Chapter 4 Texture Feature Extraction

Medical images are at the base of many routine clinical decisions and their influence continues to increase in many fields of medicine. Since the last decade, computers have become an invaluable tool for supporting medical image acquisition, processing, organization and analysis. Biomedical Image Analysis and Machine Learning Technologies: Applications and Techniques provides a panorama of the current boundary between biomedical complexity coming from the medical image context and the multiple techniques which have been used for solving many of these problems. This innovative publication serves as a leading industry reference as well as a source of creative ideas for applications of medical issues.

Emerging Technologies in Intelligent Applications for Image and Video Processing

Multimedia data comprising of images, audio and video is becoming increasingly common. The decreasing costs of consumer electronic devices such as digital cameras and digital camcorders, along with the ease of transportation facilitated by the Internet, has lead to a phenomenal rise in the amount of multimedia data generated and distributed. Given that this trend of increased use of multimedia data is likely to accelerate, there is an urgent need for providing a clear means of capturing, storing, indexing, retrieving, analyzing
and summarizing such data. Content-based access to multimedia data is of primary importance since it is the natural way by which human beings interact with such information. To facilitate the content-based access of multimedia information, the first step is to derive feature measures from these data so that a feature space representation of the data content can be formed. This can subsequently allow for mapping the feature space to the symbol space (semantics) either automatically or through human intervention. Thus, signal to symbol mapping, useful for any practical system, can be successfully achieved. Perspectives on Content-Based Multimedia Systems provides a comprehensive set of techniques to tackle these important issues. This book offers detailed solutions to a wide range of practical problems in building real systems by providing specifics of three systems built by the authors. While providing a systems focus, it also equips the reader with a keen understanding of the fundamental issues, including a formalism for content-based multimedia database systems, multimedia feature extraction, object-based techniques, signature-based techniques and fuzzy retrieval techniques. The performance evaluation issues of practical systems is also explained. This book brings together essential elements of building a content-based multimedia database system in a way that makes them accessible to practitioners in computer science and electrical engineering. It can also serve as a textbook for graduate-level courses.

Biomedical Image Analysis and Machine Learning Technologies: Applications and Techniques

Image and Video Processing is an active area of research due to its potential applications for solving real-world problems. Integrating computational intelligence to analyze and interpret information from image and video technologies is an essential step to processing and applying multimedia data. Emerging Technologies in Intelligent Applications for Image and Video Processing presents the most current research relating to multimedia technologies including video and image restoration and enhancement as well as algorithms used for image and video compression, indexing and retrieval processes, and security concerns. Featuring insight from researchers from around the world, this publication is designed for use by engineers, IT specialists, researchers, and graduate level students.

Hybrid Intelligence for Image Analysis and Understanding

This book gathers selected and expanded contributions presented at the 5th Symposium on Space Optical Instruments and Applications, which was held in Beijing, China, on September 5–7, 2018. This conference series is organized by the Sino-Holland Space Optical Instruments Laboratory, a cooperative platform between China and the Netherlands. The symposium focused on key technological problems regarding optical instruments and their applications in a space context. It covered the latest developments, experiments and results on the theory, instrumentation and applications of space optics. The book is split into five main sections: The first covers optical remote sensing system design, the second focuses on advanced optical system design, and the third addresses remote sensor calibration and measurement. Remote sensing data processing and information extraction are then presented, followed by a final section on remote sensing data applications.

Multimedia Information Extraction and Digital Heritage Preservation
The field of medical imaging seen rapid development over the last two decades and has consequently revolutionized the way in which modern medicine is practiced. Diseases and their symptoms are constantly changing therefore continuous updating is necessary for the data to be relevant. Diseases fall into different categories, even a small difference in symptoms may result in categorising it in a different group altogether. Thus analysing data accurately is of critical importance. This book concentrates on diagnosing diseases like cancer or tumor from different modalities of images. This book is divided into the following domains: Importance of big data in medical imaging, pre-processing, image registration, feature extraction, classification and retrieval. It is further supplemented by the medical analyst for a continuous treatment process. The book provides an automated system that could retrieve images based on user’s interest to a point of providing decision support. It will help medical analysts to take informed decisions before planning treatment and surgery. It will also be useful to researchers who are working in problems involved in medical imaging.

Image Analysis

The book introduces two domains namely Remote Sensing and Digital Image Processing. It discusses remote sensing, texture, classifiers, and procedures for performing the texture-based segmentation and land cover classification. The first chapter discusses the important terminologies in remote sensing, basics of land cover classification, types of remotely sensed images and their characteristics. The second chapter introduces the texture and a detailed literature survey citing papers related to texture analysis and image processing. The third chapter describes basic texture models for gray level images and multivariate texture models for color or remotely sensed images with relevant Matlab source codes. The fourth chapter focuses on texture-based classification and texture-based segmentation. The Matlab source codes for performing supervised texture based segmentation using basic texture models and minimum distance classifier are listed. The fifth chapter describes supervised and unsupervised classifiers. The experimental results obtained using a basic texture model (Uniform Local Binary Pattern) with the classifiers described earlier are discussed through the relevant Matlab source codes. The sixth chapter describes land cover classification procedure using multivariate (statistical and spectral) texture models and minimum distance classifier with Matlab source codes. A few performance metrics are also explained. The seventh chapter explains how texture based segmentation and land cover classification are performed using the hidden Markov model with relevant Matlab source codes. The eighth chapter gives an overview of spatial data analysis and other existing land cover classification methods. The ninth chapter addresses the research issues and challenges associated with land cover classification using textural approaches. This book is useful for undergraduates in Computer Science and Civil Engineering and postgraduates who plan to do research or project work in digital image processing. The book can serve as a guide to those who narrow down their research to processing remotely sensed images. It addresses a wide range of texture models and classifiers. The book not only guides but aids the reader in implementing the concepts through the Matlab source codes listed. In short, the book will be a valuable resource for growing academicians to gain expertise in their area of specialization and students who aim at gaining in-depth knowledge through practical implementations. The exercises given under texture based segmentation (excluding land cover classification exercises) can serve as lab exercises for the undergraduate students who learn texture based image processing.
There are many books on neural networks, some of which cover computational intelligence, but none that incorporate both feature extraction and computational intelligence, as Supervised and Unsupervised Pattern Recognition does. This volume describes the application of a novel, unsupervised pattern recognition scheme to the classification of various types of waveforms and images. This substantial collection of recent research begins with an introduction to Neural Networks, classifiers, and feature extraction methods. It then addresses unsupervised and fuzzy neural networks and their applications to handwritten character recognition and recognition of normal and abnormal visual evoked potentials. The third section deals with advanced neural network architectures—including modular design—and their applications to medicine and three-dimensional NN architecture simulating brain functions. The final section discusses general applications and simulations, such as the establishment of a brain-computer link, speaker identification, and face recognition. In the quickly changing field of computational intelligence, every discovery is significant. Supervised and Unsupervised Pattern Recognition gives you access to many notable findings in one convenient volume.

**Supervised and Unsupervised Pattern Recognition**

Recently, the algorithms for the processing of the visual information have greatly evolved, providing efficient and effective solutions to cope with the variability and the complexity of real-world environments. These achievements yield to the development of Machine Vision systems that overcome the typical industrial applications, where the environments are controlled and the tasks are very specific, towards the use of innovative solutions to face with everyday needs of people. The Human-Centric Machine Vision can help to solve the problems raised by the needs of our society, e.g. security and safety, health care, medical imaging, and human machine interface. In such applications it is necessary to handle changing, unpredictable and complex situations, and to take care of the presence of humans.

**Assessment of Cellular and Organ Function and Dysfunction using Direct and Derived MRI Methodologies**

The book presents three most significant areas in Biometrics and Pattern Recognition. A step-by-step approach for design and implementation of Dual Tree Complex Wavelet Transform (DTCWT) plus Rotated Complex Wavelet Filters (RCWF) is discussed in detail. In addition to the above, the book provides detailed analysis of iris images and two methods of iris segmentation. It also discusses simplified study of some subspace-based methods and distance measures for iris recognition backed by empirical studies and statistical success verifications.

**Iris Analysis for Biometric Recognition Systems**

Glaucoma is the second leading cause of blindness globally. Early detection and treatment can prevent its progression to avoid total blindness. This book discusses and reviews current approaches for detection and examines new approaches for diagnosing glaucoma using CAD system. Computer-Aided Glaucoma Diagnosis System, Chapter 1 provides a brief introduction of the disease and current methodology used to diagnose it today. Chapter 2 presents a review of the medical background of the disease, followed by a theoretical and
mathematical background used in fundus image processing. Chapter 3 is a literature review about segmentation and feature extraction. Chapter 4 describes the formulation of the proposed methodology. In Chapter 5, the results of optic disc and optic cup segmentation algorithm are presented, the feature extraction and selection method, experimental results and performance evaluations of the classifier are given. Chapter 6 presents the conclusions and discussion of the future potential for the diagnostic system. This book is intended for biomedical engineers, computer science students, ophthalmologists and radiologists looking to develop a reliable automated computer-aided diagnosis system (CAD) for detecting glaucoma and improve diagnosis of the disease. Key Features Discusses a reliable automated computer-aided diagnosis system (CAD) for detecting glaucoma and presents an algorithm that detects optic disc and optic cup Assists ophthalmologists and researchers to test a new diagnostic method that reduces the effort and time of the doctors and cost to the patients Discusses techniques to reduce human error and minimize the miss detection rate and facilitate early diagnosis and treatment Presents algorithms to detect cup and disc color, shape features and RNFL texture features Dr. Arwa Ahmed Gasm Elseid is an assistant professor, Department of Biomedical Engineering, Sudan University of Science and Technology, Khartoum, Sudan. Dr. Alnazier Osman Mohammed Hamza is professor of Medical Imaging, College of Engineering, Sudan University of Sciences and Technology, Khartoum, Sudan.

**Big Data in Medical Image Processing**

This book covers the key advances in computerized facial beauty analysis, with an emphasis on data-driven research and the results of quantitative experiments. It takes a big step toward practical facial beauty analysis, proposes more reliable and stable facial features for beauty analysis and designs new models, methods, algorithms and schemes while implementing a facial beauty analysis and beautification system. This book also tests some previous putative rules and models for facial beauty analysis by using computationally efficient mathematical models and algorithms, especially large scale database-based and repeatable experiments. The first section of this book provides an overview of facial beauty analysis. The base of facial beauty analysis, i.e., facial beauty features, is presented in part two. Part three describes hypotheses on facial beauty, while part four defines data-driven facial beauty analysis models. This book concludes with the authors explaining how to implement their new facial beauty analysis system. This book is designed for researchers, professionals and post graduate students working in the field of facial beauty analysis, computer vision, human-machine interface, pattern recognition and biometrics. Those involved in interdisciplinary fields will also find the contents useful. The ideas, means and conclusions for beauty analysis are valuable for researchers and the system design and implementation can be used as models for practitioners and engineers.

**Perspectives on Content-Based Multimedia Systems**

Medical Image Processing: Concepts and Applications presents an overview of image processing for various applications in the field of medical science. Inclusion of several topics like noise reduction filters, feature extraction, image restoration, segmentation, soft computing techniques and context-based medical image retrieval, etc. makes this book a single-source information meeting the requirements of the readers. Besides, the coverage of digital image processing, human visual perception and CAD system to be used in automated diagnosis system, medical imaging modalities, various application areas of medical field, detection and classification of various disease, etc.
Texture Feature Extraction Techniques for Image Recognition

Discusses major aspects of content-based image retrieval (CBIR) using current technologies and applications within the artificial intelligence (AI) field.

Land Cover Classification of Remotely Sensed Images

This book describes various types of image patterns for image retrieval. All these patterns are texture dependent. Few image patterns such as Improved directional local extrema patterns, Local Quantized Extrema Patterns, Local Color Oppugnant Quantized Extrema Patterns and Local Mesh quantized extrema patterns are presented. Inter-relationships among the pixels of an image are used for feature extraction. In contrast to the existing patterns these patterns focus on local neighborhood of pixels to creates the feature vector. Evaluation metrics such as precision and recall are calculated after testing with standard databases i.e., Corel-1k, Corel-5k and MIT VisTex database. This book serves as a practical guide for students and researchers. –The text introduces two models of Directional local extrema patterns viz., Integration of color and directional local extrema patterns Integration of Gabor features and directional local extrema patterns. –Provides a framework to extract the features using quantization method –Discusses the local quantized extrema collected from two oppugnant color planes –Illustrates the mesh structure with the pixels at alternate positions.

Recent Trends in Computer-aided Diagnostic Systems for Skin Diseases

This book presents state-of-the-art methodologies and a comprehensive
introduction to the recognition and representation of species and individual animals based on their physiological and phenotypic appearances, biometric characteristics, and morphological image patterns. It provides in-depth coverage of this emerging area, with an emphasis on the design and analysis techniques used in visual animal biometrics-based recognition systems. The book offers a comprehensive introduction to visual animal biometrics, addressing a range of recent advances and practices like sensing, feature extraction, feature selection and representation, matching, indexing of feature sets, and animal biometrics-based multimodal systems. It provides authoritative information on all the major concepts, as well as highly specific topics, e.g. the identification of cattle based on their muzzle point image pattern and face images to prevent false insurance claims, or the monitoring and registration of animals based on their biometric features. As such, the book provides a sound platform for understanding the Visual Animal Biometrics paradigm, a vital catalyst for researchers in the field, and a valuable guide for professionals. In addition, it can help both private and public organizations adapt and enhance their classical animal recognition systems.

**Intelligent Search Method for Enhancing High-Level Concept Image Retrieval**

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.

**5th International Symposium of Space Optical Instruments and Applications**

This book presents a thorough and detailed guide to image registration, outlining the principles and reviewing state-of-the-art tools and methods. The book begins by identifying the components of a general image registration system, and then describes the design of each component using various image analysis tools. The text reviews a vast array of tools and methods, not only describing the principles behind each tool and method, but also measuring and comparing their performances using synthetic and real data. Features: discusses similarity/dissimilarity measures, point detectors, feature extraction/selection and homogeneous/heterogeneous descriptors; examines robust estimators, point pattern matching algorithms, transformation functions, and image resampling and blending; covers principal axes methods, hierarchical methods, optimization-based methods, edge-based methods, model-based methods, and adaptive methods; includes a glossary, an extensive list of references, and an appendix on PCA.
From Natural to Artificial Intelligence

In this book, the authors present the latest research results in the multimedia and semantic web communities, bridging the "Semantic Gap". This book explains, collects, and reports on the latest research results that aim at narrowing the so-called multimedia "Semantic Gap": the large disparity between descriptions of multimedia content that can be computed automatically, and the richness and subjectivity of semantics in user queries and human interpretations of audiovisual media. Addressing the grand challenge posed by the "Semantic Gap" requires a multi-disciplinary approach (computer science, computer vision and signal processing, cognitive science, web science, etc.) and this is reflected in recent research in this area. In addition, the book targets an interdisciplinary community, and in particular the Multimedia and the Semantic Web communities. Finally, the authors provide both the fundamental knowledge and the latest state-of-the-art results from both communities with the goal of making the knowledge of one community available to the other. Key Features: Presents state-of-the-art research results in multimedia semantics: multimedia analysis, metadata standards and multimedia knowledge representation, semantic interaction with multimedia Contains real industrial problems exemplified by user case scenarios Offers an insight into various standardisation bodies including W3C, IPTC and ISO MPEG Contains contributions from academic and industrial communities from Europe, USA and Asia Includes an accompanying website containing user cases, datasets, and software mentioned in the book, as well as links to the K-Space NoE and the SMaRT society websites (http://www.multimediasemantics.com/) This book will be a valuable reference for academic and industry researchers/practitioners in multimedia, computational intelligence and computer science fields. Graduate students, project leaders, and consultants will also find this book of interest.

Medical Biometrics

The volume focuses on research-oriented work, which can help opening up new vistas of research for the research community, and explore new mechanisms of retrieval of information from multimedia documents, particularly from heritage documents, apart from using the conventional methods.

Agro-Product Processing Technology

Signal Processing for Computer Vision is a unique and thorough treatment of the signal processing aspects of filters and operators for low-level computer vision. Computer vision has progressed considerably over recent years. From methods only applicable to simple images, it has developed to deal with increasingly complex scenes, volumes, and time sequences. A substantial part of this book deals with the problem of designing models that can be used for several purposes within computer vision. These partial models have some general properties of invariance generation and generality in model generation. Signal Processing for Computer Vision is the first book to give a unified treatment of representation and filtering of higher order data, such as vectors and tensors in multidimensional space. Included is a systematic organisation for the implementation of complex models in a hierarchical modular structure and novel material on adaptive filtering using tensor data representation. Signal Processing for Computer Vision is intended for final year undergraduate and graduate students as well as engineers and researchers in the field of computer vision and image processing.

Animal Biometrics
This book introduces a range of image color feature extraction techniques. Readers are encouraged to try implementing the techniques discussed here on their own, all of which are presented in a very simple and step-by-step manner. In addition, the book can be used as an introduction to image color feature techniques for those who are new to the research field and software. The techniques are very easy to understand as most of them are described with pictorial examples. Not only the techniques themselves, but also their applications are covered. Accordingly, the book offers a valuable guide to these tools, which are a vital component of content-based image retrieval (CBIR).

**Machine Learning in Image Analysis and Pattern Recognition**

Change Detection and Image Time Series Analysis 2 presents supervised machine-learning-based methods for temporal evolution analysis by using image time series associated with Earth observation data. Chapter 1 addresses the fusion of multisensor, multiresolution and multitemporal data. It proposes two supervised solutions that are based on a Markov random field: the first relies on a quad-tree and the second is specifically designed to deal with multimission, multifrequency and multiresolution time series. Chapter 2 provides an overview of pixel based methods for time series classification, from the earliest shallow learning methods to the most recent deep-learning-based approaches. Chapter 3 focuses on very high spatial resolution data time series and on the use of semantic information for modeling spatio-temporal evolution patterns. Chapter 4 centers on the challenges of dense time series analysis, including pre processing aspects and a taxonomy of existing methodologies. Finally, since the evaluation of a learning system can be subject to multiple considerations, Chapters 5 and 6 offer extensive evaluations of the methodologies and learning frameworks used to produce change maps, in the context of multiclass and/or multilabel change classification issues.

**Image Color Feature Extraction Techniques**

Palmprint Authentication is the first book to provide a comprehensive introduction to palmprint technologies. It reveals automatic biometric techniques for personal identification using palmprint, from the approach based on offline palmprint images, to the current state-of-the-art algorithm using online palmprint images. Palmprint Authentication provides the reader with a basic concept of Palmprint Authentication. It also includes an in-depth discussion of Palmprint Authentication technologies, a detailed description of Palmprint Authentication systems, and an up-to-date coverage of how these issues are developed. This book is suitable for different levels of readers: those who want to learn more about palmprint technology, and those who wish to understand, participate, and/or develop a palmprint authentication system. Palmprint Authentication is effectively a handbook for biometric research and development. Graduate students and researchers in computer science, electrical engineering, systems science, and information technology will all find it uniquely useful, not only as a reference book, but also as a text book. Researchers and practitioners in industry, and R&D laboratories working in the fields of security system design, biometrics, immigration, law enforcement, control, and pattern recognition will also benefit from this volume.

**Computer Imaging**

This book constitutes the refereed proceedings of the 15th Scandinavian Conference on Image Analysis, SCIA 2007, held in Aalborg, Denmark in June.
2007. It covers computer vision, 2D and 3D reconstruction, classification and segmentation, medical and biological applications, appearance and shape modeling, face detection, tracking and recognition, motion analysis, feature extraction and object recognition.

**Image Pattern Recognition**

Feature Extraction for Image Processing and Computer Vision is an essential guide to the implementation of image processing and computer vision techniques, with tutorial introductions and sample code in MATLAB and Python. Algorithms are presented and fully explained to enable complete understanding of the methods and techniques demonstrated. As one reviewer noted, "The main strength of the proposed book is the link between theory and exemplar code of the algorithms." Essential background theory is carefully explained. This text gives students and researchers in image processing and computer vision a complete introduction to classic and state-of-the-art methods in feature extraction together with practical guidance on their implementation. The only text to concentrate on feature extraction with working implementation and worked through mathematical derivations and algorithmic methods A thorough overview of available feature extraction methods including essential background theory, shape methods, texture and deep learning Up to date coverage of interest point detection, feature extraction and description and image representation (including frequency domain and colour) Good balance between providing a mathematical background and practical implementation Detailed and explanatory of algorithms in MATLAB and Python

**Palmprint Authentication**

Despite the tremendous growth in the field of magnetic resonance imaging (MRI) evidenced in the initial phases of its development in the early twentieth century, scientific focus has shifted in recent years toward the study of physiology and pathophysiology that span the spatial scales of the molecule, cell, tissue, and organ. Intensified research activities over the past 15 years have justified efforts toward molecular and cellular imaging, dual-modality imaging systems, real-time acquisitions, dedicated image processing techniques and applications, and the critical evaluation of their potential translational value for use in the clinic. The integrative focus on molecular-cellular-tissue-organ function and dysfunction has taken a primary role in modern, personalized medicine, and it is envisaged to continue to do so, as accumulated knowledge from basic and clinical science work continues to elucidate molecular, cellular, and physiological/pathophysiological pathways and mechanisms. In this scientific effort, MRI continues to play a critical and synergistic role from the perspectives of basic science, diagnosis, and clinical interventional/therapeutic approaches. Within the realm of the current role of MRI in modern medicine, this book summarizes state-of-the-art direct and derived MRI methodologies and approaches as applied toward the assessment of cellular and organ function and dysfunction. The contributions in this effort are not excessive but few, comprehensive, and distinguished and of high quality. The topic areas can be generalized to find applications in other scientific areas and span both brain and cardiac applications, extending interest to wider audiences.

**Human-Centric Machine Vision**

Digital image processing and analysis is a field that continues to experience rapid growth, with applications in many facets of our lives. Areas such as medicine, agriculture, manufacturing, transportation, communication systems,
and space exploration are just a few of the application areas. This book takes
an engineering approach to image processing and analysis, including more
examples and images throughout the text than the previous edition. It provides
more material for illustrating the concepts, along with new PowerPoint slides.
The application development has been expanded and updated, and the related
chapter provides step-by-step tutorial examples for this type of development.
The new edition also includes supplementary exercises, as well as MATLAB-based
exercises, to aid both the reader and student in development of their skills.

**Variable Illumination and Invariant Features for Detecting
and Classifying Varnish Defects**

This book is to chart the progress in applying machine learning, including
deep learning, to a broad range of image analysis and pattern recognition
problems and applications. In this book, we have assembled original research
articles making unique contributions to the theory, methodology and
applications of machine learning in image analysis and pattern recognition.

**Signal Processing for Computer Vision**

Global food security is a challenging issue. Meeting the food and nutritional
requirements of the world has become an issue for national policymakers and is
of public concern. There is a need to enhance agricultural production, as well
as, to reduce postharvest loss, improve the quality of processed products, and
add value to products to make more quality food available. Agro-product
processing technology plays a major role to reduce post-harvest losses,
improve the quality of processed products, and add value to the products. It
also generates employment and ultimately contributes to food security.

Features: Covers a wide spectrum of agro-product processing technology
Explains the principles and practices of agro-product processing technology
with many worked examples to quickly teach the basic principles through
examples Contains examples from different operations on current problems to
show the wide applications of the principles of agro-product technology
Includes process control and emerging technologies in agro-product processing
such as energy and exergy analysis, neural network modeling, and CFD modeling
This book deals with physical and thermal properties, cleaning and sorting,
drying and storage, parboiling and milling, by-product utilization, heating
and cooling, refrigerated cooling, and cold storage. The most unique feature
of this book is the machine vision for grading fruits, process control and
materials handling, and emerging technologies such as neural network, finite
element, CFD, and genetic algorithm.

**Texture Analysis for Magnetic Resonance Imaging**

Change Detection and Image Time Series Analysis 1 presents a wide range of
unsupervised methods for temporal evolution analysis through the use of image
time series associated with optical and/or synthetic aperture radar
acquisition modalities. Chapter 1 introduces two unsupervised approaches to
multiple-change detection in bi-temporal multivariate images, with Chapters 2
and 3 addressing change detection in image time series in the context of the
statistical analysis of covariance matrices. Chapter 4 focuses on wavelets and
convolutional-neural filters for feature extraction and entropy-based anomaly
detection, and Chapter 5 deals with a number of metrics such as cross
correlation ratios and the Hausdorff distance for variational analysis of the
state of snow. Chapter 6 presents a fractional dynamic stochastic field model
for spatio temporal forecasting and for monitoring fast-moving meteorological
events such as cyclones. Chapter 7 proposes an analysis based on
characteristic points for texture modeling, in the context of graph theory, and Chapter 8 focuses on detecting new land cover types by classification-based change detection or feature/pixel based change detection. Chapter 9 focuses on the modeling of classes in the difference image and derives a multiclass model for this difference image in the context of change vector analysis.

**Change Detection and Image Time-Series Analysis**

Computer Imaging: Digital Image Analysis and Processing brings together analysis and processing in a unified framework, providing a valuable foundation for understanding both computer vision and image processing applications. Taking an engineering approach, the text integrates theory with a conceptual and application-oriented style, allowing you to immediately understand how each topic fits into the overall structure of practical application development. Divided into five major parts, the book begins by introducing the concepts and definitions necessary to understand computer imaging. The second part describes image analysis and provides the tools, concepts, and models required to analyze digital images and develop computer vision applications. Part III discusses application areas for the processing of images, emphasizing human visual perception. Part IV delivers the information required to apply a CVItools environment to algorithm development. The text concludes with appendices that provide supplemental imaging information and assist with the programming exercises found in each chapter. The author presents topics as needed for understanding each practical imaging model being studied. This motivates the reader to master the topics and also makes the book useful as a reference. The CVItools software integrated throughout the book, now in a new Windows version, provides practical examples and encourages you to conduct additional exploration via tutorials and programming exercises provided with each chapter.

**Computer-Aided Glaucoma Diagnosis System**

**Offline Handwritten Signature Verification Using Radial Basis Function Neural Networks**

The book describes various texture feature extraction approaches and texture analysis applications. It introduces and discusses the importance of texture features, and describes various types of texture features like statistical, structural, signal-processed and model-based. It also covers applications related to texture features, such as facial imaging. It is a valuable resource for machine vision researchers and practitioners in different application areas.

**Multimedia Semantics**

**Fundamentals of Image Data Mining**

Recent Trends in Computer-aided Diagnostic Systems for Skin Diseases: Theory, Implementation, and Analysis provides comprehensive coverage on the development of computer-aided diagnostic (CAD) systems employing image processing and machine learning tools for improved, uniform evaluation and diagnosis (avoiding subjective judgment) of skin disorders. The methods and tools are described in a general way so that these tools can be applied not
only for skin diseases but also for a wide range of analogous problems in the domain of biomedical systems. Moreover, quantification of clinically relevant information that can associate the findings of physicians/experts is the most challenging task of any CAD system. This book gives all the details in a step-by-step form for different modules so that the readers can develop each of the modules like preprocessing, feature extraction/learning, disease classification, as well as an entire expert diagnosis system themselves for their own applications. Demonstrates extensive calculations for illustrating the theoretical analysis of advanced image processing and machine learning techniques Provides a comprehensive coverage on the extraction of various signal processing tools for the extraction of statistical and clinically correlated features from skin lesion images Describes image processing and machine learning techniques for improved uniform evaluation and diagnosis of skin disorders

**Artificial Intelligence for Maximizing Content Based Image Retrieval**

**Image Registration**

This reader-friendly textbook presents a comprehensive review of the essentials of image data mining, and the latest cutting-edge techniques used in the field. The coverage spans all aspects of image analysis and understanding, offering deep insights into areas of feature extraction, machine learning, and image retrieval. The theoretical coverage is supported by practical mathematical models and algorithms, utilizing data from real-world examples and experiments. Topics and features: describes the essential tools for image mining, covering Fourier transforms, Gabor filters, and contemporary wavelet transforms; reviews a varied range of state-of-the-art models, algorithms, and procedures for image mining; emphasizes how to deal with real image data for practical image mining; highlights how such features as color, texture, and shape can be mined or extracted from images for image representation; presents four powerful approaches for classifying image data, namely, Bayesian classification, Support Vector Machines, Neural Networks, and Decision Trees; discusses techniques for indexing, image ranking, and image presentation, along with image database visualization methods; provides self-test exercises with instructions or Matlab code, as well as review summaries at the end of each chapter. This easy-to-follow work illuminates how concepts from fundamental and advanced mathematics can be applied to solve a broad range of image data mining problems encountered by students and researchers of computer science. Students of mathematics and other scientific disciplines will also benefit from the applications and solutions described in the text, together with the hands-on exercises that enable the reader to gain first-hand experience of computing.

**Digital Image Processing and Analysis**

The introduction of traditional Chinese medicine (TCM) through modern information technology will not only achieve the objective progress of the heritage of thousands of years of TCM, but also deliver novel discoveries for modern medicines. This book is an advanced monograph based on a decade's worth of research work by the authors. After a brief introduction on the four diagnosis approaches in TCM, this book delves into the three main TCM data analysis techniques: computerized tongue, pulse and odor analysis. Both graduate students and researchers in computerized TCM data analysis will benefit from the book as it will provide a comprehensive understanding of the
state-of-the-art analysis methods, image / signal acquisition devices, and the related feature extraction and classification methods. Contents:

Diagnosis Methods in Traditional Chinese Medicine:

Introduction

Computerized Tongue Image Analysis:

Tongue Image Acquisition and Preprocessing

Automated Tongue Segmentation

Tongue Image Feature Analysis

Computerized Tongue Diagnosis

Computerized Pulse Signal Analysis:

Pulse Signal Acquisition and Preprocessing

Feature Extraction of Pulse Signals

Classification of Pulse Signals

Computerized Odor Signal Analysis:

Breath Analysis System: Design and Optimization

Feature Extraction and Classification of Breath Odor Signals

Readership: Students and researchers from both academia and industry: in the field of computerized traditional Chinese medicine data analysis, or in the related fields, e.g., medical image/signal analysis, biometrics, and pattern recognition. Key Features:

The first monograph on computerized traditional Chinese medicine data analysis (CTDA)

In-depth and self-contained introduction on three main CTDA technologies

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