Professor at European University in Skopje, Macedonia.

This book covers different topics related to the recent advances in multimedia, including machine learning and AI methods in multimedia research, multimedia applications in health and medicine, multimedia transmission in wireless networks and multimedia applications in education.

Section 1 focuses on machine learning and AI methods in multimedia research, describing context-aware attention network for human emotion recognition in video, large-scale video retrieval via deep local convolutional features, region space guided transfer function design for nonlinear neural network augmented image visualization, data-driven methods for image and video understanding, and pretraining convolutional neural networks for image-based vehicle classification.

Section 2 focuses on multimedia applications in health and medicine, describing study of multimedia technology in posture training for the elderly, rapid extraction of target information in messy multimedia medical data, effectiveness of a multimedia messaging service reminder system in the management of knee osteoarthritis, and virtual realities in the treatment of mental disorders: a review of the current state of research.

Section 3 focuses on multimedia transmission in wireless networks, describing clustering in wireless multimedia sensor networks, a dynamic link adaptation for multimedia quality-based communications in IEEE_802.11 wireless networks, multimedia and VoIP-oriented cell search technique for the IEEE 802.11 WLANS, and ubiquitous control framework for delivering perceptual satisfaction of multimedia traffic.

Section 4 focuses on multimedia applications in education, describing online individualized multimedia instruction instrument for engineering communication skills, design model for educational multimedia software, cognitive constructivist theory of multimedia, design of videogame based on inca abacus, and multimedia approach in teaching mathematics through examples of interactive lessons from mathematical analysis and geometry.

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Advances in Operational Researches

Jovan Pehcevski

About the Author

Jovan obtained his PhD in Computer Science from RMIT University in Melbourne, Australia in 2007. His research interests include big data, business intelligence and predictive analytics, data and information science, information retrieval, XML, web services and service-oriented architectures, and relational and NoSQL database systems. He has published over 30 journal and conference papers and he also serves as a journal and conference reviewer. He is currently working as a Dean and Associate Professor at European University in Skopje, Macedonia.

This book covers different topics related to advanced operational researches, including optimization and linear programming, graph-based techniques and route planning, operations research in logistics problems, and methods for resource allocation.

Section 1 focuses on optimization and linear programming, describing a new approach for solving linear fractional programming problems with duality concept, a particle swarm optimization algorithm for solving pricing and lead time quotation in a dual-channel supply chain with multiple customer classes, inverting the multiple-assisting tool network problem to solve for optimality, a dynamic active-set method for linear programming, and the sliding gradient algorithm for linear programming.

Section 2 focuses on graph-based techniques and route planning, describing route optimization of electric vehicle considering soft time windows and two ways of power replenishment, the route planning on campus bus in a University, integrating origin-destination survey and stochastic user equilibrium as a case study for route relocation, and research of UAV flight planning parameters.

Section 3 focuses on operations research in logistics problems, describing optimization of urban rail transportation in emerging countries using operational research techniques, a review on strategic, tactical and operational decision planning in reverse logistics of green supply chain network design, research on agri-food cold chain logistics management system, a use case of sea-port operational efficiency by an evaluation of five Asian ports using stochastic frontier production function model, and the design of urban traffic in Ferizaj through operational research.

Section 4 focuses on methods for resource allocation, describing application of the two non-zero component lemma in resource allocation, energy efficient non-cooperative methods for resource allocation in cognitive radio networks, an alternative interpretation of mixed strategies in n-person normal form games via resource allocation, and a dynamic optimization technique for resource allocation problems in a production company.

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Computer Games Technology

Jovan Pehcevski

About the Author

Jovan obtained his PhD in Computer Science from RMIT University in Melbourne, Australia in 2007. His research interests include big data, business intelligence and predictive analytics, data and information science, information retrieval, XML, web services and service-oriented architectures, and relational and NoSQL database systems. He has published over 30 journal and conference papers and he also serves as a journal and conference reviewer. He is currently working as a Dean and Associate Professor at European University in Skopje, Macedonia.

This book covers different topics from computer gaming technology, including educational and simulation games, games hardware, games software, and computer games for social and health purposes.

Section 1 focuses on educational and simulation games, describing SIDH: a game-based architecture for a training simulator, an application of a game development framework in higher education, experiential learning in vehicle dynamics education via motion simulation and interactive gaming, and development of a driving simulator with analyzing driver's characteristics based on a virtual reality head mounted display.

Section 2 focuses on games hardware, describing fast and reliable mouse picking using graphics hardware, ballooning graphics memory space in full GPU virtualization environments, platform for distributed 3D gaming, player profile management on NFC smart card for multiplayer ubiquitous games, and real-time large crowd rendering with efficient character and instance management on GPU.

Section 3 focuses on games software, describing gamer's facial cloning for online interactive games, quantization of cognitive learning process by computer graphics-games, real-time animation of trees based on BBSC in computer games, a dense point-to-point alignment method for realistic 3D face morphing and animation, and knowledge encoding in game mechanics: transfer-oriented knowledge learning in desktop-3D and VR.

Section 4 focuses on games for social and health purposes, describing Hall of heroes - a digital game for social skills training with young adolescents, Kinect-based exer-games tailored to Parkinson patients, and development of a gesture-based game applying participatory design to reflect values of manual wheelchair users, using the revised bloom taxonomy to analyze psychotherapeutic games.

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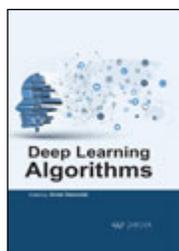
Deep Learning Algorithms

Zoran Gacovski

About the Author

Dr. Zoran Gacovski has earned his PhD degree at Faculty of Electrical engineering, Skopje. His research interests include Intelligent systems and Software engineering, fuzzy systems, graphical models (Petri, Neural and Bayesian networks), and IT security. He has published over 50 journal and conference papers, and he has been reviewer of renowned Journals. Currently, he is a professor in Computer Engineering at European University, Skopje, Macedonia.

This book covers different topics from deep learning algorithms, including: methods and approaches for deep learning, deep learning applications in biology, deep learning applications in medicine, and deep learning applications in pattern recognition systems.

Section 1 focuses on methods and approaches for deep learning, describing advancements in deep learning theory and applications - perspective in 2020 and beyond; deep ensemble reinforcement learning with multiple deep deterministic policy gradient algorithm; dynamic decision-making for stabilized deep learning software platforms; deep learning for hyperspectral data classification through exponential momentum deep convolution neural networks; and ensemble network architecture for deep reinforcement learning.

Section 2 focuses on deep learning applications in biology, describing fish detection using deep learning; deep learning identification of tomato leaf disease; deep learning for plant identification in natural environment; and applying deep learning models to mouse behavior recognition.

Section 3 focuses on deep learning applications in medicine, describing application of deep learning in neuroradiology: brain hemorrhage classification using transfer learning; a review of the application of deep learning in brachytherapy; exploring deep learning and transfer learning for colonic polyp classification; and deep learning algorithm for brain-computer interface.

Section 4 focuses on deep learning applications in pattern recognition systems, describing application of deep learning in airport visibility forecast; hierarchical representations feature deep learning for face recognition; review of research on text sentiment analysis based on deep learning; classifying hand written digits with deep learning; and bitcoin price prediction based on deep learning methods.

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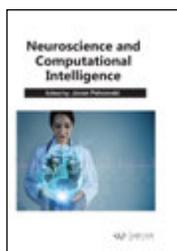
Neuroscience and Computational intelligence

Jovan Pehcevski

About the Author

Jovan obtained his PhD in Computer Science from RMIT University in Melbourne, Australia in 2007. His research interests include big data, business intelligence and predictive analytics, data and information science, information retrieval, XML, web services and service-oriented architectures, and relational and NoSQL database systems. He has published over 30 journal and conference papers and he also serves as a journal and conference reviewer. He is currently working as a Dean and Associate Professor at European University in Skopje, Macedonia.

This book covers different topics from neuroscience and computational intelligence, including semantic and concept modeling, general neuroscience topics, reasoning and knowledge modeling, and topics from clinical neuroscience.

Section 1 focuses on semantic and concept modeling, describing automatic concept extraction in semantic summarization process, a further analysis of taxonomic links in conceptual modelling, a general knowledge representation model of concepts, intelligent information access based on logical semantic binding method, and automatic concept extraction in semantic summarization process.

Section 2 focuses on general neuroscience topics, describing the philosophy and neuroscience movement, the creativity as central to critical reasoning and the facilitative role of moral education, the information infrastructure for cooperative research in neuroscience, and computational intelligence and neuroscience in neurorobotics.

Section 3 focuses on reasoning and knowledge modeling, describing knowledge representation in a proof checker for logic programs, episodic reasoning for vision-based human action recognition, a knowledge representation formalism for semantic business process management, and gaining knowledge from imperfect data.

Section 4 focuses on clinical neuroscience, describing neuroscience and unconscious processes, validating new technologies to treat depression, pain and the feeling of sentient beings, Alzheimer's disease as an adaptability disorder and what role does happiness have in treatment, management and prevention, as well as how neuroscience relates to hearing aid amplification and social cognition through the lens of cognitive and clinical neuroscience.

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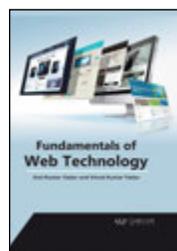
Fundamentals of Web Technology

Anil Kumar Yadav and Vinod Kumar Yadav

About the Editor

Dr. Anil Kumar Yadav received his PhD in Computer Science and Engineering and his M.Tech in Information Technology, B.Tech in Computer Science and Engineering. Presently, he is working as an Associate Professor in Computer Science & Engineering Department at IES College of Technology Bhopal M.P. His major areas of interest include Application-Oriented Reinforcement Learning, Game Technology and Machine Learning. He received many academic related awards. He has published 03 Patent, one text book on "Data Structures with C program," ARCLER PRESS and more than 34 research publication at National and International Level.

MR. Vinod Kumar Yadav is pursuing PHD (CSE) from RNTU, Bhopal and completed his M.Tech in Computer Science and Engineering from the University of Rajiv Gandhi Proudyogiki Vishwavidyalaya Bhopal M.P. and B.Tech in Information Technology from Guru Ghasidas Vishwavidyalaya Central University Bilaspur C.G. (India). He is also GATE Qualified in Information Technology. At present he is working as Head of Department ,Computer Science & Engineering BMCT, Bhopal (M. P.). His areas of interests are in Data Structures, Data mining, Artificial Intelligence, Machine Learning, Deep Learning and Computer Vision. He has supervised M.Tech and B.Tech students. He received many academic related awards. He has published a Book "Data Structures with C Programming" ARCLER PRESS, 2010 Winston Park Drive Oakville Ontario L6H 5R7 Canada in 2019. He has published 12 research papers at National, International Conferences and International Journals. He also attended several National & International workshops.

Web technology is necessary for today because the internet has become the number one source of information, and many of the conventional software applications have become web applications. Web technologies are the several tools and methods that are applied in the activity of communication between different types of devices over the internet. This book provides students and web developers with an understandable introduction to the web programming and scripting languages used to create Web sites and web applications. The main aim is to teach the programming concepts of different Web technologies and the fundamentals needed to program on the internet.

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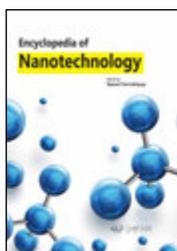
Encyclopedia of Nanotechnology

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & material processing. He obtained his PhD from University of South Australia in 2005. He is currently a Technical Consultant in Australia. He has worked for more than 20 years at mineral and chemical industries, universities and research centers around the world. Dr Farrokhpay has published more than 90 papers in high ranked journals and conference proceedings. He has also edited several technical and scientific books, and served as an editorial board member of several international scientific journals.

Nanotechnology is the study of the nanoscale: objects around a nanometer (NM) in size. Our ability to develop enormous, complex products with nanometer accuracy is quickly evolving, and comprises of hierarchical reductive methodologies and base up additive approaches. On the other hand, nature has idealized a variety of organic tools that operate at the nanoscale, structures which regularly self-regulate driven by the atomic science of subunit combinations. This chapter describes various terminologies in nano-fabrication and organic gathering, microscopy, and nanoscale natural systems. Nano-technology includes the advancement of manmade or artificial particles and sub-atomic particles that have aspects in the nanometer range (somewhere in the range of 1 and 100 nm in some respect). When combined with biotechnology, nanotechnology becomes an incredible new stage with countless applications across a wide number of pragmatic applications including farming, indicative technology, new drugs, clinical imaging, biological sensors, and others. Currently, the quantity of possible types of nanomaterials accessible for use in biotechnological applications includes nanoparticles, nanowires, nanofibers, nanostructures, and nanomachines. The risk potential of nanomaterials is however arising, and showing that there are a few materials that have qualities that might require some level of upgrade to eliminate the chance of unfavorable impacts and an open risk. In spite of the difficulties, the commercialization of nanobiotechnology products seems to have a splendid future, and within 10 years, numerous new results of this nature are probably going to be supported and used across different sectors.

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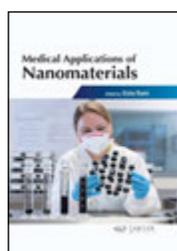
Medical Applications of Nanomaterials

Esha Rami

About the Editor

Dr. Esha Rami is presently working as an Assistant Professor, in the Department of Life science, Parul Institute of Applied Science, Parul University, India. She Did her Post graduated from Ganpat University, Ph.D. in biotechnology from Hemchandracharya North Gujarat University, in the year 2015. She has authored a number of national and international publications in reputed journals.

All other scientific disciplines, including chemistry, biology, physics, materials science, and engineering, can benefit from nanoscience and nanotechnology, which involve the study and utilization of incredibly small objects. This book presents the concept of Nano technology and its wide application in medicine. The chapters in this manual have been arranged in such a way as to provide a sequential understanding of the fundamental concepts in Nano technology and its medical application, Targeted Drug Delivery, Fundamentals of Nanobiosensors and Application of Nanomaterials in Nanopharmacology. Apart from these, this book also contains some advanced topics like Applications of Nanomaterials in Nanomedical Devices, Nanotechnology in Tissue Engineering and Gene therapy. Readers from a variety of backgrounds, such as researchers, professors, students, and biological scientists, will find this book to be equally helpful. Additionally, this book can help readers with backgrounds in other fields understand the basics of Nanotechnology and its various application.

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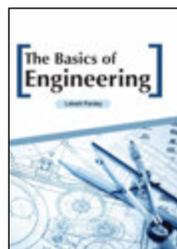
The Basics of Engineering

Lokesh Pandey

About the Author

Lokesh Pandey is currently pursuing his PhD in Mechanical Engineeing from Uttarakhand Technical University, India, where he also completed his M.Tech in Thermal Engineeing. He has more than 3 years teaching experience as a Faculty for Mechanical Engineering. He has published articles in reputed Journals and has also chaired many conferences and workshops.

The introduction to engineering, and engineering as a profession has been illustrated in this book. It throws light on the basics of mechanical engineering, engineering materials and their applications. It also discusses the engineering communications and ethics, along with the various applications of engineering across various fields.

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Encyclopedia of Science and Technology

Ramesh Chandra

About the Editor

Prof. Ramesh Chandra is an outstanding scientist, revered teacher and an exceptionally successful administrator. He is currently heading Department of Chemistry, University of Delhi, where he is serving as Professor for the last more than 26 years and Founder Director of Dr. B. R. Ambedkar Center for Biomedical Research, University of Delhi, since March 1991. He has been Vice-Chancellor, Bundelkhand University, Jhansi for six years (1999-2005); Member, Planning Commission, Government of U.P, India as well as the President of the Indian Chemical Society (2004-2006). Professor Chandra started his research career at the University of Delhi, thereafter he went to The New York Hospital-Cornell University Medical Center and the Rockefeller University, New York; State University of New York at Stonybrook, USA as Assistant Research Professor. He conducted advanced research at the Harvard University Medical School- Massachusetts General Hospital, jointly at MIT, Cambridge, USA. Over the last 38 years, Professor Chandra has contributed largely in the field of Chemical Sciences and particularly in New Drug Discovery and Development as well as Drug Metabolism. He has to his credit several patents, published more than 300 original Scientific Research Papers/ Review Articles in International journals of repute and six of his internationally acclaimed scientific Books. Prof. Chandra is the recipient of several professional national/ international recognitions; these includes: Millennium Plaques of Honor (Life Time Achievement Award for Contribution in Science & Technology) by the Indian Science Congress Association (ISCA) for 2017-2018, Award of the Highest Honor of Soka University, Tokyo, Japan (2000); J William Fulbright Scholarship (1993); The Rockefeller Foundation USA-Biotechnology Career Award (1993); and several others.

Science and technology (S&T) is broadly acknowledged as an essential tool for promoting and strengthening a nation's socioeconomic development. This volume discusses significant advances in various fields of science and technology over the years, including a knowledgeable workforce and promoting innovative intellectual ideas. Amidst rapid globalization, fast depleting material resources, increasing institutional competition, and growing demands for intellectual property protection, the importance of strengthening knowledge base is an important issue for the scientific and technology community to recognize. Given the global economic order, the S&T sector should focus on: strengthening applied research and development (R&D) for technology generation; promoting human resource development, particularly in promoting innovative ideas; promoting research and application of science and technology for natural disaster prediction, prevention and mitigation among other spheres.

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Small Electric Vehicles

Mukesh Pandey

About the Author

Prof. Dr. Mukesh Pandey is multi-skilled professional with around 30 years of rich exposure and versatile experience in Industries, Administration, Academics , Research domains and institution building. He received his B.E. from SATI Vidisha, M.Tech. from N.I.T. Bhopal and Ph.D. from RGPV, Bhopal. He played an instrumental role in the establishment of Rajiv Gandhi Technical University Bhopal, Madhya Pradesh since it's inception in 1999. He served as Rector(Pro Vice Chancellor), Director SoEEM & Dean of Faculty of Energy Technology. He has looked after as Coordinator for establishing IIIT, Bhopal (under PPP Mode by MHRD). He held various administrative positions as Director (R&D), Coordinator of RGPV- NBA Nodal Centre, Dy. Registrar, Member of Engineering Accreditation Evaluation Committee [EAEC] and Moderation Committee of NBA(National Board of Accreditation). Professor Pandey works in the area of Renewable Energy and Environment having focus on Solar Thermal Energy and he has developed an Energy Technology Park at RGPV, Bhopal by making use of the renewable energy resources; Solar Roof Top Plant on University Building, Energy Systems, Solar Thin Film systems, Solar wind Hybrid System, Bio-Diesel Reactor, CO2 Carbon Sequestration Unit, Dual Rotor Wind Turbine etc. Professor Pandey has an iconic track record of quality teaching, innovation and research he has been Principal Investigator of many Govt. Funded Projects by DST, MNRE, MPCST, AICTE etc including Principal Investigator of Innovative & Breakthrough Technology based 30KW CL-CSP SOLAR international R&D PROJECT (India-Japan Joint Venture Project) installed in RGPV campus. He has also facilitated as Reviewer for many national and international journals of repute and associated with many academic and research organizations at various levels. Over the past several years he has taught M.Tech. and Ph.D. Research Scholars in the areas of Energy, Environment, Direct Energy Conversion and Integrated Energy Systems and has been keynote speaker and resource person at several International and National Conferences and programmes.

The needs of different drivers can be accommodated in the plug-in electric vehicles (EVs or electric cars) currently available in the market in a manner similar to the conventional vehicles which had varied kinds of technology available to them. This book takes the readers through various aspects and various types of electric vehicles. This book sheds light on the several characteristics of electric vehicles, battery, flywheels, capacitors, electric fuel, electric vehicle modeling and design considerations. This book has been designed to suit the knowledge and pursuit of the researcher and scholars and to empower them with various aspects, application, future, and trends of electric vehicles, so that they are updated with the information.

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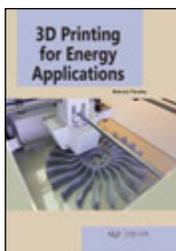
3D Printing for Energy Applications

Mukesh Pandey

About the Author

Prof. Dr. Mukesh Pandey is multi-skilled professional with around 30 years of rich exposure and versatile experience in Industries, Administration, Academics , Research domains and institution building. He received his B.E. from SATI Vidisha, M.Tech. from N.I.T. Bhopal and Ph.D. from RGPV, Bhopal. He played an instrumental role in the establishment of Rajiv Gandhi Technical University Bhopal, Madhya Pradesh since it's inception in 1999. He served as Rector(Pro Vice Chancellor), Director SoEEM & Dean of Faculty of Energy Technology. He has looked after as Coordinator for establishing IIIT, Bhopal (under PPP Mode by MHRD). He held various administrative positions as Director (R&D), Coordinator of RGPV- NBA Nodal Centre, Dy. Registrar, Member of Engineering Accreditation Evaluation Committee [EAEC] and Moderation Committee of NBA(National Board of Accreditation). Professor Pandey works in the area of Renewable Energy and Environment having focus on Solar Thermal Energy and he has developed an Energy Technology Park at RGPV, Bhopal by making use of the renewable energy resources; Solar Roof Top Plant on University Building, Energy Systems, Solar Thin Film systems, Solar wind Hybrid System, Bio-Diesel Reactor, CO2 Carbon Sequestration Unit, Dual Rotor Wind Turbine etc. Professor Pandey has an iconic track record of quality teaching, innovation and research he has been Principal Investigator of many Govt. Funded Projects by DST, MNRE, MPCST, AICTE etc including Principal Investigator of Innovative & Breakthrough Technology based 30KW CL-CSP SOLAR international R&D PROJECT (India-Japan Joint Venture Project) installed in RGPV campus. He has also facilitated as Reviewer for many national and international journals of repute and associated with many academic and research organizations at various levels. Over the past several years he has taught M.Tech. and Ph.D. Research Scholars in the areas of Energy, Environment, Direct Energy Conversion and Integrated Energy Systems and has been keynote speaker and resource person at several International and National Conferences and programmes.

3D Printing for Energy Applications is a comprehensive and cutting-edge examination of how 3D printing can be used to fabricate complicated devices in the energy sector. The book discusses topics of additive manufacturing of functional materials that can be used in the energy sector. It examines both 3D printing processes and printable materials methods and their use in energy systems or devices. This book is divided into three parts that cover functional material's 3D printing before exploring the 3D printing of energy devices. It concludes with printing issues in complicated object creation. It also offers an intriguing outlook on the future of complex device 3D printing. Ideal for materials scientists, graduate students in material sciences, chemistry, and engineering will find 3D Printing for Energy Applications useful as a one-stop reference for present and future outlooks on 3D printing of high-value-added multifaceted devices.

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Advanced Elastomeric Materials

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & material processing. He obtained his PhD from University of South Australia in 2005. He is currently a Technical Consultant in Australia. He has worked for more than 20 years at mineral and chemical industries, universities and research centers around the world. Dr Farrokhpay has published more than 90 papers in high ranked journals and conference proceedings. He has also edited several technical and scientific books, and served as an editorial board member of several international scientific journals.

Elastomers are being used widely in many engineering applications. They can be used in extreme conditions such as corrosive environments or at high temperatures, therefore, it is difficult to predict their expected service life. This book reviews the fundamentals of elastomeric materials and their manufacturing techniques with emphasis on their physical and chemical properties. It contains eight chapters focusing on various aspects of elastomers. An introduction of these materials is provided in Chapter 1. In Chapter 2, classification of elastomeric materials is discussed while morphology and compatibility of different elastomeric blends are discussed in Chapter 3. Furthermore, Chapter 4 contains the essentials of mechanical properties of different elastomeric materials and their response under mechanical conditions. In Chapter 5, properties and applications of conductive elastomers are explained. Chapter 6 discusses the mechanical and electrical properties of elastomeric materials and Chapter 7 deals with the applications of elastomers in aerospace and defense sectors. Finally, Chapter 8 discusses the biomedical applications of these materials. This book is greatly beneficial for students, researchers, engineers, teachers, and basically anybody who is interested in elastomers and rubbers or works with these materials.

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Organic Solar Cells

Sujata N. Mustapure

About the Editor

Dr. Sujata Nagnath Mustapure (1988) is presently serving as teaching associate, Department of Electrical & Other Energy sources, College of agricultural engineering & Technology, Vasantrao Naik Marathwada Krishi Vidhyapeet, Parbhani, Maharashtra. She obtained her B.Tech (agril. Engg.) in 2010 from Vasantrao Naik Marathwada Krishi Vidhyapeet, Parbhani. Gold medal in M.Tech (Agril. Engg.), 2014 from Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and Ph.D in Renewable energy engineering in 2019 from Maharana Pratap University of Agriculture and Technology, Udaipur. She has also worked as assistant professor in College of Agricultural, Naigoan, Vasantrao Naik Marathwada Krishi Vidhyapeet, Parbhani.

The solar energy industry is greatly subsidized for several years but the costs of inorganic/silicon solar cell power plants or panels are still not economical. A method for reducing the manufacturing costs of solar cells is to utilize organic materials that could be processed under low-demanding situations. Organic solar cells have numerous intrinsic advantages, like their flexibility, low material, lightweight, low manufacturing costs, low toxicity, and minimal environmental impact. In the past few years, organic photovoltaics (OPV) has received immense attention owing to their exceptional features, such as low-temperature synthesis, light, and cheap materials, solution processability, and tunable electronic properties. Apart from environmental and economic benefits, most of the organic solar cells (SCs) exhibit higher efficiencies which are comparable with the efficiencies of silicon solar cells. They have exhibited conversion efficiencies of more than 13% to date. This book encompasses the fundamentals of organic solar photovoltaics. The detailed content of the book addresses the photovoltaic energy conversion limits and provides a well-explained overview of molecular electronics, which focuses on the working principle, manufacturing, and characterization of polymeric solar cells. Different chapters of the book focus on the electrochemical processes taking place in organic solar cells by offering a detailed explanation of the exciton separation, charge-carrier transport, and electricity generation. The book also focuses on the experimental methodologies for getting a thorough understanding of the key photovoltaic processes in different types of polymeric solar cells. The primary focus of this book is to provide a comprehensive analysis of the fundamental features of organic solar cells.

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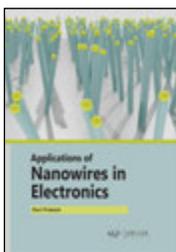
Applications of Nanowires in Electronics

Ravi Prakash

About the Auhtor

Prof. Ravi Prakash is working as an assisastant Professor in Electronics and Communication Engineering Uma Nath Singh Institute of Engineering and Technology Veer Bahadur Singh Purvanchal University Jaunpur, Uttar Pradesh, India. He was born on January 19, 1975, in Jaunpur, U.P., India. He received the B. Tech. degree in Electronics and Telecommunication Engineering from University of Allahabad, Allahabad, U.P., India in 1997, and M. Tech. degree in Electronics Engineering (Communication Technology) from University of Allahabad, Allahabad, U. P., 2001. He is gold medalist at his graduation level and rank holder in board examination. He has almost 21 years teaching experience at B. Tech., M. Tech. and Ph.D. level in engineering. He had worked as head of department of Electronics Engineering at Veer Bahadur Singh Purvanchal University Jaunpur for almost ten years. He received the Ph.D. degree in Electronics and Communication Engineering from University of Allahabad, U.P., India. His current research interests include Communication Technology. He has published several research articles in reputed international journals related to wireless, optical and digital communication. He has worked as several research and reviewer committee member, and he has excellent work in the field of digital communication, wireless and mobile communication. He had worked as Nodal officer, academic in the Technical Education Quality Improvement Program (TEQIP) supported by World Bank at university level.

One-dimensional semiconducting materials are expected to produce highly-efficient electronic components due to their extraordinary characteristics in applications like nanoscale electronics, biology, optoelectronics, and energy storage. Moreover, complex semiconducting materials have also been developed from nanowires using epitaxial growth mechanisms. The current application areas of nanowires include high-speed transistors, nanoelectronics, chemical- and biosensors, and LEDs (light-emitting diodes) with little power consumption. Concerns for the synthesis of these devices include inferior mobility and optical characteristics of nanomaterials materials. This book offers a thorough understanding of recent developments in synthesizing nanowires for constructing various types of electronic components. Especially, the book reviews the uses of nanowires in sensors, detectors, energy storage, circuits, and energy conversion, etc. Growth approaches of various types of nanowires are also discoursed along with the discussion of their electronic applications. Therefore, this book can be used as a ready reference by researchers, students, and teachers in the field of nanotechnology and electronics.

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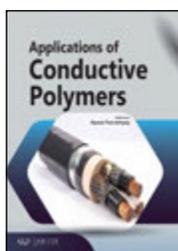
Applications of Conductive Polymers

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & material processing. He obtained his PhD from University of South Australia in 2005. He is currently a Technical Consultant in Australia. He has worked for more than 20 years at mineral and chemical industries, universities and research centers around the world. Dr Farrokhpay has published more than 90 papers in high ranked journals and conference proceedings. He has also edited several technical and scientific books, and served as an editorial board member of several international scientific journals.

Conductive polymers are being used more and more as a substitute for metallic conductors and semiconductors. The moduli of conductive polymers are much lower than the metallic components, but they have better performance in special applications such as soft biological tissues and rubbers. Moreover, polymer constituents and manufacturing parameters can be varied to adjust the mechanical and electrical properties of these polymers. This book has eight chapters containing a broad range of application of conducting polymers. Chapter 1 is an introduction to conducting polymers and it explains the history, classification, synthesis routes and electrical properties of these polymers. Application of conductive polymers in drug delivery systems is discussed in Chapter 2 while Chapter 3 focuses on the applications of these polymers in textile industry. Chapter 4 discusses the applications of conductive polymers in development of supercapacitors and in Chapter 5, their applications in developing organic solar cells are explained. Chapter 6 summarizes applications of conductive polymers in membrane development and Chapter 7 discusses their applications in tissue engineering and medical area. Finally, a detailed description of different conductive polymers and their application in energy storage systems are discussed in Chapter 8. This book can be used as a textbook for students and researchers in materials science, chemical engineering, and polymer technology. In addition, it can be used by industrial experts and engineers who need detailed information about conductive polymers.

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The Medical Device Handbook For Europe

Shalinee Naidoo

About the Auhtor

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

As the medical device landscape continues to evolve, so does the regulatory framework in Europe. Through this process many gaps and scarcity of skills and expertise have also been identified. For this reason, there was an increasing need to update the current medical device directive (MDD 93/42/EEC) being used within the European Union. This in turn led to the development and release of the Medical Device Regulation (EU MDR 2017/745). The release of the new Medical Device Regulation (EU MDR 2017/745) in 2017 marked the start of a three-year transition period for various Economic Operators along the supply chain. This volume aims to provide a simple overview of the medical device industry in Europe with particular focus on the main aspects covered in the new European Medical Device Regulation. Important concepts such as essential phases in a device lifecycle, complying to standards and regulations, the CE mark process and classification of medical devices in Europe are covered.

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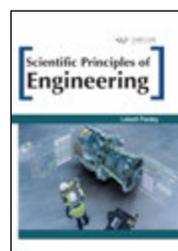
Scientific Principles of Engineering

Lokesh Pandey

About the Author

Lokesh Pandey is currently pursuing his PhD in Mechanical Engineeing from Uttarakhand Technical University, India, where he also completed his M.Tech in Thermal Engineeing. He has more than 3 years teaching experience as a Faculty for Mechanical Engineering. He has published articles in reputed Journals and has also chaired many conferences and workshops.

"The book ""Scientific Principles of Engineering"" provides a comprehensive introduction to the subject as well as various examples of engineering principles. When we talk about engineering principles, we refer to the ideas, norms, and concepts one must keep in mind to successfully solve an engineering challenge. On the other hand, not much publication is available on engineering principles. This is because the concepts that are applied to find a solution to an issue will frequently be different depending on the kind of difficulty that is faced. This book is ideal for first-year engineering students and their instructors since it allows for an accessible and comprehensive overview of the subject and detailed answers to challenging issues. This book provides an in-depth and credible analysis of the problem and its solutions. All branches of engineering may be traced back to the same core of scientific concepts. To address complex challenges, engineers from different fields may communicate with one another using these universal concepts. The engineering community's productivity would suffer significantly if its members didn't adhere to the same core values. This book covers the fundamental scientific concepts and many practical ideas that engineers apply when developing new tools and infrastructure. From the optimal layout of a circuit board to the most cost-effective construction methods, these guidelines offer advice on a wide range of topics based on years of expertise and testing. Engineers may make risk-free and efficient designs if they adhere to these guidelines.

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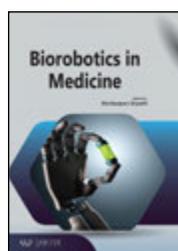
Biorobotics in Medicine

ShivSanjeevi Sripathi

About the Editor

ShivSanjeevi Sripathi completed his Masters in Biotechnology from Mumbai University in 2008. He was awarded for academic excellence in both his Bachelors and Masters for securing second rank in Mumbai University in 2006 and first rank in his college: Kishinchand chellaram College. For his Masters he secured first rank in his college KET's V.G.Vaze College. He qualified CSIR and NET and and TOEFL in September 2008. He then worked on a stem cell project at the Specialized Centre for Cell Based Therapy (SCCT),KEM Hospital at Mumbai on a project entitled, : Isolation & detection of stem cells from Human Umbilical cord/ amniotic membrane" following which he worked at Junior Research Fellow at Microbiology & Cell Biology Department, Indian Institute of Science, Bangalore on cloning of cell wall genes and transcription factors in E.coli & M.smegmatis. As a writer, he has authored and co-authored 35 books on various aspects of biology such as bionics, molecular wires, cloning, hypertension, the epidemics of the 21st century, handling depression, camouflage, hygiene, immunology and many more with international publishers. He loves to read and share on interesting aspects of life sciences in books. In his free time he loves to travel and explore and give talks on spirituality, ancient customs and traditions.

This book presents research-backed examples of how robots are being employed to assist healthcare procedures. This becomes pertinent with repeated pandemic outbreaks. The COVID-19 pandemic has necessitated "social distancing" with robust sterilization and cleaning procedures: robots have been probed in these aspects. The book starts with examples of robots in healthcare followed by two chapters on surgical robots or case studies and examples of the potential of these machines in surgery. The concepts of nano and micro have been extended to robots with the development of "nanobots". Research is ongoing in this field aimed at employing these robots to target specific cells or deliver appropriate cargo to alter the face of drug delivery.

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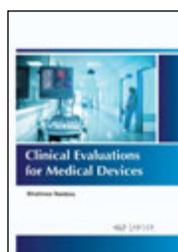
Clinical Evaluations for Medical Devices

Shalinee Naidoo

About the Author

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

Being a medical device manufacturer involves more than just manufacturing of the device itself. It is also the manufacturers responsibility to ensure adequate research is done on the device so that it can be safely used. Clinical evidence is often collected throughout the entire life cycle of a medical device and is often an ongoing process. The process starts during the design and development of the device to show safety and efficacy and is often updated even after the device is on the market. This evidence is often compiled in a Clinical Evaluation Report and presents itself a chapter of the device technical file. As the medical industry continues to evolve, so does the complexity of clinical data needed during the regulatory approval process. This volume provides an introduction into the basic concepts of clinical evaluation report writing. Important concepts such as how to conduct a literature review, claiming equivalence and when to update your clinical reports are covered.

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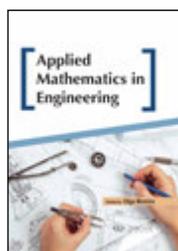
Applied Mathematics in Engineering

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. and M.Sc. in Astrophysics and B.Sc. in Physics/ Applied Mathematics (Astronomy). She is an experienced technical writer and data analyst. As a graduate student, she held two research grants to carry out her work in Astrophysics at two of the most renowned European institutions in the fields of Astrophysics and Space Science (the European Space Agency, and the European Southern Observatory). She is currently an independent scientist, peer-reviewer and editor. Her research interest is solar physics, machine learning and artificial neural networks.

"Applied Mathematics in Engineering" is an edited book comprising 15 contemporaneous open-access articles focused on mathematical modelling, mathematical optimization, and fractal mathematics and their applications in modern engineering and industry. The first part covers a wide range of mathematical models for solving real-world problems in mechanical engineering, biomedicine, fluid dynamics, and other applications. The second part of the book presents various mathematical optimization methods and algorithms (e.g. topology optimization, hybrid arithmetic optimization, and isogeometric topology optimization) for solving engineering problems. The third part of the book is dedicated to the mathematics of fractals and its applications in the engineering of antennas, image compression technology, fracture mechanics, ophthalmology and more. The intended audience of this book is undergraduate and graduate students, as well as junior researchers.

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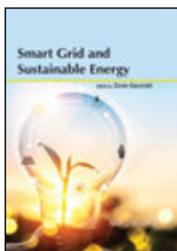
Smart Grid and Sustainable Energy

Zoran Gacovski

About the Editor

Dr. Zoran Gacovski's current position is a full professor at the Faculty of Technical Sciences, "Mother Tereza" University, Skopje, Macedonia. His teaching subjects include Software engineering and Intelligent systems, and his areas of research are: information systems, intelligent control, machine learning, graphical models (Petri, Neural and Bayesian networks), and human-computer interaction. Prof. Gacovski has earned his PhD degree at Faculty of Electrical engineering, UKIM, Skopje. In his career he was awarded by Fulbright postdoctoral fellowship (2002) for research stay at Rutgers University, USA. He has also earned best-paper award at the Baltic Olympiad for Automation control (2002), US NSF grant for conducting a specific research in the field of human-computer interaction at Rutgers University, USA (2003), and DAAD grant for research stay at University of Bremen, Germany (2008 and 2012). The projects he took an active participation in, are: "A multimodal human-computer interaction and modelling of the user behaviour" (for Rutgers University, 2002-2003) - sponsored by US Army and Ford; "Development and implementation of algorithms for guidance, navigation and control of mobile objects" (for Military Academy – Skopje, 1999-2002); "Analytical and non-analytical intelligent systems for deciding and control of uncertain complex processes" (for Macedonian Ministry of Science, 1995-1998). He is the author of 3 books (including international edition "Mobile Robots"), 20 journal papers, over 40 Conference papers, and he is also a reviewer/ editor for IEEE journals and Conferences.

This book covers different topics from smart grids and sustainable energy, including: automation and control of smart grids, sustainability and energy efficiency, security and stability of smart grids, and intelligent implementation of smart grids. Section 1 focuses on automation and control of smart grids, describing smart grids: future of electrical transmission and distribution, building automation networks for smart grids, voltage control in smart grids: an approach based on sensitivity theory, agents for smart power grids, and distributed optimal control of transient stability for a power information physical system. Section 2 focuses on sustainability and energy efficiency, describing energy efficiency in smart grid: a prospective study on energy management systems, energy efficiency and renewable energy technologies using smart grids: study case on NIPE building at UNICAMP campus, towards attaining reliable and efficient green cloud computing using micro-smart grids to power internet data center, the development of electricity grid, smart grid and renewable energy in Taiwan, and optimal power flow approach for cognitive and reliable operation of distributed generation as smart grid. Section 3 focuses on security and stability of smart grids, describing a secure and scalable data communication scheme in smart grids, S-DPS: an SDN-based DDOS protection system for smart grids, distribution system reliability analysis for smart grid applications, and approach to assess the resiliency of electric power grids. Section 4 focuses on intelligent implementations of smart grids, describing intelligent load shedding using TCP/IP for smart grids, intelligent load management scheme for a residential community in smart grids network using fair emergency demand response programs, towards implementation of smart grid: an updated review on electrical energy storage systems, and a perspective on the future of distribution: smart grids, state of the art, benefits and research plans.

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Safety Science and Technology

Zoran Gacovski

About the Editor

Dr. Zoran Gacovski's current position is a full professor at the Faculty of Technical Sciences, "Mother Tereza" University, Skopje, Macedonia. His teaching subjects include Software engineering and Intelligent systems, and his areas of research are: information systems, intelligent control, machine learning, graphical models (Petri, Neural and Bayesian networks), and human-computer interaction. Prof. Gacovski has earned his PhD degree at Faculty of Electrical engineering, UKIM, Skopje. In his career he was awarded by Fulbright postdoctoral fellowship (2002) for research stay at Rutgers University, USA. He has also earned best-paper award at the Baltic Olympiad for Automation control (2002), US NSF grant for conducting a specific research in the field of human-computer interaction at Rutgers University, USA (2003), and DAAD grant for research stay at University of Bremen, Germany (2008 and 2012). The projects he took an active participation in, are: "A multimodal human-computer interaction and modelling of the user behaviour" (for Rutgers University, 2002-2003) - sponsored by US Army and Ford; "Development and implementation of algorithms for guidance, navigation and control of mobile objects" (for Military Academy – Skopje, 1999-2002); "Analytical and non-analytical intelligent systems for deciding and control of uncertain complex processes" (for Macedonian Ministry of Science, 1995-1998). He is the author of 3 books (including international edition "Mobile Robots"), 20 journal papers, over 40 Conference papers, and he is also a reviewer/ editor for IEEE journals and Conferences.

In this book we present different topics from safety science and technology, including: safety-critical systems, safety simulation techniques, safety in transport and vehicles, and safety analysis in medicine (hospitals). Section 1 focuses on safety-critical systems, describing architecture level safety analyses for safety-critical systems, safety assessment of nuclear power plants for liquefaction consequences, the Fukushima nuclear accident: insights on the safety aspects, an augmented framework for formal analysis of safety critical systems, and concepts of safety critical systems unification approach & security assurance process. Section 2 focuses on safety simulation techniques, describing the marine safety simulation based electronic chart display and information system, improved modelling and assessment of the performance of firefighting means in the frame of a fire PSA, scenario grouping and classification methodology for post-processing of data generated by integrated deterministic-probabilistic safety analysis, demonstration of emulator-based Bayesian calibration of safety analysis codes: theory and formulation, microscopic simulation-based high occupancy vehicle lane safety and operation assessment: a case study. Section 3 focuses on safety in transport and vehicles, describing safety of autonomous vehicles, studying the safety impact of autonomous vehicles using simulation-based surrogate safety measures, advanced modeling and simulation of vehicle active aerodynamic safety, and analyzing driving safety using vehicle-water-filled rutting dynamics model and simulation. Section 4 focuses on safety analysis in medicine (hospitals), describing establishing patient safety in intensive care - a grounded theory, analysis of critical incidents during anesthesia in a tertiary hospital, healthcare professional's perception of patient safety measured by the hospital survey on patient safety culture: a systematic review and meta-analysis, and uncertainty of clinical thinking and patient safety.

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Organic Semiconductors for Optoelectronics

S.N. Shukla

About the Author

Dr. SachchidaNand Shukla, is presently working as Professor, Department of Physics & Electronics, Dr. RamManohar Lohia Avadh University, Ayodhya, UP, India. He did his Masters in Physics (Electronics) in 1988 and Ph.D. in 1992 from the same university. Dr. Shukla holds 27 years' experience of teaching M.Sc. (Physics) and M.Sc. (Electronics) students and 3 years experience of teaching B.Tech., MCA and B.Sc. (Electronics) students. He has published 85 research papers in peer-reviewed/ indexed journals of International/National repute & conference proceedings and 02 books. In his supervision 14 research scholars have been awarded Ph.D. degree. In addition to it he is the recipient of Best Scientist National Award (2018) of IRDP Group of Journals, Chennai and Maatee Ratan Samman (2017). He has also been selected as Fellow of IACSIT (International Association of Computer Science and Information Technology, Singapore) and Associate Fellow of IAPS (International Academy of Physical Sciences) in 2018. In view of Dr. Shukla's academic achievements his employer institution, Dr. RamManohar Lohia Avadh University, has conferred upon him the 'Certificate of Appreciation' in 2018. Besides having a wide exposure to various key positions of University administration like Pro Vice Chancellor, Registrar, Director College Development Council (CDC), Coordinator UGC and RUSA, Head of Physics Department etc, Dr. Shukla has membership of 08 academic bodies of international repute. To name a few are ISCA (The Indian Science Congress Association, Kolkata, India), IETE (The Institution of Electronics and Telecommunication Engineers, New Delhi, India), NASI (The National Academy of Sciences, India, Allahabad, India), IAPS (International Academy of Physical Sciences, Allahabad, India) and SCIEI (Science and Engineering Institute, Hong Kong, SAR of China).

"The book ""Organic Semiconductors for Optoelectronics"" provides a thorough analysis of the topic and illustrated examples of organic semiconductors in various applications. Organic semiconductors, which are composed of polymers or -bonded molecules, may conduct when charge carriers are inserted into them. The backbone of the polymeric chain containing the conjugated system of bonds enables charge transfer through the polymer chain. This textbook offers the teachers, researchers, and students an easy and thorough explanation of the principles, guidelines, and, particularly, the complicated instrumentation techniques used in optoelectronics. It discusses some recent advances in the study of the optoelectronic properties of organic semiconductors while also summarizing the fundamental ideas. Examples and applications of electronic and optoelectronic organic materials are also discussed in the book. This handbook thoroughly covers different aspects of organic semiconductors present today. Even a reader with no prior knowledge should be able to grasp the fundamental concepts of organic semiconductors after reading this book.

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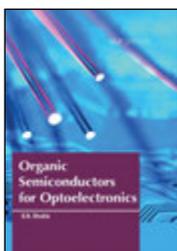## How to Classify your Medical Device Under European Regulations

Shalinee Naidoo

About the Authors

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

Over the last 20 or so years, the number, range, and complexity of medical devices available on the market has increased drastically and as a result, so has the complexity of the regulations involved. With new and emerging technologies as well as various well-known incidents within the medical device industry, the current regulatory framework has since been challenged. In fact, many gaps and scarcity of skills and expertise have been identified. For this reason, there was an increasing need to update the current Medical Device Directive (MDD 93/42/EEC) in the European Union, which in turn led to the development and release of the Medical Device Regulation (EU MDR 2017/745). This volume aims to provide an easy-to-understand guide for beginners to the medical device regulations in Europe with specific focus on classification methods. It looks specifically at how to class a medical device based on the risk associated with it as well the details around the European Classification Systems provided in the MEDDEV 2.4/1. This volume also delves into the detail around defining borderline medical devices and how they are classified according to the Manual on Borderline and Classification in the Community Regulatory Framework for Medical Devices as published by the European Commission.

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Machine Learning: A Physicist Perspective

Nelson Bolivar

About the Author

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

Deep-learning and machine-learning have gained a significant importance in the last few years. New inventions and discoveries are taking place every day to exploit the concepts of machine-learning technique. The aim of this book is to present the fundamentals of machine-learning with an emphasis on deep-learning, neural networks and physical aspects of machine learning.

Design of materials and molecules with desired features is an essential prerequisite for progressing technology in our contemporary societies. This necessitates both the capability to compute precise microscopic characteristics, such as forces, energies and efficient selection of potential energy faces, to attain corresponding macroscopic features. Tools required to achieve the above mentioned goals can be extracted from quantum mechanics, statistical mechanics, and classical physics, respectively.

To overcome the challenge of technology integration, significant efforts are being made to speed up quantum physical simulations with the help of machine learning. This evolving interdisciplinary community consists of material scientists, chemists, physicists, computer scientists and mathematicians, coming together to contribute to the exciting field of machine learning and artificial intelligence.

This book can be used as a reference material for acquiring fundamentals of machine learning from a physicist's perspective. Moreover, people from all backgrounds can benefit from this introductory book on Machine Learning.

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Graphene Devices

Nelson Bolivar

About the Authors

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

Graphene is considered to be the pioneer two-dimensional material with an immense potential of research and industrial growth. It constitutes the foundation for novel electronic applications of nanomaterials. Successful segregation of single-layered graphene has instigated a lot of curiosity in unraveling the prospects of its use in synthesis of various electronic and electrical devices, predominantly because of its remarkable electronic characteristics. This book primarily focuses on practical uses of graphene determined by its unique characteristics. The mechanisms of thermal and electric transport in graphene, quantum dots, interface phenomena, non-equilibrium states, dissipation, and scattering are thoroughly discussed in the book. Detailed evaluations and comparisons between theoretical and experimental aspects of graphene based materials are illustrated with a range of practical examples. This book also emphases on carbon based nanomaterials (graphene) as novel materials for applications in modern electrical and electronic devices. The growth and applications of novel graphene technology are also discussed in the book. As new materials and new devices, nano-graphene materials are estimated to be pioneer materials that would surpass the conventional materials in terms of performance as well as cost. This book familiarizes the audience with latest accomplishments of graphene devices, and technological growth. The book is mainly focused at a broad range of audiences ranging from undergraduate students and doctoral fellows to industrial engineers and researchers. However, this book can be used specifically by materials scientists, chemists and physicists to expand their knowledge about synthesis, characterization and applications of graphene based materials.

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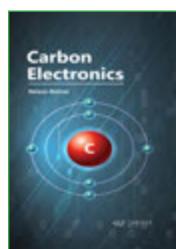
Carbon Electronics

Nelson Bolivar

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Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

This book, Carbon Electronics, offers a comprehensive overview of the latest advances in the area of carbon based electronic and circuit applications. The book essentially encompasses physical, chemical and electrical characteristics of carbon based materials. It familiarizes the readers with basic device physics and electronic configurations of carbon materials while offering different examples of the state-of-the-art carbon nanotube devices. The applications of carbon materials include cell electrodes, flexible displays, transistors, organic electronics, solar cells, integrated circuits and semiconductors. These applications offer solutions for the current energy and health crisis. Each contribution of the carbon-based materials emphasizes on the significance of the structural and functional characteristics of electronic devices.

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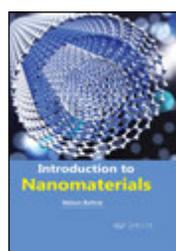
Introduction to Nanomaterials

Nelson Bolivar

About the Author

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

This book is mainly intended for undergraduate students of materials engineering and electrical engineering. However, the book is also beneficial for graduate students from various multidisciplinary areas including chemistry, physics, materials engineering, electrical engineering, chemical engineering, mechanical engineering, biology and, and bioengineering. Researchers and scientists in the area of nanoscience and nanotechnology can also use the book for constructing the background essential to comprehend the fundamentals of nanomaterials. The world is rapidly moving towards technological evolution since the start of 21st century. Nanotechnology is revolutionizing the world due to its unique and extraordinary applications in almost every area of human activity. The advent of nanotechnology has resulted in the shrinkage of chips and electrical circuits from giant structures to the size of our finger nails. We can store data up to 1 tera-byte in a storage device. The smart watches are performing the tasks as a mini-computer. On the other hand, the development of smart-phone technology has completely revolutionized the world. The applications of nanotechnology in medicine and medical devices have resulted in efficient disease detection and higher cure rates. The use of nanomaterials in electronic sensors and solar cells is also getting great attention now-a-days. There are numerous other applications of nanomaterials in various sectors of materials development which are paving a way towards a nano-age. This introductory book on nanomaterials particularly addresses the necessities of engineers and scientists who require the basic knowledge about nanoscience and nanotechnology, without indulging into the minor scientific details.

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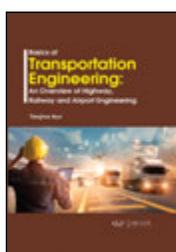
Basics of Transportation Engineering: An overview of Highway, Railway and Airport Engineering

Tanjina Nur

About the Authors

Tanjina finished her PhD in Civil and Environmental Engineering in 2014 from University of Technology Sydney (UTS). Now she is working as Post-Doctoral Researcher in the Centre for Technology in Water and Wastewater (CTWW) and published about eight International journal papers with 80 citations. Her research interest is wastewater treatment technology using adsorption process.

'Basics of Transportation Engineering: An Overview of Railway and Airport Engineering' is a handbook for integrating different transport systems and evaluating their prospective impact on the environment and society. Rigorous and clear in its coverage, the book begins with illustration of principles associated to transport engineering, traffic engineering and transportation planning. This book is divided into three parts. There are eight chapters in the book. First two chapters focus on fundamentals and general principles of transportation engineering. Next three chapters focus on Railway engineering while the last three chapters of the book focus on airport engineering. Railway transport is the backbone of transportation systems. A country cannot develop its infrastructure without upgrading its railway transportation. Presently, most of the developed countries have developed updated railway transportation systems. On the other hand, airport transportation and airport engineering are key areas of modern infrastructure developments. This book provides essential information related to transportation engineering, traffic engineering, railway transport, railway engineering, airport transportation and airport engineering.

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Pollution Control for Oil and Gas Engineering

Vierah Hulley

About the Author

Vierah Hulley is an internationally experienced expert in Environmental and Earth Sciences and Management. She has an extensive vocational background in the areas of environmental policy development, environmental risk management, natural resources management, contaminated site remediation, sustainable development, and spatial analytics. She is the founder and Managing Director of HL Nexus: The Data Imaginarium; a company dedicated to optimizing natural resources management with data science. Vierah holds a master's degree in Geology and a PhD in Geohydrology, with a focus on environmental and spatial science.

This is a novel handbook on pollution control in oil and gas industry that encompasses hundreds of multidisciplinary topics. However, the book is profoundly slanted towards management and pollution control in oil and gas industries. Multi-media contamination technologies are also covered in this book which contain detailed explanation of three different kinds of pollution, e.g., air pollution, soil pollution and water pollution. This book is divided into eight chapters. Initial four chapters introduce the audience with fundamental concepts of oil and gas pollution and its impacts. While last four chapters deal with pollution control mechanism. This book essentially covers the necessary requirements for soil, water and air pollution controls in oil and gas industries, petrochemical plants, oil terminals, chemical plants, and interrelated facilities. This book has been organized to help environmental scientists and oil and gas engineers as a hands-on reference for dealing with practices and technologies of pollution control. The details pertaining to all three kinds of environmental pollutions and their control strategies are exquisitely illustrated in this manuscript.

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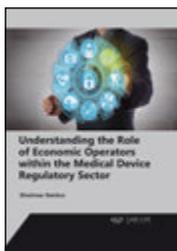
Understanding the Role of Economic Operators within the Medical Device Regulatory Sector

Shalinee Naidoo

About the Authors

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

New and emerging technologies as well as various well-known incidents within the medical device industry have challenged the current framework, highlighted gaps and pointed to a certain scarcity of skills and expertise. For this reason, there was increasing need to update the European Medical Device Directives. This has since led to the development and release of the Medical Device Regulation (MDR 2017/745) which has now put stricter regulatory controls on the entire product life cycle. Both the EU Medical Devices Regulation (MDR) and In Vitro Diagnostic Medical Devices Regulation (IVDR) contain a complete section on economic operators for medical devices. Although the manufacturer is ultimately responsible for ensuring their medical device is compliant with the relevant legislation, the various defined economic operators within the Regulation, now have a part to play in ensuring the safety and performance of the device throughout the supply chain. This new policy of sharing compliance is an important component of the MDR2017/745 with each economic operator serving as a control on the other, causing each device to receive a number of checks throughout the process before it is brought to market. In addition to this, it also allows for any compliance issues emerging from any one of the economic operators to have a direct legal implication on the other. Changes brought about by the MDR2017/745 in Europe require not only manufacturers but all defined economic operators to take a proactive, multilevel and multidisciplinary approach when it comes to ensuring safe and effective devices are placed on the market. This volume looks at each Economic Operator in greater details with their relevant responsibilities.

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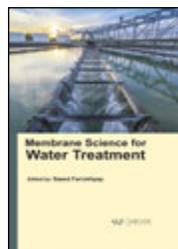
Membrane Science for Water Treatment

Saeed Farrokhpay

About the Editor

Dr Saeed Farrokhpay is a Chemical Engineer with several years of experience in mineral & chemical processing. He obtained his PhD from Ian Wark Research Institute, University of South Australia in 2005. He is currently a Consultant in Australia and provides technical services and consultancy to improve complex mineral and chemical processing performance. He has worked as a Senior Researcher at different universities and research centers around the world. Dr Farrokhpay has published more than 80 papers in high ranked journals and conference proceedings and has served as an editorial board member of several international journals.

In this book, the fundamental of membrane science and technology and their application in water treatment is discussed. These days accessing to fresh water is a real challenge in some parts of the world, and membrane technology plays an important role for producing fresh water from saltwater or wastewater. Membranes offer substantial benefits over other available technologies as they are flexible and compatible with various systems.

This book provides in-depth technical knowledge on the basics, applications, and latest developments of membrane science and technology. It has 8 chapters and each chapter contains a comprehensive analysis of a specific aspect of the membrane science and technology. It covers the current status of membrane technologies and a critical overview of new materials and processes, as well as opportunities for future research.

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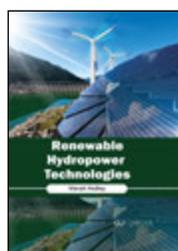
Renewable Hydropower Technologies

Vierah Hulley

About the Authors

Vierah Hulley is an internationally experienced expert in Environmental and Earth Sciences and Management. She has an extensive vocational background in the areas of environmental policy development, environmental risk management, natural resources management, contaminated site remediation, sustainable development, and spatial analytics. She is the founder and Managing Director of HL Nexus: The Data Imaginarium; a company dedicated to optimizing natural resources management with data science. Vierah holds a master's degree in Geology and a PhD in Geohydrology, with a focus on environmental and spatial science.

The production of electricity using the power of hydro and thermal energies presents a sustainable and renewable energy production technology. Hydropower is a mature technology, used in over 160 countries globally, where the kinetic energy of falling water is converted to electricity in hydropower plants. This book, divided into eight chapters, provides the reader with information on fundamental concepts and terminologies of the hydropower technologies. Each chapter can be read as stand-alone comprehensive content to gain knowledge on a particular area of relevance or interest. Readers are presented with a concise compilation of the best current knowledge on the types, mechanics and sustainability in the planning, management, and operations of hydropower technologies.

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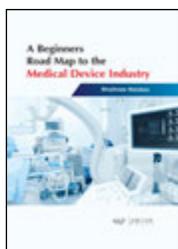
A Beginners Road Map to the Medical Device Industry

Shalinee Naidoo

About the Authors

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

It is estimated that there are over 10 000 different medical devices available on the market today. These devices have become an integral part of health care and a vital component of the various activities carried out by health-care providers to treat people with varying medical conditions all around the world. Regulatory requirements for such devices differ from country to country all around the world which in turn make it difficult for manufacturers to obtain all round market approval for their products. While market approval from regulatory authorities can easily be obtained if a manufacturer can prove the device meets national regulatory guidelines; differences in regulatory requirements between different countries means that a manufacturer's registration process becomes more complex and ultimately may require additional resources or information. This volume aims to provide a basic roadmap to beginners into the medical device industry. It provides a simplistic overview of the vast history behind much of the regulations and medical technology governing the field today as well as the need and importance of associated medical device regulations and essential principles governing safe and effective manufacture and use of these devices.

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5G and 6G Communication Technologies

Zoran Gacovski

About the Editor

Dr. Zoran Gacovski has earned his PhD degree at Faculty of Electrical engineering, Skopje. His research interests include Intelligent systems and Software engineering, fuzzy systems, graphical models (Petri, Neural and Bayesian networks), and IT security. He has published over 50 journal and conference papers, and he has been reviewer of renowned Journals. Currently, he is a professor in Computer Engineering at European University, Skopje, Macedonia.

This book covers different topics from 5G and 6G mobile technologies, including: telecommunication, antenna and bandwidth aspects of 5G, business solutions enabled by 5G technology, different application scenarios of 5G, and topics from the 6G technology.

Section 1 focuses on telecommunication, antenna and bandwidth aspects of 5G, describing mobile communication through 5G technology, a review in the core technologies of 5G: device-to-device communication, multi-access edge computing and network function virtualization, design of a multiband patch antenna for 5G communication systems, wideband reconfigurable millimeter-wave linear array antenna using liquid crystal for 5G networks, and FBMC vs OFDM waveform contenders for 5G wireless communication system.

Section 2 focuses on business solutions enabled by 5G technology, describing the roles of 5G mobile broadband in the development of IoT, big data, cloud and SDN, planning and profit sharing in overlay Wi-Fi and LTE systems toward 5G networks, construction of enterprise 5G business ecosystem - case study of Huawei, and 5G new radio prototype implementation based on SDR.

Section 3 focuses on different application scenarios of 5G, describing the prospect of 5G technology applied to distance medical education and clinical practice, research on the innovation path of logistics formats based on 5G technology, limiting energy consumption by decreasing packets retransmissions in 5G network, effective packet number for 5G IM WeChat application at early stage traffic classification, and software defined network (SDN) and OpenFlow protocol in 5G network.

Section 4 focuses on topics from the 6G technology, describing the shift to 6G communications: vision and requirements, a semi-dynamic bidirectional clustering algorithm for downlink cell-free massive distributed antenna system, resource allocation for SWIPT systems with nonlinear energy harvesting model, and a resource allocation scheme with delay optimization considering mmWave wireless networks.

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Essential principles of Safety and Effectiveness for medical devices

Shalinee Naidoo

About the Authors

Shalinee Naidoo is currently the Regulatory and Product Development Manager of a medical device manufacturer based in South Africa. She is directly involved in global regulatory compliance and the design and development of new medical devices from idea conception to market. She is also the founder of Life of Shal (www.lifeofshal.com) an online travel journal created to inspire others to explore the world and Scientist's Sanctuary (www.scientistssanctuary.com) – a science communication company that specializes in bridging the gap between scientific knowledge and creative communication for both the academic and corporate world.

The medical device sector is growing fast. Every day new technology which is both complex and smart are being added to the industry. Ensuring safe and effective use of medical devices for patients and users of the device itself is a crucial responsibility for manufacturers. When designing and manufacturing medical devices, safety, and efficacy should be of utmost importance. A manufacturer should never compromise on the clinical safety requirements of its users, patients or any other persons involved. Generally, the design of a medical device is regulated by the essential principles (EP) of safety and performance. What this means is that if a device is designed to relieve pain, the manufacturer must be able to clinically prove that the device can in fact relieve pain. Often this poses a great deal of challenges to manufacturers; however, building in appropriate safety and risk management functions across a device's lifecycle is imperative if they wish to reduce the risk of post-market problems. This volume aims to provide an overview of the harmonized essential principles that must be achieved in the design and development of medical devices. It provides an in-depth explanation of the relevant medical device regulations in Europe with a specific focus on the safety and performance requirements for medical devices.

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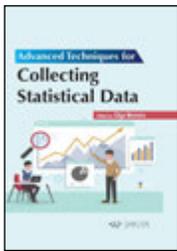
Advanced Techniques for Collecting Statistical Data

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. and M.Sc. in Astrophysics and B.Sc. in Physics/ Applied Mathematics (Astronomy). She is an experienced technical writer and data analyst. As a graduate student, she held two research grants to carry out her work in Astrophysics at two of the most renowned European institutions in the fields of Astrophysics and Space Science (the European Space Agency, and the European Southern Observatory). She is currently an independent scientist, peer-reviewer and editor. Her research interest is solar physics, machine learning and artificial neural networks.

"Advanced Techniques for Collecting Statistical Data" is an edited book consisting of 17 contemporaneous open-access articles focused on data collection methods, from qualitative research techniques to automated data collection systems. The first chapters include a practical guide to designing, sampling, and collecting qualitative research data. The second part of the book is devoted to data mining of information collected from clinical and social studies surveys, as well as from social media. The final chapters reflect on current efforts to optimize and automate data collection procedures. This book also includes new methodologies based on automatic data collection and analysis systems based on smartphone technology and artificial intelligence, as well as their application in clinical research, sociology, stock market prediction and other fields. This book is intended to reach an academic audience ranging from undergraduate students to junior researchers.

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The use of Mathematical Structures: Modelling Real Phenomena

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. and M.Sc. in Astrophysics and B.Sc. in Physics/ Applied Mathematics (Astronomy). She is an experienced technical writer and data analyst. As a graduate student, she held two research grants to carry out her work in Astrophysics at two of the most renowned European institutions in the fields of Astrophysics and Space Science (the European Space Agency, and the European Southern Observatory). She is currently an independent scientist, peer-reviewer and editor. Her research interest is solar physics, machine learning and artificial neural networks.

"The Use Of Mathematical Structures: Modelling Real Phenomena" is an edited book consisting of 16 contemporaneous open-access articles that are devoted to the mathematical modelling of natural phenomena. To summarize, this book is about the use of applied mathematics and mathematical analysis in the context of its applications to real-world problems. It includes a selection of real-world problems in fluid dynamics, mechanical engineering, biology, and biochemistry. The last chapters include the mathematical modelling of the COVID-19 virus. The intended audience of this book is undergraduate and graduate students, as well as junior researchers. The reader must have a good knowledge of ordinary differential equations, boundary value problems, fractional calculus, stability theory, and wavelets in order to fully understand the real-world problems and their mathematical modelling included in this book.

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Statistical Mechanics and Entropy

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. in Astrophysics and B.Sc. in Physics and Applied Mathematics. She is an experienced technical writer and researcher which former fellowships include postgraduate positions at two of the most renown European institutions in the fields of Astrophysics and Space Science (the European Southern Observatory, and the European Space Agency). Presently, she is an independent scientist working on projects involving machine learning and neural networks research as well as peer-reviewing and edition of academic books.

"Statistical Mechanics and Entropy" is an edited book consisting of 16 contemporaneous open-access articles that highlight different aspects of the definition of entropy in statistical mechanics and other fields. The book includes a reflection on the real physical meaning of thermodynamic entropy, and several misconceptions regarding the violation of the second law of thermodynamics by perpetual motion machines, Maxwell's demon, vortex tube, etc. It overviews the concept of generalized Boltzmann-Gibbs entropy in dynamical systems (e.g. Kolmogorov–Sinai entropy), information theory (e.g. Rényi and Shannon entropies), and statistical physics (e.g. Tsallis entropy). It includes quantum modifications and extensions of equilibrium statistical mechanics. Fundamental laws of nature and thermodynamics are expanded from classical simple systems to quantum systems, as well as to more complex systems in biology, cosmology, economy and communication networks. Reading this book requires some knowledge in thermodynamics, calculus and differential equations. This book is intended to reach an academic audience ranging from undergraduate students to experienced researchers.

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The Notion of Mathematical Proof: Key Rules and Considerations

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. and M.Sc. in Astrophysics and B.Sc. in Physics/ Applied Mathematics (Astronomy). She is an experienced technical writer and data analyst. As a graduate student, she held two research grants to carry out her work in Astrophysics at two of the most renowned European institutions in the fields of Astrophysics and Space Science (the European Space Agency, and the European Southern Observatory). She is currently an independent scientist, peer-reviewer and editor. Her research interest is solar physics, machine learning and artificial neural networks.

"The Notion Of Mathematical Proof: Key Rules And Considerations" is an edited book consisting of 16 contemporaneous open-access articles that aim to cover the different aspects of learning and teaching mathematical proof. The first part of this book aims at summing up factors that influence the cognitive development required to successfully understand and solve mathematical proofs. The second part of the book aims to overview implementations of learning methods for constructing and evaluating the validity of mathematical proof, as well as to provide strategies for overcoming possible difficulties in mathematical proof processing. It also includes other studies related to mathematical proof and a motion-based program for improving mathematical reasoning through action. This book is intended to reach out to an academic audience ranging from undergraduate students to junior researchers.

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Use of Abstraction and Logic in Mathematics

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. and M.Sc. in Astrophysics and B.Sc. in Physics/ Applied Mathematics (Astronomy). She is an experienced technical writer and data analyst. As a graduate student, she held two research grants to carry out her work in Astrophysics at two of the most renowned European institutions in the fields of Astrophysics and Space Science (the European Space Agency, and the European Southern Observatory). She is currently an independent scientist, peer-reviewer and editor. Her research interest is solar physics, machine learning and artificial neural networks.

"The Use of Abstraction and Logic in Mathematics" is an edited book consisting of 16 contemporaneous open-access articles that are essentially devoted to mathematical logic research, from classical to non-classical logical systems, from algebraic logic to fuzzy logic. The book addresses the following mathematical logic topics: first-order and higher-order logic; as well as infinitary, description, modal; fixed-point, algebraic and fuzzy logic. This book also includes examples of practical applications of logical systems in link prediction and image processing tasks, as well as in the training of neural networks and artificial intelligence. The intended audience of this book is undergraduate and graduate students, as well as junior researchers. Familiarity with first-order and higher-order logics, as well as set theory, and algebra is essential to grasp the concepts and methods described in this book.

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Key Concepts in Mathematics

Alberto D. Yazon

About the Author

Dr. Alberto Dolor Yazon is an Associate Professor and Chairperson of Curriculum and Instruction Development and Quality Assurance at the Laguna State Polytechnic University, Philippines. He obtained his Doctor of Philosophy in Mathematics Education at Philippine Normal University, Manila. He is a Technical Committee and Advisory Board Member of EURASIA Research since September, 2019. He authored the published books Learning Guide in Methods of Research, Assessment in Student Learning, Fundamentals of Advanced Mathematics, and Introduction to Mathematical Literacy. He had published 13 research papers, three (3) of which are indexed in Scopus Journal. He is a resource speaker for different topics related to Mathematics, Assessment of Learning, Statistics, and Research. He seats as a panel of examiner and adviser in master's thesis and doctoral dissertation among graduate students. He is also an Accreditor in the Accrediting Agency of Chartered Colleges and Universities in the Philippines, Inc. (AACCUP) and Internal Quality Auditor in International Organization for Standardization (ISO).

This book provide highlights on the various terms that are used in mathematics. Mathematics is essential in many fields, including natural science, engineering, medicine, finance, and the social sciences. Applied mathematics has led to entirely new mathematical disciplines, such as statistics and game theory. Mathematicians engage in pure mathematics (mathematics for its own sake) without having any application in mind, but practical applications for what began as pure mathematics are often discovered later.

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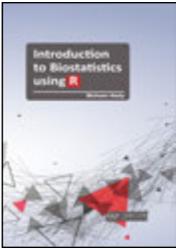
Introduction to Biostatistics using R

Mohsen Nady

About the Author

Mohsen Nady is a pharmacist with a M.D. in Microbiology and a diploma in Industrial Pharmacy. In addition, Mohsen has more than 4 years experience using R programming language. Mohsen has applied his skills in R programming to different projects related to Genomics, Microbiology, Biostatistics, Six Sigma, Data Analytics, Data Visualization, Building Apps, Geography, Market Analysis, Business Analysis,…...etc. Mohsen also published his thesis in high impact journal that attracted many citations, where all the statistical analysis were performed by him in addition to the methodological part. Furthermore, Mohsen has earned additional certificates, from top universities (Harvard, Johns Hopkins, Denmark,...etc) in R programming, Python, Excel, and Minitab that highlight his outstanding programming skills.

This book covers some introductory steps in biostatistics using R programming language. Biostatistics is the branch of statistics that applies statistical methods to medical and biological problems. Biostatistics has become more important recently for studying the great amount of data that is produced from census data, genome sequencing, gene expression data, medical bioinformatics, and medical imaging data. With the help of R programming, statistical analysis, data cleaning, data visualization, and machine learning has become a relatively easy tasks for these huge datasets. R is now considered the centerpiece language for doing all these data science skills because it has many useful packages that not only can perform all these tasks, but also, has additional packages that were specifically designed for several statistical tasks related to biology and medical data. In addition, many scientific journals require the data analysis R scripts to ensure reproducibility of the submitted results. The first chapter of this book introduces many statistical concepts used in scientific research like study designs, sample, and population, and data types. Chapters 2, 4, and 5 cover the three main data types which are continuous data, categorical data, and time to event data. Chapter 3 discusses the popular continuous distribution that is the normal distribution along with its application to sample data. Chapter 6 is about the sampling distribution of different sample estimates along with a discussion of the famous central limit theorem (CLT). Chapters 7 and 8 are involved in confidence interval (CI) calculations, and Chapters 9–11 discuss several types of statistical tests like t-test, ANOVA, Chi-square, log-rank, etc. Finally, Chapters 12–14 deal with different regression types; linear regression for continuous outcomes, logistic regression for binary outcomes, and Cox regression for time to event outcomes. In all these chapters, many examples from many scientific journal articles or built in data sets along with different codes and outputs are given to help your understanding of these numerous statistical concepts. I hope this book will be a great addition to your future biostatistical projects.

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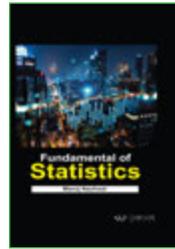
Fundamental of Statistics

Manoj Nauhwar

About the Author

Manoj Nauhwar is a Charted Accountant (CA) by profession in Dedicated Freight Corridor Corporation of India Limited, New Delhi, who also engaged in proofreading scientific and academic research related to the account, finance, and also management. He has completed many assignments in various public sectors. He has eight years of experience in education and the private sector. He is currently engaged both in the finance sector and also teaches CA final students.

Statistics is a crucial process behind how we make discoveries in science, make decisions based on data, and make predictions. This book has been prepared for students that they have acquired or gain fair knowledge of statistics and easy presentation of simple language has written for proper understand each and every topic. The chapters have been so arranged to give a sequential knowledge of the introduction of statistics, etc., in this book with practical approaches. This book would serve not only for undergraduate but post-graduate students of biotechnology, MSc, BSc in Environment, Bioinformatics, and Agriculture, all life science students, BCom, MCom, B.A, M.A, MPhil, and also research scholar of various universities.

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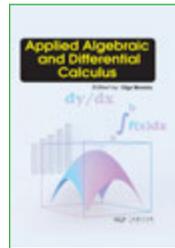
Applied Algebraic and Differential Calculus

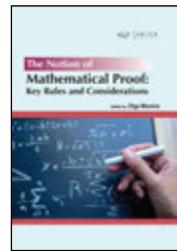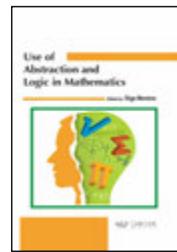### *Olga Moreira*

About the Editor

Olga Moreira is a Ph.D. in Astrophysics and B.Sc. in Physics and Applied Mathematics. She is an experienced technical writer and researcher which former fellowships include postgraduate positions at two of the most renown European institutions in the fields of Astrophysics and Space Science (the European Southern Observatory, and the European Space Agency). Presently, she is an independent scientist working on projects involving machine learning and neural networks research as well as peer-reviewing and edition of academic books.

Applied Algebraic and Differential Calculus" is an edited book consisting of 18 open-access articles on mathematical analysis and computational methodologies for solving differential equations, as well as matrix eigenvalue, boundary value, and bifurcation problems. It includes a variety of algebraic and numerical strategies from decomposition to neural network based methods.

Reading this book requires some knowledge in advanced calculus, differential equations, matrix computations. This book is intended to reach an academic audience ranging from graduate student to experienced researchers.

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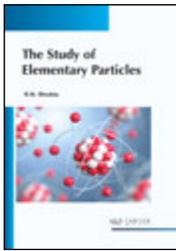
The Study of Elementary Particles

S.N. Shukla

About the Author

Dr. SachchidaNand Shukla, is presently working as Professor, Department of Physics & Electronics, Dr. RamManohar Lohia Avadh University, Ayodhya, UP, India. He did his Masters in Physics (Electronics) in 1988 and Ph.D. in 1992 from the same university. Dr. Shukla holds 27 years' experience of teaching M.Sc. (Physics) and M.Sc. (Electronics) students and 3 years experience of teaching B.Tech., MCA and B.Sc. (Electronics) students. He has published 85 research papers in peer-reviewed/ indexed journals of International/National repute & conference proceedings and 02 books. In his supervision 14 research scholars have been awarded Ph.D. degree. In addition to it he is the recipient of Best Scientist National Award (2018) of IRDP Group of Journals, Chennai and Maatee Ratan Samman (2017). He has also been selected as Fellow of IACSIT (International Association of Computer Science and Information Technology, Singapore) and Associate Fellow of IAPS (International Academy of Physical Sciences) in 2018. In view of Dr. Shukla's academic achievements his employer institution, Dr. RamManohar Lohia Avadh University, has conferred upon him the 'Certificate of Appreciation' in 2018. Besides having a wide exposure to various key positions of University administration like Pro Vice Chancellor, Registrar, Director College Development Council (CDC), Coordinator UGC and RUSA, Head of Physics Department etc, Dr. Shukla has membership of 08 academic bodies of international repute. To name a few are ISCA (The Indian Science Congress Association, Kolkata, India), IETE (The Institution of Electronics and Telecommunication Engineers, New Delhi, India), NASI (The National Academy of Sciences, India, Allahabad, India), IAPS (International Academy of Physical Sciences, Allahabad, India) and SCIEI (Science and Engineering Institute, Hong Kong, SAR of China).

From the inception of particle physics during the 1930s up to the recent 21st century drives, the inventive concepts and technologies of molecular physics have infiltrated the mainstream society to change how we live. There is a long and developing list of viable applications with regards to particle physics. Today, every significant medical center globally uses accelerators generating x-rays, neutrons, protons, and heavy ions for diagnosis and cure of illnesses. It is believed that there are more than 7,000 actives medical linacs across the planet that have treated around 30 million patients. Likewise, biomedical researchers use molecular physics advances to unravel the design of proteins, data that is critical to understanding biological cycles and treating illness. A better comprehension of protein design allows for the improvement of viable medications, for example, Kaletra, among the globe's most-prescribed medication to combat AIDS. The future for particle physics is bright and still more is yet to be discovered.

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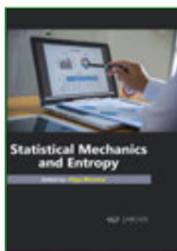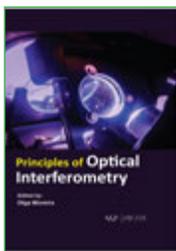
Principles of Optical Interferometry

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. in Astrophysics and B.Sc. in Physics and Applied Mathematics. She is an experienced technical writer and researcher which former fellowships include postgraduate positions at two of the most renown European institutions in the fields of Astrophysics and Space Science (the European Southern Observatory, and the European Space Agency). Presently, she is an independent scientist working on projects involving machine learning and neural networks research as well as peer-reviewing and edition of academic books.

Principles of Optical Interferometry" is an edited book consisting of 19 contemporaneous open-access articles featuring different aspects of optical interferometry, from heterodyne to speckle interferometry. It includes methodologies of interferometric fringe analysis, as well the applications of Fabry-Perot, Fizeau, and Mach-Zehnder Interferometers. It introduces to a class of recent interferometer designs such as the Point Diffraction Interferometer, Radial Shearing Interferometer, Fiber-Optic Ring Resonator Interferometer and a Neural Network-Based Laser Interferometer.

Reading this book requires some knowledge in calculus, differential equations, electromagnetism, and general topics in interferometry. This book is intended to reach an academic audience ranging from Science undergraduate students to experienced researchers.

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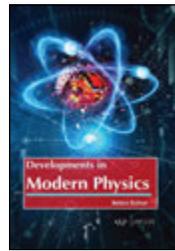
Developments in Modern Physics

Nelson Bolívar

About the Author

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

In the 20th century — the age of "modern physics" — our view of the physical universe underwent a revolution. This book Developments in Modern Physics presents the fundamentals and frontiers of contemporary physics to the most gifted pupils. Typically, students must take multiple courses to cover the majority of these topics. The purpose is to give them a sense of where they're heading and how everything fits together as they go. Quantum mechanics. nuclear physics, particle physics, special relativity, condensed-matter physics, relativistic quantum mechanics, and general relativity are the main topics covered in this book. The objective is to address these topics in considerable depth such that students "get" them and have a basic understanding of them. The book presupposes a one-year calculus-based introductory physics course and a one-year calculus course. Several appendices educate the reader on any additional mathematics that may be required. Numerous problems are presented, the majority of which will lead dedicated readers as far as they wish in modern physics.

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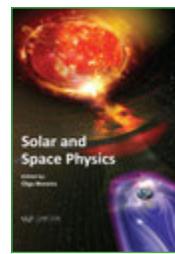
Solar and Space Physics

Olga Moreira

About the Editor

Olga Moreira is a Ph.D. in Astrophysics and B.Sc. in Physics and Applied Mathematics. She is an experienced technical writer and researcher which former fellowships include postgraduate positions at two of the most renown European institutions in the fields of Astrophysics and Space Science (the European Southern Observatory, and the European Space Agency). Presently, she is an independent scientist working on projects involving machine learning and neural networks research as well as peer-reviewing and edition of academic books.

"Solar and Space Physics" is an edited book consisting of 16 contemporaneous open-access articles featuring the modeling of the solar magnetic activity and space weather. It aims to provide an overall overview and to review the recent advances in the modelling of the solar dynamo and its important features, including the sunspot butterfly diagram. It also focuses on the impact of the solar activity cycle on Earth's environment. It includes magnetohydrodynamics modeling and forecasting of the past, current, and future solar magnetic activity, from the strong magnetic eruptions during solar minima to low number of sunspots and weakening of magnetic structures during solar minima. It includes, in particular, the analysis of the most recent solar cycles (Solar Cycles 23 and 24) as well as a prediction for the current solar cycle (Solar Cycle 25).

Reading this book requires some knowledge in electromagnetism, hydrodynamics, and time series. This book is intended to reach an academic audience ranging from advanced undergraduate students to experienced researchers.

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Key Concepts in Physics

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Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

This book explains various key concepts and terms that are important in the context of physics. Physics is the branch of science that deals with the structure of matter and how the fundamental constituents of the universe interact. It studies objects ranging from the very small using quantum mechanics to the entire universe using general relativity.

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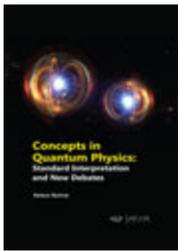
Concepts in Quantum Physics: Standard Interpretation and New Debates

Nelson Bolivar

About the Author

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

The book addresses fundamental conceptions in quantum mechanics. Its point of view goes from the classical to the quantum and back, taking the reader into a constant reviewing of the formulations, interpretations, and common misinterpretations in quantum physics. It has a good emphasis in the experimental grounds of the origins of quantum physics. The ontological and epistemological discussion related to quantum mechanics interpretations follow some of the recent approaches, giving a fresh review of the current state in the field.

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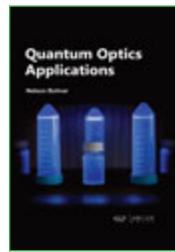
Quantum Optics Applications

Nelson Bolivar

About the Author

Nelson Bolivar is currently a Physics Professor in the Physics Department at the Universidad Central de Venezuela, where he has been teaching since 2007. His interests include quantum field theory applied in condensed matter. He obtained his PhD in physics from the Universite de Lorraine (France) in 2014 in a joint PhD with the Universidad Central de Venezuela. His BSc in physics is from the Universidad Central de Venezuela.

Quantum Optics offers a very wide coverage of fundamental phenomena encompassing quantum mechanics and physical optics. Quantum optics allows the engineers and scientists to perform research in laser physics and quantum optics. This book covers various topics including electromagnetic field quantization, quantum coherence theory, models of atom-field interaction, resonance fluorescence, laser theory and input-output theory (application in non-linear optics). The purpose of this book is to offer various exciting advances in the field of quantum optics. Presently, quantum optics is being applied in many applications which involve electronics, climate control, space science, medical science and industrial sectors. This book put emphasis on basic concepts and applications of quantum optics and its associated fields, so as to facilitate the students and researchers to perform their research in this amazing field. The topics of this books are offered in a didactic and unified manner. The book exhibits a pedagogical and clear demonstration of topics. It successfully stabilizes the theoretical and quantum aspects of quantum optics with modern relevant experiments. The book is equally useful for students, scientist, teachers and industrialists from various backgrounds including quantum mechanics, optical physics, electromagnetism and many multidisciplinary fields.

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284	9781773615394	Volume 1: Nano structures for energy storage and conversion and their application as catalysts for photochemistry and sensing	Engineering and Technology	2019	Dr. Aneeya Kumar Samantara, National Institute of Science Education and Research, Bhubaneswar, India and Mr. Satyajit Ratha, Indian Institute of Technology Bhubaneswar, India	175	Hardcover

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