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## KEY=MATHEMATICS - MOHAMMAD ANTON

### MEDICAL IMAGING: CONCEPTS, METHODOLOGIES, TOOLS, AND APPLICATIONS

#### CONCEPTS, METHODOLOGIES, TOOLS, AND APPLICATIONS

**IGI Global** Medical imaging has transformed the ways in which various conditions, injuries, and diseases are identified, monitored, and treated. As various types of digital visual representations continue to advance and improve, new opportunities for their use in medical practice will likewise evolve. Medical Imaging: Concepts, Methodologies, Tools, and Applications presents a compendium of research on digital imaging technologies in a variety of healthcare settings. This multi-volume work contains practical examples of implementation, emerging trends, case studies, and technological innovations essential for using imaging technologies for making medical decisions. This comprehensive publication is an essential resource for medical practitioners, digital imaging technologists, researchers, and medical students.

### THE MATHEMATICS OF COMPUTERIZED TOMOGRAPHY

**SIAM** This book provides a unified view of tomographic techniques and an in-depth treatment of reconstruction algorithms.

### MATHEMATICAL METHODS IN IMAGE RECONSTRUCTION

**SIAM** This book provides readers with a superior understanding of the mathematical principles behind imaging.

### 3D IMAGE RECONSTRUCTION FOR CT AND PET

### A PRACTICAL GUIDE WITH PYTHON

**CRC Press** This is a practical guide to tomographic image reconstruction with projection data, with strong focus on Computed Tomography (CT) and Positron Emission Tomography (PET). Classic methods such as FBP, ART, SIRT, MLEM and OSEM are presented with modern and compact notation, with the main goal of guiding the reader from the comprehension of the mathematical background through a fast-route to real practice and computer implementation of the algorithms. Accompanied by example data sets, real ready-to-run Python toolsets and scripts and an overview the latest research in the field, this guide will be invaluable for graduate students and early-career researchers and scientists in medical physics and biomedical engineering who are beginners in the field of image reconstruction. A top-down guide from theory to practical implementation of PET and CT reconstruction methods, without sacrificing the rigor of mathematical background Accompanied by Python source code snippets, suggested exercises, and supplementary ready-to-run examples for readers to download from the CRC Press website Ideal for those willing to move their first steps on the real practice of image reconstruction, with modern scientific programming language and toolsets Daniele Panetta is a researcher at the Institute of Clinical Physiology of the Italian National Research Council (CNR-IFC) in Pisa. He earned his MSc degree in Physics in 2004 and specialisation diploma in Health Physics in 2008, both at the University of Pisa. From 2005 to 2007, he worked at the Department of Physics "E. Fermi" of the University of Pisa in the field of tomographic image reconstruction for small animal imaging micro-CT instrumentation. His current research at CNR-IFC has as its goal the identification of novel PET/CT imaging biomarkers for cardiovascular and metabolic diseases. In the field micro-CT imaging, his interests cover applications of three-dimensional morphometry of biosamples and scaffolds for regenerative medicine. He acts as reviewer for scientific journals in the field of Medical Imaging: Physics in Medicine and Biology, Medical Physics, Physica Medica, and others. Since 2012, he is adjunct professor in Medical Physics at the University of Pisa. Niccolò Camarlinghi is a researcher at the University of Pisa. He obtained his MSc in Physics in 2007 and his PhD in Applied Physics in 2012. He has been working in the field of Medical Physics since 2008 and his main research fields are medical image analysis and image reconstruction. He is involved in the development of clinical, pre-clinical PET and hadron therapy monitoring scanners. At the time of writing this book he was a lecturer at University of Pisa, teaching courses of life-sciences and medical physics laboratory. He regularly acts as a referee for the following journals: Medical Physics, Physics in Medicine and Biology, Transactions on Medical Imaging, Computers in Biology and Medicine, Physica Medica, EURASIP Journal on Image and Video Processing, Journal of Biomedical and Health Informatics.

### INTRODUCTION TO THE MATHEMATICS OF MEDICAL IMAGING

#### SECOND EDITION

**SIAM** At the heart of every medical imaging technology is a sophisticated mathematical model of the measurement process and an algorithm to reconstruct an image from the measured data. This book provides a firm foundation in the mathematical tools used to model the measurements and derive the reconstruction algorithms used in most of these modalities. The text uses X-ray computed tomography (X-ray CT) as a 'pedagogical machine' to illustrate important ideas and its extensive discussion of background material makes the more advanced mathematical topics accessible to people with a less formal mathematical education. This new edition contains a chapter on magnetic resonance imaging (MRI), a revised section on the relationship between the continuum and discrete Fourier transforms, an improved description of the gridding method, and new sections on both Grangreat's formula and noise analysis in MR-imaging. Mathematical concepts are illuminated with over 200 illustrations and numerous exercises.

### HANDBOOK OF MATHEMATICAL METHODS IN IMAGING

**Springer Science & Business Media** The Handbook of Mathematical Methods in Imaging provides a comprehensive treatment of the mathematical techniques used in imaging science. The material is grouped into two central themes, namely, Inverse Problems (Algorithmic Reconstruction) and Signal and Image Processing. Each section within the themes covers applications (modeling), mathematics, numerical methods (using a case example) and open questions. Written by experts in the area, the presentation is mathematically rigorous. The entries are cross-referenced for easy navigation through connected topics. Available in both print and electronic forms, the handbook is enhanced by more than 150 illustrations and an extended bibliography. It will benefit students, scientists and researchers in applied mathematics. Engineers and computer scientists working in imaging will also find this handbook useful.

### MATHEMATICS AND COMPUTER SCIENCE IN MEDICAL IMAGING

**Springer** Proceedings of the NATO Advanced Study Institute on Mathematics and Computer Science in Medical Imaging, held in Il Ciocco, Italy, September 21 - October 4, 1986

### ELECTRON TOMOGRAPHY

#### METHODS FOR THREE-DIMENSIONAL VISUALIZATION OF STRUCTURES IN THE CELL

**Springer Science & Business Media** This definitive work provides a comprehensive treatment of the mathematical background and working methods of three-dimensional reconstruction from tilt series. Special emphasis is placed on the problems presented by limitations of data collection in the transmission electron microscope. The book, extensively revised and updated, takes the reader from biological specimen preparation to three-dimensional images of the cell and its components.

### X-RAY MICROSCOPY 2002

#### 7TH INTERNATIONAL CONFERENCE ON X-RAY MICROSCOPY, ESRF, GRENOBLE, FRANCE, JULY 28-AUGUST 2, 2002

### X-RAY COMPUTED TOMOGRAPHY IN BIOMEDICAL ENGINEERING

**Springer Science & Business Media** Computed Tomography gives a detailed overview of various aspects of computed tomography. It discusses X-ray CT tomography from a historical point of view, the design and physical operating principles of computed tomography apparatus, the algorithms of image reconstruction and the quality assessment criteria of tomography scanners. Algorithms of image reconstruction from projections, a crucial problem in medical imaging, are considered in depth. The author gives descriptions of the reconstruction methods related to tomography scanners with a parallel X-ray beam, trough solutions with fan-shaped beam and successive modifications of spiral scanners. Computed Tomography contains a dedicated chapter for those readers who are interested in computer simulations based on studies of reconstruction algorithms. The information included in this chapter will enable readers to create a simulation environment in which virtual tomography projections can be obtained in all basic projection systems. This monograph is a valuable study on computed tomography that will be of interest to advanced students and researchers in the fields of biomedical engineering, medical electronics, computer science and medicine.

### INDUSTRIAL X-RAY COMPUTED TOMOGRAPHY

**Springer** X-ray computed tomography has been used for several decades as a tool for measuring the three-dimensional geometry of the internal organs in medicine. However, in recent years, we have seen a move in manufacturing industries for the use of X-ray computed tomography; first to give qualitative information about the internal geometry and defects in a component, and more recently, as a fully-quantitative technique for dimensional and materials analysis. This trend is primarily due to the ability of X-ray computed tomography to give a high-density and multi-scale representation of both the

external and internal geometry of a component, in a non-destructive, non-contact and relatively fast way. But, due to the complexity of X-ray computed tomography, there are remaining metrological issues to solve and the specification standards are still under development. This book will act as a one-stop-shop resource for students and users of X-ray computed tomography in both academia and industry. It presents the fundamental principles of the technique, detailed descriptions of the various components (hardware and software), current developments in calibration and performance verification and a wealth of example applications. The book will also highlight where there is still work to do, in the perspective that X-ray computed tomography will be an essential part of Industry 4.0.

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### HYPERPOLARIZATION METHODS IN NMR SPECTROSCOPY

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**Springer** Elucidating Organic Reaction Mechanisms using photo-CIDNP Spectroscopy, by Martin Goez. Parahydrogen Induced Polarization by Homogeneous Catalysis: Theory and Applications, by Kerstin Münnemann et al. Improving NMR and MRI Sensitivity with Parahydrogen, by R. Mewis & Simon Duckett. The Solid-state Photo-CIDNP Effect, by Jörg Matysik et al. Parahydrogen-induced Polarization in Heterogeneous Catalytic Processes, by Igor Koptiyug et al. Dynamic Nuclear Polarization Enhanced NMR Spectroscopy, by U. Akbey & H. Oschkinat. Photo-CIDNP NMR Spectroscopy of Amino Acids and Proteins, by Lars T. Kuhn.

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### NONLINEAR ILL-POSED PROBLEMS

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**Springer**

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### AN INTRODUCTION TO MATHEMATICS OF EMERGING BIOMEDICAL IMAGING

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**Springer Science & Business Media** Biomedical imaging is a fascinating research area to applied mathematicians. Challenging imaging problems arise and they often trigger the investigation of fundamental problems in various branches of mathematics. This is the first book to highlight the most recent mathematical developments in emerging biomedical imaging techniques. The main focus is on emerging multi-physics and multi-scales imaging approaches. For such promising techniques, it provides the basic mathematical concepts and tools for image reconstruction. Further improvements in these exciting imaging techniques require continued research in the mathematical sciences, a field that has contributed greatly to biomedical imaging and will continue to do so. The volume is suitable for a graduate-level course in applied mathematics and helps prepare the reader for a deeper understanding of research areas in biomedical imaging.

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### THE RADON TRANSFORM AND SOME OF ITS APPLICATIONS

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**Courier Corporation** Of value to mathematicians, physicists, and engineers, this excellent introduction to Radon transform covers both theory and applications, with a rich array of examples and literature that forms a valuable reference. This 1993 edition is a revised and updated version by the author of his pioneering work.

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### COMPUTED TOMOGRAPHY

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### ALGORITHMS, INSIGHT, AND JUST ENOUGH THEORY

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**SIAM** This book describes fundamental computational methods for image reconstruction in computed tomography (CT) with a focus on a pedagogical presentation of these methods and their underlying concepts. Insights into the advantages, limitations, and theoretical and computational aspects of the methods are included, giving a balanced presentation that allows readers to understand and implement CT reconstruction algorithms. Unique in its emphasis on the interplay between modeling, computing, and algorithm development, Computed Tomography: Algorithms, Insight, and Just Enough Theory develops the mathematical and computational aspects of three main classes of reconstruction methods: classical filtered back-projection, algebraic iterative methods, and variational methods based on nonlinear numerical optimization algorithms. It spotlights the link between CT and numerical methods, which is rarely discussed in current literature, and describes the effects of incomplete data using both microlocal analysis and singular value decomposition (SVD). This book sets the stage for further exploration of CT algorithms. Readers will be able to grasp the underlying mathematical models to motivate and derive the basic principles of CT reconstruction and will gain basic understanding of fundamental computational challenges of CT, such as the influence of noisy and incomplete data, as well as the reconstruction capabilities and the convergence of the iterative algorithms. Exercises using MATLAB are included, allowing readers to experiment with the algorithms and making the book suitable for teaching and self-study. Computed Tomography: Algorithms, Insight, and Just Enough Theory is primarily aimed at students, researchers, and practitioners interested in the computational aspects of X-ray CT and is also relevant for anyone working with other forms of tomography, such as neutron and electron tomography, that share the same mathematical formulation. With its basis in lecture notes developed for a PhD course, it is appropriate as a textbook for courses on computational methods for X-ray CT and computational methods for inverse problems.

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### THE ROLE OF TOPOLOGY IN MATERIALS

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**Springer** This book presents the most important advances in the class of topological materials and discusses the topological characterization, modeling and metrology of materials. Further, it addresses currently emerging characterization techniques such as optical and acoustic, vibrational spectroscopy (Brillouin, infrared, Raman), electronic, magnetic, fluorescence correlation imaging, laser lithography, small angle X-ray and neutron scattering and other techniques, including site-selective nanoprobe. The book analyzes the topological aspects to identify and quantify these effects in terms of topology metrics. The topological materials are ubiquitous and range from (i) de novo nanoscale allotropes of carbons in various forms such as nanotubes, nanorings, nanohorns, nanowalls, peapods, graphene, etc. to (ii) metallo-organic frameworks, (iii) helical gold nanotubes, (iv) Möbius conjugated polymers, (v) block co-polymers, (vi) supramolecular assemblies, to (vii) a variety of biological and soft-matter systems, e.g. foams and cellular materials, vesicles of different shapes and genera, biomimetic membranes, and filaments, (viii) topological insulators and topological superconductors, (ix) a variety of Dirac materials including Dirac and Weyl semimetals, as well as (x) knots and network structures. Topological databases and algorithms to model such materials have been also established in this book. In order to understand and properly characterize these important emergent materials, it is necessary to go far beyond the traditional paradigm of microscopic structure-property-function relationships to a paradigm that explicitly incorporates topological aspects from the outset to characterize and/or predict the physical properties and currently untapped functionalities of these advanced materials. Simulation and modeling tools including quantum chemistry, molecular dynamics, 3D visualization and tomography are also indispensable. These concepts have found applications in condensed matter physics, materials science and engineering, physical chemistry and biophysics, and the various topics covered in the book have potential applications in connection with novel synthesis techniques, sensing and catalysis. As such, the book offers a unique resource for graduate students and researchers alike.

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### COMPUTATIONAL RADIOLOGY AND IMAGING

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### THERAPY AND DIAGNOSTICS

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**Springer Science & Business Media** The articles collected in this volume are based on lectures given at the IMA Workshop, "Computational Radiology and Imaging: Therapy and Diagnostics", March 17-21, 1997. Introductory articles by the editors have been added. The focus is on inverse problems involving electromagnetic radiation and particle beams, with applications to X-ray tomography, nuclear medicine, near-infrared imaging, microwave imaging, electron microscopy, and radiation therapy planning. Mathematical and computational tools and models which play important roles in this volume include the X-ray transform and other integral transforms, the linear Boltzmann equation and, for near-infrared imaging, its diffusion approximation, iterative methods for large linear and non-linear least-squares problems, iterative methods for linear feasibility problems, and optimization methods. The volume is intended not only for mathematical scientists and engineers working on these and related problems, but also for non-specialists. It contains much introductory expository material, and a large number of references. Many unsolved computational and mathematical problems of substantial practical importance are pointed out.

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### INVERSE PROBLEMS AND IMAGING

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### LECTURES GIVEN AT THE C.I.M.E. SUMMER SCHOOL HELD IN MARTINA FRANCA, ITALY, SEPTEMBER 15-21, 2002

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**Springer** Nowadays we are facing numerous and important imaging problems: nondestructive testing of materials, monitoring of industrial processes, enhancement of oil production by efficient reservoir characterization, emerging developments in noninvasive imaging techniques for medical purposes - computerized tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), X-ray and ultrasound tomography, etc. In the CIME Summer School on Imaging (Martina Franca, Italy 2002), leading experts in mathematical techniques and applications presented broad and useful introductions for non-experts and practitioners alike to many aspects of this exciting field. The volume contains part of the above lectures completed and updated by additional contributions on other related topics.

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### 3000 YEARS OF ANALYSIS

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### MATHEMATICS IN HISTORY AND CULTURE

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**Springer Nature** What exactly is analysis? What are infinitely small or infinitely large quantities? What are indivisibles and infinitesimals? What are real numbers, continuity, the continuum, differentials, and integrals? You'll find the answers to these and other questions in this unique book! It explains in detail the origins and evolution of this important branch of mathematics, which Euler dubbed the "analysis of the infinite." A wealth of diagrams, tables, color images and figures serve to illustrate the fascinating history of analysis from Antiquity to the present. Further, the content is presented in connection with the historical and cultural events of the respective epochs, the lives of the scholars seeking knowledge, and insights into the subfields of analysis they created and shaped, as well as the applications in virtually every aspect of modern life that were made possible by analysis.

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### THE RADON TRANSFORM

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### THE FIRST 100 YEARS AND BEYOND

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**Walter de Gruyter GmbH & Co KG** In 1917, Johann Radon published his fundamental work, where he introduced what is now called the Radon transform. Including important contributions by several experts, this book reports on ground-breaking developments related to the Radon transform throughout these years, and also discusses novel mathematical research topics and applications for the next century.

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## BIOLOGY OF SPIDERS

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**OUP USA** One of the only books to treat the whole spider, from its behavior and physiology to its neurobiology and reproductive characteristics, *Biology of Spiders* is considered a classic in spider literature. First published in German in 1979, the book is now in its third edition, and has established itself as the supreme authority on these fascinating creatures. Containing five hundred new references, this book incorporates the latest research while dispelling many oft-heard myths and misconceptions that surround spiders. Of special interest are chapters on the structure and function of spider webs and silk, as well as those on spider venom. A new subchapter on tarantulas will appeal especially to tarantula keepers and breeders. The highly accessible text is supplemented by exceptional, high-quality photographs, many of them originals, and detailed diagrams. It will be of interest to arachnologists, entomologists, and zoologists, as well as to academics, students of biology, and the general reader curious about spiders.

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## SELECTING AND ORDERING POPULATIONS

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### A NEW STATISTICAL METHODOLOGY

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**SIAM** Provides a compendium of applied aspects of ordering and selection procedures.

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## PRINCIPLES OF APPLIED MATHEMATICS

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### TRANSFORMATION AND APPROXIMATION

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**CRC Press** Principles of Applied Mathematics provides a comprehensive look at how classical methods are used in many fields and contexts. Updated to reflect developments of the last twenty years, it shows how two areas of classical applied mathematics spectral theory of operators and asymptotic analysis are useful for solving a wide range of applied science problems. Topics such as asymptotic expansions, inverse scattering theory, and perturbation methods are combined in a unified way with classical theory of linear operators. Several new topics, including wavelength analysis, multigrid methods, and homogenization theory, are blended into this mix to amplify this theme. This book is ideal as a survey course for graduate students in applied mathematics and theoretically oriented engineering and science students. This most recent edition, for the first time, now includes extensive corrections collated and collected by the author.

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## NUMERICAL METHODS FOR DIFFERENTIAL EQUATIONS, OPTIMIZATION, AND TECHNOLOGICAL PROBLEMS

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### DEDICATED TO PROFESSOR P. NEITTAANMÄKI ON HIS 60TH BIRTHDAY

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**Springer Science & Business Media** This book contains the results in numerical analysis and optimization presented at the ECCOMAS thematic conference "Computational Analysis and Optimization" (CAO 2011) held in Jyväskylä, Finland, June 9-11, 2011. Both the conference and this volume are dedicated to Professor Pekka Neittaanmäki on the occasion of his sixtieth birthday. It consists of five parts that are closely related to his scientific activities and interests: Numerical Methods for Nonlinear Problems; Reliable Methods for Computer Simulation; Analysis of Noised and Uncertain Data; Optimization Methods; Mathematical Models Generated by Modern Technological Problems. The book also includes a short biography of Professor Neittaanmäki.

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## LONG-EARED BATS

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**A&C Black** Examining the biology, ecology and behaviour of two European bat species - *Plecotus auritus* and "*Plecotus austriacus*" - this book investigates their behaviour and considers the full range of conservation issues relating to the species. Topics covered include, identifying the species, foraging, reproductive biology, social organization, and the effects of man-made alterations to the environment and proposed conservation methods."

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## DISCRETE INVERSE PROBLEMS

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### INSIGHT AND ALGORITHMS

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**SIAM** This book gives an introduction to the practical treatment of inverse problems by means of numerical methods, with a focus on basic mathematical and computational aspects. To solve inverse problems, we demonstrate that insight about them goes hand in hand with algorithms.

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## BATS IN THE ANTHROPOCENE: CONSERVATION OF BATS IN A CHANGING WORLD

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**Springer** This book focuses on central themes related to the conservation of bats. It details their response to land-use change and management practices, intensified urbanization and roost disturbance and loss. Increasing interactions between humans and bats as a result of hunting, disease relationships, occupation of human dwellings, and conflict over fruit crops are explored in depth. Finally, contributors highlight the roles that taxonomy, conservation networks and conservation psychology have to play in conserving this imperilled but vital taxon. With over 1300 species, bats are the second largest order of mammals, yet as the Anthropocene dawns, bat populations around the world are in decline. Greater understanding of the anthropogenic drivers of this decline and exploration of possible mitigation measures are urgently needed if we are to retain global bat diversity in the coming decades. This book brings together teams of international experts to provide a global review of current understanding and recommend directions for future research and mitigation.

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## FUNDAMENTALS OF COMPUTERIZED TOMOGRAPHY

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### IMAGE RECONSTRUCTION FROM PROJECTIONS

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**Springer Science & Business Media** This revised and updated second edition - now with two new chapters - is the only book to give a comprehensive overview of computer algorithms for image reconstruction. It covers the fundamentals of computerized tomography, including all the computational and mathematical procedures underlying data collection, image reconstruction and image display. Among the new topics covered are: spiral CT, fully 3D positron emission tomography, the linogram mode of backprojection, and state of the art 3D imaging results. It also includes two new chapters on comparative statistical evaluation of the 2D reconstruction algorithms and alternative approaches to image reconstruction.

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## UK MAMMALS

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### SPECIES STATUS AND POPULATION TRENDS : FIRST REPORT

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Focusing on UK mammals, this report summarises results from the Tracking Mammals Partnership, a collaborative initiative, involving 24 organisations with a variety of interests in mammals. It aims to improve the quality, quantity, and dissemination of information on the status of species in the UK.

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## MOBILE MUSEUMS

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### COLLECTIONS IN CIRCULATION

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**UCL Press** Mobile Museums presents an argument for the importance of circulation in the study of museum collections, past and present. It brings together an impressive array of international scholars and curators from a wide variety of disciplines - including the history of science, museum anthropology and postcolonial history - to consider the mobility of collections. The book combines historical perspectives on the circulation of museum objects in the past with contemporary accounts of their re-mobilisation, notably in the context of Indigenous community engagement. Contributors seek to explore processes of circulation historically in order to re-examine, inform and unsettle common assumptions about the way museum collections have evolved over time and through space. By foregrounding questions of circulation, the chapters in Mobile Museums collectively represent a fundamental shift in the understanding of the history and future uses of museum collections. The book addresses a variety of different types of collection, including the botanical, the ethnographic, the economic and the archaeological. Its perspective is truly global, with case studies drawn from South America, West Africa, Oceania, Australia, the United States, Europe and the UK. Mobile Museums helps us to understand why the mobility of museum collections was a fundamental aspect of their history and why it continues to matter today. Praise for Mobile Museums 'This book advances a paradigm shift in studies of museums and collections. A distinguished group of contributors reveal that collections are not dead assemblages. The nineteenth and twentieth centuries were marked by vigorous international traffic in ethnography and natural history specimens that tell us much about colonialism, travel and the history of knowledge - and have implications for the remobilisation of museums in the future.' - Nicholas Thomas, University of Cambridge 'The first major work to examine the implications and consequences of the migration of materials from one scientific or cultural milieu to another, it highlights the need for a more nuanced understanding of collections and offers insights into their potential for future re-mobilisation.' - Arthur MacGregor

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## MEDICAL IMAGE RECONSTRUCTION

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### A CONCEPTUAL TUTORIAL

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**Springer Science & Business Media** "Medical Image Reconstruction: A Conceptual Tutorial" introduces the classical and modern image reconstruction technologies, such as two-dimensional (2D) parallel-beam and fan-beam imaging, three-dimensional (3D) parallel ray, parallel plane, and cone-beam imaging. This book presents both analytical and iterative methods of these technologies and their applications in X-ray CT (computed tomography), SPECT (single photon emission computed tomography), PET (positron emission tomography), and MRI (magnetic resonance imaging). Contemporary research results in exact region-of-interest (ROI) reconstruction with truncated projections, Katsevich's cone-beam filtered backprojection algorithm, and reconstruction with highly undersampled data with l0-minimization are also included. This book is written for engineers and researchers in the field of biomedical engineering specializing in medical imaging and image processing with image reconstruction. Gengsheng Lawrence Zeng is an expert in the development of medical image reconstruction algorithms and is a professor at the Department of Radiology, University of Utah, Salt Lake City, Utah, USA.

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## NONLINEAR SYSTEMS ANALYSIS

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**SECOND EDITION**


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**SIAM** When M. Vidyasagar wrote the first edition of *Nonlinear Systems Analysis*, most control theorists considered the subject of nonlinear systems a mystery. Since then, advances in the application of differential geometric methods to nonlinear analysis have matured to a stage where every control theorist needs to possess knowledge of the basic techniques because virtually all physical systems are nonlinear in nature. The second edition, now republished in SIAM's Classics in Applied Mathematics series, provides a rigorous mathematical analysis of the behavior of nonlinear control systems under a variety of situations. It develops nonlinear generalizations of a large number of techniques and methods widely used in linear control theory. The book contains three extensive chapters devoted to the key topics of Lyapunov stability, input-output stability, and the treatment of differential geometric control theory. Audience: this text is designed for use at the graduate level in the area of nonlinear systems and as a resource for professional researchers and practitioners working in areas such as robotics, spacecraft control, motor control, and power systems.

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**RIDGE FUNCTIONS**


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**Cambridge University Press** Presents the state of the art in the theory of ridge functions, providing a solid theoretical foundation.

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**HANDBOOK OF MEDICAL IMAGING**


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**PROCESSING AND ANALYSIS MANAGEMENT**


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**Academic Press** In recent years, the remarkable advances in medical imaging instruments have increased their use considerably for diagnostics as well as planning and follow-up of treatment. Emerging from the fields of radiology, medical physics and engineering, medical imaging no longer simply deals with the technology and interpretation of radiographic images. The limitless possibilities presented by computer science and technology, coupled with engineering advances in signal processing, optics and nuclear medicine have created the vastly expanded field of medical imaging. The *Handbook of Medical Imaging* is the first comprehensive compilation of the concepts and techniques used to analyze and manipulate medical images after they have been generated or digitized. The *Handbook* is organized in six sections that relate to the main functions needed for processing: enhancement, segmentation, quantification, registration, visualization as well as compression storage and telemedicine. \* Internationally renowned authors (Johns Hopkins, Harvard, UCLA, Yale, Columbia, UCSF) \* Includes imaging and visualization \* Contains over 60 pages of stunning, four-color images

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**BIOMEDICAL IMAGE ANALYSIS**


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**CRC Press** Computers have become an integral part of medical imaging systems and are used for everything from data acquisition and image generation to image display and analysis. As the scope and complexity of imaging technology steadily increase, more advanced techniques are required to solve the emerging challenges. *Biomedical Image Analysis* demonstr

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**THE RADON TRANSFORM**


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**Springer Science & Business Media** The first edition of this book has been out of print for some time and I have decided to follow the publisher's kind suggestion to prepare a new edition. Many examples with explicit inversion formulas and range theorems have been added, and the group-theoretic viewpoint emphasized. For example, the integral geometric viewpoint of the Poisson integral for the disk leads to interesting analogies with the X-ray transform in Euclidean 3-space. To preserve the introductory flavor of the book the short and self-contained Chapter on Schwartz' distributions has been added. Here §5 provides proofs of the needed results about the Riesz potentials while §§3-4 develop the tools from Fourier analysis following closely the account in Hormander's books (1963) and [1983]. There is some overlap with my books (1984) and [1994b] which however rely heavily on Lie group theory. The present book is much more elementary. I am indebted to Sine Jensen for a critical reading of parts of the manuscript and to Hilgert and Schlichtkrull for concrete contributions mentioned at specific places in the text. Finally I thank Jan Wetzel and Bonnie Friedman for their patient and skillful preparation of the manuscript.

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**THE IUCN INVERTEBRATE RED DATA BOOK**


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**International Union for Conservation of**

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**THE RADON TRANSFORM AND MEDICAL IMAGING**


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**SIAM** This book surveys the main mathematical ideas and techniques behind some well-established imaging modalities such as X-ray CT and emission tomography, as well as a variety of newly developing coupled-physics or hybrid techniques, including thermoacoustic tomography. The *Radon Transform and Medical Imaging* emphasizes mathematical techniques and ideas arising across the spectrum of medical imaging modalities and explains important concepts concerning inversion, stability, incomplete data effects, the role of interior information, and other issues critical to all medical imaging methods. For nonexperts, the author provides appendices that cover background information on notation, Fourier analysis, geometric rays, and linear operators. The vast bibliography, with over 825 entries, directs readers to a wide array of additional information sources on medical imaging for further study.

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**SCIENTIFIC COMPUTING**


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**A HISTORICAL PERSPECTIVE**


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**Springer** This book explores the most significant computational methods and the history of their development. It begins with the earliest mathematical / numerical achievements made by the Babylonians and the Greeks, followed by the period beginning in the 16th century. For several centuries the main scientific challenge concerned the mechanics of planetary dynamics, and the book describes the basic numerical methods of that time. In turn, at the end of the Second World War scientific computing took a giant step forward with the advent of electronic computers, which greatly accelerated the development of numerical methods. As a result, scientific computing became established as a third scientific method in addition to the two traditional branches: theory and experimentation. The book traces numerical methods' journey back to their origins and to the people who invented them, while also briefly examining the development of electronic computers over the years. Featuring 163 references and more than 100 figures, many of them portraits or photos of key historical figures, the book provides a unique historical perspective on the general field of scientific computing – making it a valuable resource for all students and professionals interested in the history of numerical analysis and computing, and for a broader readership alike.

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