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Techniques and Applications of Hyperspectral Image Analysis Hyperspectral Image Analysis Hyperspectral Imaging Deep Learning for Hyperspectral Image Analysis and Classification Hyperspectral Imaging Advances in Hyperspectral Image Processing Techniques Hyperspectral Data Processing Processing and Analysis of Hyperspectral Data Understanding Hyperspectral Image and Signal Processing Hyperspectral Image Processing Processing and Analysis of Hyperspectral Data Real-Time Progressive Hyperspectral Image Processing Hyperspectral Imaging in Agriculture, Food and Environment Hyperspectral Imaging Analysis and Applications for Food Quality Hyperspectral Data Exploitation Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data Derivative Hyperspectral Image Analysis for Land Use Classification Hyperspectral Imaging for Food Quality Analysis and Control Real-Time Recursive Hyperspectral Sample and Band Processing Processing of Hyperspectral Medical Images Graph Spectral Image Processing Hybrid Intelligence for Image Analysis and Understanding Hyperspectral Image Analysis for Questioned Historical Documents Remote Sensing Digital Image Analysis Hyperspectral Imaging Technology in Food and Agriculture Multispectral and Hyperspectral Image Acquisition and Processing Hyperspectral Remote Sensing Field Guide to Hyperspectral/multispectral Image Processing Hyperspectral Remote Sensing and Spectral Signature Applications 2018 9th Workshop on Hyperspectral Image and Signal Processing Evolution in Remote Sensing (WHISPERS) Spectral-Spatial Classification of Hyperspectral Remote Sensing Images Hyperspectral Remote Sensing in Urban Environments The Future of Hyperspectral Imaging Mathematical Models for Remote Sensing Image Processing Advances in Machine Learning and Image Analysis for GeoAI Remote Sensing Digital Image Analysis Signal and Image Processing for Remote Sensing, Second Edition Resolving Spectral Mixtures Classification of Hyperspectral Remote Sensing Images Computational Intelligence for Remote Sensing

Techniques and Applications of Hyperspectral Image Analysis 2007-09-27 techniques and applications of hyperspectral image analysis gives an introduction to the field of image analysis using hyperspectral techniques and includes definitions and instrument descriptions other imaging topics that are covered are segmentation regression and classification the book discusses how high quality images of large data files can be structured and archived imaging techniques also demand accurate calibration and are covered in sections about multivariate calibration techniques the book explains the most important instruments for hyperspectral imaging in more technical detail a number of applications from medical and chemical imaging are presented and there is an emphasis on data analysis including modeling data visualization model testing and statistical interpretation

Hyperspectral Image Analysis 2020-04-27 this book reviews the state of the art in algorithmic approaches addressing the practical challenges that arise with hyperspectral image analysis tasks with a focus on emerging trends in machine learning and image processing understanding it presents advances in deep learning multiple instance learning sparse representation based learning low dimensional manifold models anomalous change detection target recognition sensor fusion and super resolution for robust multispectral and hyperspectral image understanding it presents research from leading international experts who have made foundational contributions in these areas the book covers a diverse array of applications of multispectral hyperspectral imagery in the context of these algorithms including remote sensing face recognition and biomedicine this book would be particularly beneficial to graduate students and researchers who are taking advanced courses in or are working in the areas of image analysis machine learning and remote sensing with multi channel optical imagery researchers and professionals in academia and industry working in areas such as electrical engineering civil and environmental engineering geosciences and biomedical image processing who work with multi channel optical data will find this book useful

Hyperspectral Imaging 2019-09-29 hyperspectral imaging volume 32 presents a comprehensive exploration of the different analytical methodologies applied on hyperspectral imaging and a state of the art analysis of applications in different scientific and industrial areas this book presents for the first time a comprehensive collection of the main multivariate algorithms used for hyperspectral image analysis in different fields of application the benefits drawbacks and suitability of each are fully discussed along with examples of their application users will find state of the art information on the machinery for hyperspectral image acquisition along with a critical assessment of the usage of hyperspectral imaging in diverse scientific fields provides a comprehensive roadmap of hyperspectral image analysis with benefits and considerations for each method discussed covers state of the art applications in different scientific fields discusses the implementation of hyperspectral devices in different environments

Deep Learning for Hyperspectral Image Analysis and Classification 2021-02-20 this book focuses on deep learning based methods for hyperspectral image hsi analysis unsupervised spectral spatial adaptive band noise factor based formulation is devised for hsi noise detection and band categorization the method to characterize the bands along with the noise estimation of hsis will benefit subsequent remote sensing techniques significantly this book develops on two fronts on the one hand it is aimed at domain professionals who want to have an

updated overview of how hyperspectral acquisition techniques can combine with deep learning architectures to solve specific tasks in different application fields on the other hand the authors want to target the machine learning and computer vision experts by giving them a picture of how deep learning technologies are applied to hyperspectral data from a multidisciplinary perspective the presence of these two viewpoints and the inclusion of application fields of remote sensing by deep learning are the original contributions of this review which also highlights some potentialities and critical issues related to the observed development trends

Hyperspectral Imaging 2013-12-11 hyperspectral imaging techniques for spectral detection and classification is an outgrowth of the research conducted over the years in the remote sensing signal and image processing laboratory rssipl at the university of maryland baltimore county it explores applications of statistical signal processing to hyperspectral imaging and further develops non literal spectral techniques for subpixel detection and mixed pixel classification this text is the first of its kind on the topic and can be considered a recipe book offering various techniques for hyperspectral data exploitation in particular some known techniques such as osp orthogonal subspace projection and cem constrained energy minimization that were previously developed in the rssipl are discussed in great detail this book is self contained and can serve as a valuable and useful reference for researchers in academia and practitioners in government and industry

Advances in Hyperspectral Image Processing Techniques 2022-11-09 advances in hyperspectral image processing techniques authoritative and comprehensive resource covering recent hyperspectral imaging techniques from theory to applications advances in hyperspectral image processing techniques is derived from recent developments of hyperspectral imaging hsi techniques along with new applications in the field covering many new ideas that have been explored and have led to various new directions in the past few years the work gathers an array of disparate research into one resource and explores its numerous applications across a wide variety of disciplinary areas in particular it includes an introductory chapter on fundamentals of hsi and a chapter on extensive use of hsi techniques in satellite on orbit and on board processing to aid readers involved in these specific fields the book s content is based on the expertise of invited scholars and is categorized into six parts part i provides general theory part ii presents various band selection techniques for hyperspectral images part iii reviews recent developments on compressive sensing for hyperspectral imaging part iv includes fusion of hyperspectral images part v covers hyperspectral data unmixing part vi offers different views on hyperspectral image classification specific sample topics covered in advances in hyperspectral image processing techniques include two fundamental principles of hyperspectral imaging constrained band selection for hyperspectral imaging and class information based band selection for hyperspectral image classification restricted entropy and spectrum properties for hyperspectral imaging and endmember finding in compressively sensed band domain hyperspectral and lidar data fusion fusion of band selection methods for hyperspectral imaging and fusion using multi dimensional information advances in spectral unmixing of hyperspectral data and fully constrained least squares linear spectral mixture analysis sparse representation based hyperspectral image classification collaborative hyperspectral image classification class feature weighted hyperspectral image classification target detection

approach to hyperspectral image classification with many applications beyond traditional remote sensing ranging from defense and intelligence to agriculture to forestry to environmental monitoring to food safety and inspection to medical imaging advances in hyperspectral image processing techniques is an essential resource on the topic for industry professionals researchers academics and graduate students working in the field

Hyperspectral Data Processing 2013-04-08 hyperspectral data processing algorithm design and analysis is a culmination of the research conducted in the remote sensing signal and image processing laboratory rssipl at the university of maryland baltimore county specifically it treats hyperspectral image processing and hyperspectral signal processing as separate subjects in two different categories most materials covered in this book can be used in conjunction with the author s first book hyperspectral imaging techniques for spectral detection and classification without much overlap many results in this book are either new or have not been explored presented or published in the public domain these include various aspects of endmember extraction unsupervised linear spectral mixture analysis hyperspectral information compression hyperspectral signal coding and characterization as well as applications to conceal target detection multispectral imaging and magnetic resonance imaging hyperspectral data processing contains eight major sections part i provides fundamentals of hyperspectral data processing part ii offers various algorithm designs for endmember extraction part iii derives theory for supervised linear spectral mixture analysis part iv designs unsupervised methods for hyperspectral image analysis part v explores new concepts on hyperspectral information compression parts vi vii develops techniques for hyperspectral signal coding and characterization part viii presents applications in multispectral imaging and magnetic resonance imaging hyperspectral data processing compiles an algorithm compendium with matlab codes in an appendix to help readers implement many important algorithms developed in this book and write their own program codes without relying on software packages hyperspectral data processing is a valuable reference for those who have been involved with hyperspectral imaging and its techniques as well those who are new to the subject

Processing and Analysis of Hyperspectral Data 2020-01-22 hyperspectral imagery has received considerable attention in the last decade as it provides rich spectral information and allows the analysis of objects that are unidentifiable by traditional imaging techniques it has a wide range of applications including remote sensing industry sorting food analysis biomedical imaging etc however in contrast to rgb images from which information can be intuitively extracted hyperspectral data is only useful with proper processing and analysis this book covers theoretical advances of hyperspectral image processing and applications of hyperspectral processing including unmixing classification super resolution and quality estimation with classical and deep learning methods

Understanding Hyperspectral Image and Signal Processing 2014 one of the first texts to focus on investigating designing and implementing algorithms and computer programs as an introduction to the rapidly evolving field of hyperspectral image and signal processing covering a range of applications the authors provide a tutorial on hyperspectral image analysis focusing on the mathematical physical and algorithmic models necessary to devise programs that can extract the useful information that is present in measured hyperspectral data the amount of

data produced by a hyperspectral imaging device can be enormous so care and advanced processing steps must be taken to efficiently and effectively extract information the reader will learn about these processing steps the authors take the readers through the topic step by step from the physics foundations of the acquisition process to the particular algorithms and families of processing tools for classification feature selection extraction visualization unmixing and classification homework problems are provided whereby some problems are mathematical in nature whereas others involve writing brief computer programs describes the science and hardware technology underlying hyperspectral image analysis focuses on the mathematical and algorithmic concepts for processing hyperspectral data teaches readers the conceptual basis of how the hundreds of bands in spectral pixels can be used to gather information about the materials and objects that are present in the field of view or scene of a hyperspectral camera outlines how to write programs that can find things that are smaller than a single pixel and in turn details how to write programs that can describe and classify components of a scene shows how programs can use spatial information together with spectral information to produce more accurate automated analyses of images illustrates methods with a number of examples from across several applications areas such as estimating the extent of an oil spill detecting toxic gases around industrial plants or for homeland security imaging human tissue to aid medical diagnosis includes companion website hosted by the authors offering publicly available hyperspectral images and sample programs for processing as well as matlab code

Hyperspectral Image Processing 2015-07-15 based on the authors research this book introduces the main processing techniques in hyperspectral imaging in this context svm based classification distance comparison based endmember extraction svm based spectral unmixing spatial attraction model based sub pixel mapping and map pocs based super resolution reconstruction are discussed in depth readers will gain a comprehensive understanding of these cutting edge hyperspectral imaging techniques researchers and graduate students in fields such as remote sensing surveying and mapping geosciences and information systems will benefit from this valuable resource

Processing and Analysis of Hyperspectral Data 2020 the book covers the most crucial parts of real time hyperspectral image processing causality and real time capability recently two new concepts of real time hyperspectral image processing progressive hyperspectral imaging phsi and recursive hyperspectral imaging rhsi both of these can be used to design algorithms and also form an integral part of real time hyperpsectral image processing this book focuses on progressive nature in algorithms on their real time and causal processing implementation in two major applications endmember finding and anomaly detection both of which are fundamental tasks in hyperspectral imaging but generally not encountered in multispectral imaging this book is written to particularly address phsi in real time processing while a book recursive hyperspectral sample and band processing algorithm architecture and implementation springer 2016 can be considered as its companion book

Real-Time Progressive Hyperspectral Image Processing 2016-03-22 this book is about the novel aspects and future trends of the hyperspectral imaging in agriculture food and environment the topics covered by this book

are hyperspectral imaging and their applications in the nondestructive quality assessment of fruits and vegetables hyperspectral imaging for assessing quality and safety of meat multimode hyperspectral imaging for food quality and safety models fitting to pattern recognition in hyperspectral images sequential classification of hyperspectral images graph construction for hyperspectral data unmixing target visualization method to process hyperspectral image and soil contamination mapping with hyperspectral imagery this book is a general reference work for students professional engineers and readers with interest in the subject

Hyperspectral Imaging in Agriculture, Food and Environment 2018-08-01 in processing food hyperspectral imaging combined with intelligent software enables digital sorters or optical sorters to identify and remove defects and foreign material that are invisible to traditional camera and laser sorters hyperspectral imaging analysis and applications for food quality explores the theoretical and practical issues associated with the development analysis and application of essential image processing algorithms in order to exploit hyperspectral imaging for food quality evaluations it outlines strategies and essential image processing routines that are necessary for making the appropriate decision during detection classification identification quantification and or prediction processes features covers practical issues associated with the development analysis and application of essential image processing for food quality applications surveys the breadth of different image processing approaches adopted over the years in attempting to implement hyperspectral imaging for food quality monitoring explains the working principles of hyperspectral systems as well as the basic concept and structure of hyperspectral data describes the different approaches used during image acquisition data collection and visualization the book is divided into three sections section i discusses the fundamentals of imaging systems how can hyperspectral image cube acquisition be optimized also two chapters deal with image segmentation data extraction and treatment seven chapters comprise section ii which deals with chemometrics one explains the fundamentals of multivariate analysis and techniques while in six other chapters the reader will find information on and applications of a number of chemometric techniques principal component analysis partial least squares analysis linear discriminant model support vector machines decision trees and artificial neural networks in the last section applications numerous examples are given of applications of hyperspectral imaging systems in fish meat fruits vegetables medicinal herbs dairy products beverages and food additives

Hyperspectral Imaging Analysis and Applications for Food Quality 2018-11-16 authored by a panel of experts in the field this book focuses on hyperspectral image analysis systems and applications with discussion of application based projects and case studies this professional reference will bring you up to date on this pervasive technology wether you are working in the military and defense fields or in remote sensing technology geoscience or agriculture

Hyperspectral Data Exploitation 2007-06-11 the first of its kind this book reviews image processing tools and techniques including independent component analysis mutual information markov random field models and support vector machines the book also explores a number of experimental examples based on a variety of remote sensors the book will be useful to people involved in hyperspectral imaging research as well as by

remote sensing data like geologists hydrologists environmental scientists civil engineers and computer scientists

Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data 2013-03-09 based on the integration of computer vision and spectrscopy techniques hyperspectral imaging is a novel technology for obtaining both spatial and spectral information on a product used for nearly 20 years in the aerospace and military industries more recently hyperspectral imaging has emerged and matured into one of the most powerful and rapidly growing methods of non destructive food quality analysis and control hyperspectral imaging for food quality analysis and control provides the core information about how this proven science can be practically applied for food quality assessment including information on the equipment available and selection of the most appropriate of those instruments additionally real world food industry based examples are included giving the reader important insights into the actual application of the science in evaluating food products presentation of principles and instruments provides core understanding of how this science performs as well as guideline on selecting the most appropriate equipment for implementation includes real world practical application to demonstrate the viability and challenges of working with this technology provides necessary information for making correct determination on use of hyperspectral imaging

Derivative Hyperspectral Image Analysis for Land Use Classification 2000 this book explores recursive architectures in designing progressive hyperspectral imaging algorithms in particular it makes progressive imaging algorithms recursive by introducing the concept of kalman filtering in algorithm design so that hyperspectral imagery can be processed not only progressively sample by sample or band by band but also recursively via recursive equations this book can be considered a companion book of author s books real time progressive hyperspectral image processing published by springer in 2016

Hyperspectral Imaging for Food Quality Analysis and Control 2010-06-29 this book presents new methods of analyzing and processing hyperspectral medical images which can be used in diagnostics for example for dermatological images the algorithms proposed are fully automatic and the results obtained are fully reproducible their operation was tested on a set of several thousands of hyperspectral images and they were implemented in matlab the presented source code can be used without licensing restrictions this is a valuable resource for computer scientists bioengineers doctoral students and dermatologists interested in contemporary analysis methods

Real-Time Recursive Hyperspectral Sample and Band Processing 2017-04-23 graph spectral image processing is the study of imaging data from a graph frequency perspective modern image sensors capture a wide range of visual data including high spatial resolution high bit depth 2d images and videos hyperspectral images light field images and 3d point clouds the field of graph signal processing extending traditional fourier analysis tools such as transforms and wavelets to handle data on irregular graph kernels provides new flexible computational tools to analyze and process these varied types of imaging data recent methods combine graph signal processing ideas with deep neural network architectures for enhanced performances with robustness and smaller memory requirements the book is divided into two parts the first is centered on the fundamentals of graph signal

processing theories including graph filtering graph learning and graph neural networks the second part details several imaging applications using graph signal processing tools including image and video compression 3d image compression image restoration point cloud processing image segmentation and image classification as well as the use of graph neural networks for image processing

Processing of Hyperspectral Medical Images 2016-12-01 a synergy of techniques on hybrid intelligence for real life image analysis hybrid intelligence for image analysis and understanding brings together research on the latest results and progress in the development of hybrid intelligent techniques for faithful image analysis and understanding as such the focus is on the methods of computational intelligence with an emphasis on hybrid intelligent methods applied to image analysis and understanding the book offers a diverse range of hybrid intelligence techniques under the umbrellas of image thresholding image segmentation image analysis and video analysis key features provides in depth analysis of hybrid intelligent paradigms divided into self contained chapters provides ample case studies illustrations and photographs of real life examples to illustrate findings and applications of different hybrid intelligent paradigms offers new solutions to recent problems in computer science specifically in the application of hybrid intelligent techniques for image analysis and understanding using well known contemporary algorithms the book is essential reading for lecturers researchers and graduate students in electrical engineering and computer science

Graph Spectral Image Processing 2021-08-31 remote sensing digital image analysis provides the non specialist with an introduction to quantitative evaluation of satellite and aircraft derived remotely retrieved data since the first edition of the book there have been significant developments in the algorithms used for the processing and analysis of remote sensing imagery nevertheless many of the fundamentals have substantially remained the same this new edition presents material that has retained value since those early days along with new techniques that can be incorporated into an operational framework for the analysis of remote sensing data the book is designed as a teaching text for the senior undergraduate and postgraduate student and as a fundamental treatment for those engaged in research using digital image processing in remote sensing the presentation level is for the mathematical non specialist since the very great number of operational users of remote sensing come from the earth sciences communities the text is pitched at a level commensurate with their background each chapter covers the pros and cons of digital remotely sensed data without detailed mathematical treatment of computer based algorithms but in a manner conductive to an understanding of their capabilities and limitations problems conclude each chapter

Hybrid Intelligence for Image Analysis and Understanding 2017-07-27 hyperspectral imaging or imaging spectroscopy is a novel technology for acquiring and analysing an image of a real scene by computers and other devices in order to obtain quantitative information for quality evaluation and process control image processing and analysis is the core technique in computer vision with the continuous development in hardware and software for image processing and analysis the application of hyperspectral imaging has been extended to the safety and quality evaluation of meat and produce especially in recent years hyperspectral imaging has attracted much

research and development attention as a result rapid scientific and technological advances have increasingly taken place in food and agriculture especially on safety and quality inspection classification and evaluation of a wide range of food products illustrating the great advantages of using the technology for objective rapid non destructive and automated safety inspection as well as quality control therefore as the first reference book in the area hyperspectral imaging technology in food and agriculture focuses on these recent advances the book is divided into three parts which begins with an outline of the fundamentals of the technology followed by full covering of the application in the most researched areas of meats fruits vegetables grains and other foods which mostly covers food safety and quality as well as remote sensing applicable for crop production hyperspectral imaging technology in food and agriculture is written by international peers who have both academic and professional credentials with each chapter addressing in detail one aspect of the relevant technology thus highlighting the truly international nature of the work therefore the book should provide the engineer and technologist working in research development and operations in the food and agricultural industry with critical comprehensive and readily accessible information on the art and science of hyperspectral imaging technology it should also serve as an essential reference source to undergraduate and postgraduate students and researchers in universities and research institutions

Hyperspectral Image Analysis for Questioned Historical Documents 2010 advanced imaging spectral technology and hyperspectral analysis techniques for multiple applications are the key features of the book this book will present in one volume complete solutions from concepts fundamentals and methods of acquisition of hyperspectral data to analyses and applications of the data in a very coherent manner it will help readers to fully understand basic theories of hrs how to utilize various field spectrometers and bioinstruments the importance of radiometric correction and atmospheric correction the use of analysis tools and software and determine what to do with hrs technology and data

Remote Sensing Digital Image Analysis 2012-09-13 hyper multispectral imagery in optical remote sensing utilizes wavelengths that range from the visible to the reflective shortwave infrared inverse processes using machine learning are applied to the spectral profiles recorded for target detection material identification and associated environmental applications which is the main purpose of remote sensing this field guide covers the fundamentals of remote sensing spectral imaging for image understanding image processing for correction and quality improvement and image analysis for information extraction at subpixel pixel superpixel and image levels including feature mining and feature reduction basic concepts and fundamental understanding are emphasized to prepare the reader for exploring advanced methods

Hyperspectral Imaging Technology in Food and Agriculture 2015-09-29 contributed papers presented at the national seminar on hyperspectral remote sensing and spectral signature databse management system held on february 14 15 2008 at annamalai university

Multispectral and Hyperspectral Image Acquisition and Processing 2001 the aim of this workshop is to bring together all the people involved in hyperspectral data processing generally speaking by data we mean signals as

provided by spectrometers and processed individually images from the ground using microscopes and spectrometers to airborne or satellite sensors up to astrophysical data models models of the sensors or of the sensed scene including physical considerations by processing we mean everything from the acquisition the calibration to the analysis image processing signal processing feature extraction dimension reduction unmixing and source separation classification

<u>Hyperspectral Remote Sensing</u> 2017-08-16 this comprehensive new resource brings you up to date on recent developments in the classification of hyperspectral images using both spectral and spatial information including advanced statistical approaches and methods the inclusion of spatial information to traditional approaches for hyperspectral classification has been one of the most active and relevant innovative lines of research in remote sensing during recent years this book gives you insight into several important challenges when performing hyperspectral image classification related to the imbalance between high dimensionality and limited availability of training samples or the presence of mixed pixels in the data this book also shows you how to integrate spatial and spectral information in order to take advantage of the benefits that both sources of information provide

Field Guide to Hyperspectral/multispectral Image Processing 2022 this book is intended to provide a detailed perspective on techniques and challenges in detecting urban materials using hyperspectral data including a systematic perspective on the spectral properties of the materials and methods it adopts a process chain approach in describing the topic and explains image processing steps from reflectance calibration to final insights the objective of the book is to provide in depth information on hyperspectral remote sensing of urban materials covering global case studies as applicable features covers the complete processing chain of hyperspectral data specifically in urban environments gives more information about the mapping and classification of urban scenes includes information from basic imaging spectroscopy to advanced methods such as deep learning for imaging spectroscopy reviews detailed spectral characteristics of urban materials commonly found in world cities discusses advanced supervised methods such as deep learning with a due focus on hyperspectral data analysis this book is aimed at professionals and graduate students in hyperspectral imaging urban remote sensing and hyperspectral image processing

<u>Hyperspectral Remote Sensing and Spectral Signature Applications</u> 2009 this book includes some very recent applications and the newest emerging trends of hyper spectral imaging hsi hsi is a very recent and strange beast a sort of a melting pot of previous techniques and scientific interests merging and concentrating the efforts of physicists chemists botanists biologists and physicians to mention just a few as well as experts in data crunching and statistical elaboration for almost a century scientific observation from looking to planets and stars down to our own cells and below could be divided into two main categories analyzing objects on the basis of their physical dimension recording size position weight etc and their variations or on how the object emits reflects or absorbs part of the electromagnetic spectrum i e spectroscopy while the two aspects have been obviously entangled instruments and skills have always been clearly distinct from each other with hsi now available this is no longer the case this instrument can return specimen dimensionalities and spectroscopic properties to any

single pixel of your specimen in a single set of data hsi modality is ubiquitous and scale invariant enough to be used to mark terrestrial resources on the basis of a land map obtained from satellite observation actually the oldest application of this type or to understand if the cell you are looking at is cancerous or perfectly healthy for all these reasons hsi represents one of the most exciting methodologies of the new millennium

2018 9th Workshop on Hyperspectral Image and Signal Processing Evolution in Remote Sensing (WHISPERS) 2018-09-23 this book maximizes reader insights into the field of mathematical models and methods for the processing of two dimensional remote sensing images it presents a broad analysis of the field encompassing passive and active sensors hyperspectral images synthetic aperture radar sar interferometric sar and polarimetric sar data at the same time it addresses highly topical subjects involving remote sensing data types e g very high resolution images multiangular or multiresolution data and satellite image time series and analysis methodologies e g probabilistic graphical models hierarchical image representations kernel machines data fusion and compressive sensing that currently have primary importance in the field of mathematical modelling for remote sensing and image processing each chapter focuses on a particular type of remote sensing data and or on a specific methodological area presenting both a thorough analysis of the previous literature and a methodological and experimental discussion of at least two advanced mathematical methods for information extraction from remote sensing data this organization ensures that both tutorial information and advanced subjects are covered with each chapter being written by research scientists from at least two different institutions it offers multiple professional experiences and perspectives on each subject the book also provides expert analysis and commentary from leading remote sensing and image processing researchers many of whom serve on the editorial boards of prestigious international journals in these fields and are actively involved in international scientific societies providing the reader with a comprehensive picture of the overall advances and the current cutting edge developments in the field of mathematical models for remote sensing image analysis this book is ideal as both a reference resource and a textbook for graduate and doctoral students as well as for remote sensing scientists and practitioners

Spectral-Spatial Classification of Hyperspectral Remote Sensing Images 2015-09-01 advances in machine learning and image analysis for geoai provides state of the art machine learning and signal processing techniques for a comprehensive collection of geospatial sensors and sensing platforms the book covers supervised semi supervised and unsupervised geospatial image analysis sensor fusion across modalities image super resolution transfer learning across sensors and time points and spectral unmixing among other topics the chapters in these thematic areas cover a variety of algorithmic frameworks such as variants of convolutional neural networks graph convolutional networks multi stream networks bayesian networks generative adversarial networks transformers and more advances in machine learning and image analysis for geoai provides graduate students researchers and practitioners in the area of signal processing and geospatial image analysis with the latest techniques to implement deep learning strategies in their research covers the latest machine learning and signal processing techniques that can effectively leverage geospatial imagery at scale presents a variety of

algorithmic frameworks including variants of convolutional neural networks multi stream networks bayesian networks and more includes open source code base for algorithms described in each chapter

Hyperspectral Remote Sensing in Urban Environments 2023-10-31 remote sensing digital image analysis provides the non specialist with an introduction to quantitative evaluation of satellite and aircraft derived remotely retrieved data each chapter covers the pros and cons of digital remotely sensed data without detailed mathematical treatment of computer based algorithms but in a manner conductive to an understanding of their capabilities and limitations problems conclude each chapter this fourth edition has been developed to reflect the changes that have occurred in this area over the past several years its focus is on those procedures that seem now to have become part of the set of tools regularly used to perform thematic mapping as with previous revisions the fundamental material has been preserved in its original form because of its tutorial value its style has been revised in places and it has been supplemented if newer aspects have emerged in the time since the third edition appeared it still meets however the needs of the senior student and practitioner

The Future of Hyperspectral Imaging 2019-11-20 continuing in the footsteps of the pioneering first edition signal and image processing for remote sensing second edition explores the most up to date signal and image processing methods for dealing with remote sensing problems although most data from satellites are in image form signal processing can contribute significantly in extracting information from remotely sensed waveforms or time series data this book combines both providing a unique balance between the role of signal processing and image processing featuring contributions from worldwide experts this book continues to emphasize mathematical approaches not limited to satellite data it also considers signals and images from hydroacoustic seismic microwave and other sensors chapters cover important topics in signal and image processing and discuss techniques for dealing with remote sensing problems each chapter offers an introduction to the topic before delving into research results making the book accessible to a broad audience this second edition reflects the considerable advances that have occurred in the field with 23 of 27 chapters being new or entirely rewritten coverage includes new mathematical developments such as compressive sensing empirical mode decomposition and sparse representation as well as new component analysis methods such as non negative matrix and tensor factorization the book also presents new experimental results on sar and hyperspectral image processing the emphasis is on mathematical techniques that will far outlast the rapidly changing sensor software and hardware technologies written for industrial and academic researchers and graduate students alike this book helps readers connect the dots in image and signal processing new in this edition the second edition includes four chapters from the first edition plus 23 new or entirely rewritten chapters and 190 new figures new topics covered include compressive sensing the mixed pixel problem with hyperspectral images hyperspectral image hsi target detection and classification based on sparse representation an isar technique for refocusing moving targets in sar images empirical mode decomposition for signal processing feature extraction for classification of remote sensing signals and images active learning methods in classification of remote sensing images signal subspace identification of hyperspectral data wavelet based multi hyperspectral image restoration and fusion the second edition is not

intended to replace the first edition entirely and readers are encouraged to read both editions of the book for a more complete picture of signal and image processing in remote sensing see signal and image processing for remote sensing crc press 2006

Mathematical Models for Remote Sensing Image Processing 2017-11-28 resolving spectral mixtures with applications from ultrafast time resolved spectroscopy to superresolution imaging offers a comprehensive look into the most important models and frameworks essential to resolving the spectral unmixing problem from multivariate curve resolution and multi way analysis to bayesian positive source separation and nonlinear unmixing unravelling total spectral data into the contributions from individual unknown components with limited prior information is a complex problem that has attracted continuous interest for almost four decades spectral unmixing is a topic of interest in statistics chemometrics signal processing and image analysis for decades researchers from these fields were often unaware of the work in other disciplines due to their different scientific and technical backgrounds and interest in different objects or samples this led to the development of quite different approaches to solving the same problem this multi authored book will bridge the gap between disciplines with contributions from a number of well known and strongly active chemometric and signal processing research groups among chemists multivariate curve resolution methods are preferred to extract information about the nature amount and location in time process and space imaging and microscopy of chemical constituents in complex samples in signal processing assumptions are usually around statistical independence of the extracted components however the chapters include the complexity of the spectral data to be unmixed as well as dimensionality and size of the data sets advanced spectroscopy is the key thread linking the different chapters applications cover a large part of the electromagnetic spectrum time resolution ranges from femtosecond to second in process spectroscopy and spatial resolution covers the submicronic to macroscopic scale in hyperspectral imaging demonstrates how and why data analysis signal processing and chemometrics are essential to the spectral unmixing problem guides the reader through the fundamentals and details of the different methods presents extensive plots graphical representations and illustrations to help readers understand the features of different techniques and to interpret results bridges the gap between disciplines with contributions from a number of well known and highly active chemometric and signal processing research groups

Advances in Machine Learning and Image Analysis for GeoAI 2024-06-01 recent advances in hyperspectral remote sensor technology allow the simultaneous acquisition of hundreds of spectral wavelengths for each image pixel hyperspectral imaging systems can acquire numerous contiguous spectral bands throughout the electromagnetic spectrum therefore hyperspectral imaging techniques are widely used for many applications including environmental monitoring mineralogy astronomy surveillance and defense nevertheless the high dimensionality of the pixels undesirable noise high spectral redundancy and spectral and spatial variabilities in conjunction with limited ground truth data present challenges for the analysis of hyperspectral imagery the classification technology is currently the predominate method for analyzing hyperspectral images and has received much attention over the past decades numerous pixel wise classification methods which only use

spectral information have been proposed to classify remote sensing images recent advances in spectral spatial classification of hyperspectral images are presented in this book several techniques are investigated for combining both spatial and spectral information the book highlights the importance of spectral spatial strategies for the accurate classification of hyperspectral images and validates the proposed methods spectral spatial classification of hyperspectral remote sensing images presents insight into numerous important challenges when performing hyperspectral image classification related to the imbalance between high dimensionality and limited availability of training samples or the presence of mixed pixels in the data the book also demonstrates the reader how to integrate spatial and spectral information in order to take advantage of the benefits that both sources of information provide

Remote Sensing Digital Image Analysis 1999 this book is a composition of different points of view regarding the application of computational intelligence techniques and methods to remote sensing data and applications it is the general consensus that classification its related data processing and global optimization methods are core topics of computational intelligence much of the content of the book is devoted to image segmentation and recognition using diverse tools from different areas of the computational intelligence field ranging from artificial neural networks to markov random field modeling the book covers a broad range of topics starting from the hardware design of hyperspectral sensors and data handling problems namely data compression and watermarking issues as well as autonomous web services the main contents of the book are devoted to image analysis and efficient parallel implementations of these analysis techniques the classes of images dealt with throughout the book are mostly multispectral hyperspectral images though there are some instances of processing synthetic aperture radar images

Signal and Image Processing for Remote Sensing, Second Edition 2012-02-22

Resolving Spectral Mixtures 2016-08-13

Classification of Hyperspectral Remote Sensing Images 2018-05

Computational Intelligence for Remote Sensing 2008-06-05

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