Gilles Aubert
Pierre Kornprobst

Mathematical Problems in Image Processing

Partial Differential Equations and the Calculus of Variations

Second Edition

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Gilles Aubert,Pierre Kornprobst

Mathematical Problems In Image Processing Partial:

Mathematical Problems in Image Processing Gilles Aubert,Pierre Kornprobst,2008-04-06 Partial differential equations and variational methods were introduced into image processing about 15 years ago and intensive research has been carried out since then The main goal of this work is to present the variety of image analysis applications and the precise mathematics involved It is intended for two audiences The first is the mathematical community to show the contribution of mathematics to this domain and to highlight some unresolved theoretical questions The second is the computer vision community to present a clear self contained and global overview of the mathematics involved in image processing problems The book is divided into five main parts Chapter 1 is a detailed overview Chapter 2 describes and illustrates most of the mathematical notions found throughout the work Chapters 3 and 4 examine how PDEs and variational methods can be successfully applied in image restoration and segmentation processes Chapter 5 which is more applied describes some challenging computer vision problems such as sequence analysis or classification This book will be useful to researchers and graduate students in mathematics and computer vision   *Mathematical Problems in Image Processing* Gilles Aubert,Pierre Kornprobst,2006 Partial differential equations and variational methods were introduced into image processing about 15 years ago and intensive research has been carried out since then The main goal of this work is to present the variety of image analysis applications and the precise mathematics involved It is intended for two audiences The first is the mathematical community to show the contribution of mathematics to this domain and to highlight some unresolved theoretical questions The second is the computer vision community to present a clear self contained and global overview of the mathematics involved in image processing problems This book will be useful to researchers and graduate students in mathematics and computer vision

Mathematical Problems in Image Processing Gilles Aubert,Pierre Kornprobst,2008-11-01 The updated 2nd edition of this book presents a variety of image analysis applications reviews their precise mathematics and shows how to discretize them For the mathematical community the book shows the contribution of mathematics to this domain and highlights unsolved theoretical questions For the computer vision community it presents a clear self contained and global overview of the mathematics involved in image procesing problems The second edition offers a review of progress in image processing applications covered by the PDE framework and updates the existing material The book also provides programming tools for creating simulations with minimal effort   **Computational Methods for Inverse Problems and Applications** Amine Laghrib,Mourad Nachaoui,Lekbir Afraites,2025-07-24 This book highlights recent trends in inverse problems and their integration with computer science a field rapidly evolving yet underexplored mathematically ICMDS 2024 aims to unite scientists to explore the latest in mathematics and its applications across various scientific disciplines Key topics include inverse problems partial differential equations mathematical control numerical analysis and computer science Our goal is to provide substantial mathematical insights and practical applications to bridge this gap With its growing significance in media

and industry this event promises to attract a diverse audience and foster collaboration across scientific domains The main contribution of this book is to give some sufficient mathematical content with expressive results and accurate applications As a growing field it is gaining a lot of attention both in media as well as in the industry world which will attract the interest of readers from different scientist discipline   Handbook of Mathematical Models and Algorithms in Computer Vision and Imaging Ke Chen,Carola-Bibiane Schönlieb,Xue-Cheng Tai,Laurent Younes,2023-02-24 This handbook gathers together the state of the art on mathematical models and algorithms for imaging and vision Its emphasis lies on rigorous mathematical methods which represent the optimal solutions to a class of imaging and vision problems and on effective algorithms which are necessary for the methods to be translated to practical use in various applications Viewing discrete images as data sampled from functional surfaces enables the use of advanced tools from calculus functions and calculus of variations and nonlinear optimization and provides the basis of high resolution imaging through geometry and variational models Besides optimization naturally connects traditional model driven approaches to the emerging data driven approaches of machine and deep learning No other framework can provide comparable accuracy and precision to imaging and vision Written by leading researchers in imaging and vision the chapters in this handbook all start with gentle introductions which make this work accessible to graduate students For newcomers to the field the book provides a comprehensive and fast track introduction to the content to save time and get on with tackling new and emerging challenges For researchers exposure to the state of the art of research works leads to an overall view of the entire field so as to guide new research directions and avoid pitfalls in moving the field forward and looking into the next decades of imaging and information services This work can greatly benefit graduate students researchers and practitioners in imaging and vision applied mathematicians medical imagers engineers and computer scientists   *Extremal Problems of Analysis and Applications* Vladyslav Babenko,Volodymyr Kofanov,Peter Kogut,Oleg Kovalenko,Nataliia Parfinovych,2025-09-26 This book presents solutions to various extremal problems in analysis and provides mathematical tools that can be used to solve complex problems in different areas of fundamental and applied science These problems are not just theoretical but they have practical applications in various fields including optimization and image processing The book includes an in depth exploration of Ostrowski type inequalities covering their applications to operator theory inequalities for derivatives and optimization of cubature formulae The authors also provide a comprehensive treatment of the Bojanov Naidenov and Erdos problems and investigate their solutions for various function classes including differentiable functions trigonometric polynomials and splines Additionally the book explores sharp Remez type inequalities These inequalities are examined in different metrics for various function classes including trigonometric polynomials and splines The authors also include innovative research in image processing focusing on the restoration of noise corrupted optical images with simultaneous contrast enhancement and a variational approach to simultaneous fusion and denoising of color images with different spatial resolutions This book is a valuable resource for researchers and graduate students in

approximation theory numerical analysis and image processing **Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications** Yongjie Jessica Zhang,João Manuel R.S. Tavares,2014-07-23 This book constitutes the refereed proceedings of the 4th International Conference on Computational Modeling of Objects Presented in Images CompIMAGE 2014 held in Pittsburgh PA USA in September 2014 The 29 revised full papers presented together with 10 short papers and 6 keynote talks were carefully reviewed and selected from 54 submissions The papers cover the following topics medical treatment imaging and analysis image registration denoising and feature identification image segmentation shape analysis meshing and graphs medical image processing and simulations image recognition reconstruction and predictive modeling image based modeling and simulations and computer vision and data driven investigations *Scale Space and Variational Methods in Computer Vision* Xue-Cheng Tai,Knut Morken,Marius Lysaker,Knut-Andreas Lie,2009-05-25 This book constitutes the refereed proceedings of the Second International Conference on Scale Space Methods and Variational Methods in Computer Vision SSVM 2009 emanated from the joint edition of the 5th International Workshop on Variational Geometric and Level Set Methods in Computer Vision VLSM 2009 and the 7th International Conference on Scale Space and PDE Methods in Computer Vision Scale Space 2009 held in Voss Norway in June 2009 The 71 revised full papers presented were carefully reviewed and selected numerous submissions The papers are organized in topical sections on segmentation and detection image enhancement and reconstruction motion analysis optical flow registration and tracking surfaces and shapes scale space and feature extraction Modeling and Inverse Problems in Imaging Analysis Bernard Chalmond,2003-01-14 More mathematicians have been taking part in the development of digital image processing as a science and the contributions are reflected in the increasingly important role modeling has played solving complex problems This book is mostly concerned with energy based models Most of these models come from industrial projects in which the author was involved in robot vision and radiography tracking 3D lines radiographic image processing 3D reconstruction and tomography matching deformation learning Numerous graphical illustrations accompany the text **Image Processing Based on Partial Differential Equations** Xue-Cheng Tai,Knut-Andreas Lie,Tony F. Chan,Stanley Osher,2006-11-22 This book publishes a collection of original scientific research articles that address the state of art in using partial differential equations for image and signal processing Coverage includes level set methods for image segmentation and construction denoising techniques digital image inpainting image dejittering image registration and fast numerical algorithms for solving these problems Digital Color Imaging Christine Fernandez-Maloigne,Frederique Robert-Inacio,Ludovic Macaire,2013-03-04 This collective work identifies the latest developments in the field of the automatic processing and analysis of digital color images For researchers and students it represents a critical state of the art on the scientific issues raised by the various steps constituting the chain of color image processing It covers a wide range of topics related to computational color imaging including color filtering and segmentation color texture characterization color

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Encyclopedia of Mathematical Physics Jean-Pierre Françoise,Gregory L. Naber,Sheung Tsun Tsou,2006 The Encyclopedia of Mathematical Physics provides a complete resource for researchers students and lecturers with an interest in mathematical physics It enables readers to access basic information on topics peripheral to their own areas to provide a repository of the core information in the area that can be used to refresh the researcher s own memory banks and aid teachers in directing students to entries relevant to their course work The Encyclopedia does contain information that has been distilled organised and presented as a complete reference tool to the user and a landmark to the body of knowledge that has accumulated in this domain It also is a stimulus for new researchers working in mathematical physics or in areas using the methods originating from work in mathematical physics by providing them with focused high quality background information Editorial Board Jean Pierre Fran oise Universit Pierre et Marie Curie Paris France Gregory L Naber Drexel University Philadelphia PA USA Tsou Sheung Tsun University of Oxford UK Also available online via ScienceDirect 2006 featuring extensive browsing searching and internal cross referencing between articles in the work plus dynamic linking to journal articles and abstract databases making navigation flexible and easy   *Image Processing* Henri Maître,2008-11-10 Knowing the statistical properties of images sampling them to reduce the observable world to a series of discrete values restoring images in order to correct degradations all these operations are explained here together with the mathematical tools they require   **SIAM Journal on Scientific Computing** ,2005   **Visual Communications and Image Processing 2004** ,2004   **Computer Vision - ECCV ...** ,2002   **Pattern Recognition and Image Analysis** ,2005   **Medical Image Computing and Computer-assisted Intervention** ,2002   **Visual Communications and Image Processing 2004** Sethuraman Panchanathan,Vasudev Bhaskaran,2004 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature   *Journal of the Society for Industrial and Applied Mathematics. Series B: Numerical Analysis* Society for Industrial and Applied Mathematics,2004

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