Lecture Notes in Computer Science 7324

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison
Lancaster University, UK

Takeo Kanade
Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler
University of Surrey, Guildford, UK

Jon M. Kleinberg
Cornell University, Ithaca, NY, USA

Alfred Kobsa
University of California, Irvine, CA, USA

Friedemann Mattern
ETH Zurich, Switzerland

John C. Mitchell
Stanford University, CA, USA

Moni Naor
Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz
University of Bern, Switzerland

C. Pandu Rangan
Indian Institute of Technology, Madras, India

Bernhard Steffen
TU Dortmund University, Germany

Madhu Sudan
Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos
University of California, Los Angeles, CA, USA

Doug Tygar
University of California, Berkeley, CA, USA

Gerhard Weikum
Max Planck Institute for Informatics, Saarbruecken, Germany

Aurélio Campilho Mohamed Kamel (Eds.)

Image Analysis and Recognition

9th International Conference, ICIAR 2012
Aveiro, Portugal, June 25-27, 2012
Proceedings, Part I

Springer

Volume Editors

Aurélio Campilho
Universidade do Porto
Faculdade de Engenharia
INEB - Instituto de Engenharia Biomédica
Rua Dr. Roberto Frias
4200-465 Porto, Portugal
E-mail: campilho@fe.up.pt

Mohamed Kamel
University of Waterloo
Department of Electrical and Computer Engineering
Waterloo, ON, Canada N2L 3G1
E-mail: mkamel@uwaterloo.ca

ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-31294-6 e-ISBN 978-3-642-31295-3
DOI 10.1007/978-3-642-31295-3
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012940285

CR Subject Classification (1998): I.4, I.5, I.2.10, I.2, H.3, F.2.2

LNCS Sublibrary: SL 6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

© Springer-Verlag Berlin Heidelberg 2012

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.
The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

Nine years ago we started the ICIAR series of annual conferences alternating between Europe and North America as a forum for researchers to interact and present their latest research in the theory, methodology, and applications of image analysis and recognition. We are pleased that ICIAR has maintained this forum and has become truly an international conference with participation from more than 30 countries on average.

ICIAR 2012, the International Conference on Image Analysis and Recognition, was held in Aveiro, Portugal, June 25–27, 2012. As in the past two years, ICIAR was organized at the same time as AIS 2012, the International Conference on Autonomous and Intelligent Systems. Both conferences are organized by AIMI – Association for Image and Machine Intelligence, a not-for-profit organization registered in Ontario, Canada.

For ICIAR 2012, we received a total of 207 full papers from 41 countries. The review process was carried out by members of the Program Committee and other reviewers. Each paper was reviewed by at least two reviewers, and checked by the Conference Chairs. A total of 107 papers were finally accepted and appear in the two volumes of these proceedings. We would like to sincerely thank the authors for responding to our call, and to thank the reviewers for the careful evaluation and feedback provided to the authors. It is this collective effort that resulted in the strong conference program and high-quality proceedings.

This year, the conference program included a focused day on "Biomedical Image Analysis" with the following two special sessions: "Recent Advances in Retinal Image Analysis" chaired by Ana Mendonça and Manuel Penedo; "Advanced Detection and Shape Modelling of Cells in Microscopy Images" chaired by Pedro Quelhas and João Sanches.

We were very pleased to include in the conference program four outstanding keynote talks by well-known scientists: Wiro Nissen, Delft University of Technology, The Netherlands; Rudolf Kruse, University of Magdeburg, Germany; Robert Fisher, Edinburgh University, UK; and Bioucas Dias, Instituto Superior Técnico, Portugal. We would like to express our gratitude to the keynote speakers for accepting our invitation to share their vision and recent advances in their areas of expertise which are at the core of the topics of the two conferences.

We would like to thank Khaled Hammouda, the webmaster of the conference, for maintaining the Web pages, interacting with the authors, and preparing the proceedings.

As all conferences, the success of ICIAR 2012 is attributed to the effort and work of many people including members of the Organizing Committee, staff, and volunteers. We gratefully acknowledge their support and efforts.

We are also grateful to Springer's editorial staff, for supporting this publication in the LNCS series. We also would like to acknowledge the professional service of Viagens Abreu in taking care of the registration process and the special events of the conference.

We hope this publication provides a good view into the research presented at the conference.

June 2012

Aurélio Campilho
Mohamed Kamel

Organization

ICIAR 2012 – International Conference on Image Analysis and Recognition

General Chair

Aurélio Campilho	University of Porto, Portugal campilho@fe.up.pt

General Co-chair

Mohamed Kamel	University of Waterloo, Canada mkamel@uwaterloo.ca

Local Organizing Committee

Ana Maria Mendonça	University of Porto, Portugal amendon@fe.up.pt
Jorge Alves Silva	University of Porto, Portugal jsilva@fe.up.pt
António Pimenta Monteiro	University of Porto, Portugal apm@fe.up.pt
Pedro Quelhas	Biomedical Engineering Institute, Portugal pedro.quelhas@gmail.com
Gabriela Afonso	Biomedical Engineering Institute, Portugal Gabriela.Afonso@ineb.up.pt

Conference Secretariat

Viagens Abreu SA	Porto, Portugal congresses.porto@viagensabreu.pt

Webmaster

Khaled Hammouda	Waterloo, Ontario, Canada hammouda@pami.uwaterloo.ca

Advisory Committee

M. Ahmadi	University of Windsor, Canada
P. Bhattacharya	Concordia University, Canada
T.D. Bui	Concordia University, Canada
M. Cheriet	University of Quebec, Canada
E. Dubois	University of Ottawa, Canada
Z. Duric	George Mason University, USA
G. Granlund	Linköping University, Sweden
L. Guan	Ryerson University, Canada
M. Haindl	Institute of Information Theory and Automation, Czech Republic
E. Hancock	The University of York, UK
J. Kovacevic	Carnegie Mellon University, USA
M. Kunt	Swiss Federal Institute of Technology (EPFL), Switzerland
J. Padilha	University of Porto, Portugal
K.N. Plataniotis	University of Toronto, Canada
A. Sanfeliu	Technical University of Catalonia, Spain
M. Shah	University of Central Florida, USA
M. Sid-Ahmed	University of Windsor, Canada
C.Y. Suen	Concordia University, Canada
J.S. Suri	Global Biomedical Technologies, Inc., USA
A.N. Venetsanopoulos	University of Toronto, Canada
M. Viergever	University of Utrecht, The Netherlands
B. Vijayakumar	Carnegie Mellon University, USA
J. Villanueva	Autonomous University of Barcelona, Spain
R. Ward	University of British Columbia, Canada
D. Zhang	The Hong Kong Polytechnic University, Hong Kong

Program Committee

A. Abate	University of Salerno, Italy
P. Aguiar	Institute for Systems and Robotics, Portugal
M. Ahmed	Wilfrid Laurier University, Canada
N. Alajlan	King Saud University, Saudi Arabia
J. Alirezaie	Ryerson University, Canada
H. Araújo	University of Coimbra, Portugal
N. Arica	Turkish Naval Academy, Turkey
T. Barata	University of Coimbra, Portugal
J. Barbosa	University of Porto, Portugal
J. Barron	University of Western Ontario, Canada
J. Batista	University of Coimbra, Portugal

R. Bernardes	University of Coimbra, Portugal
G. Bilodeau	École Polytechnique de Montréal, Canada
J. Bioucas	Technical University of Lisbon, Portugal
B. Boufama	University of Windsor, Canada
T.D. Bui	Concordia University, Canada
X. Cao	Beihang University, China
J. Cardoso	University of Porto, Portugal
G. Carneiro	University of Adelaide, Australia
E. Cernadas	University of Vigo, Spain
M. Cheriet	University of Quebec, Canada
M. Coimbra	University of Porto, Portugal
M. Correia	University of Porto, Portugal
L. Corte-Real	University of Porto, Portugal
A. Dawoud	University of South Alabama, USA
M. De Gregorio	Istituto di Cibernetica "E. Caianiello" - CNR, Italy
J. Dias	University of Coimbra, Portugal
Z. Duric	George Mason University, USA
N. El Gayar	Nile University, Egypt
M. El-Sakka	University of Western Ontario, Canada
J. Fan	Northwestern University, USA
J. Fernandez	Centro Nacional de Biotecnología - CSIC, Spain
M. Figueiredo	Technical University of Lisbon, Portugal
A. Fred	Technical University of Lisbon, Portugal
G. Freeman	University of Waterloo, Canada
V. Grau	University of Oxford, UK
M. Greenspan	Queen's University, Canada
F. Guibault	École Polytechnique de Montréal, Canada
M. Haindl	Institute of Information Theory and Automation, Czech Republic
E. Hancock	University of York, UK
C. Hong	Hong Kong Polytechnic, Hong Kong
J. Jiang	University of Bradford, UK
J. Jorge	INESC-ID, Portugal
M. Khan	Saudi Arabia
Y. Kita	National Institute AIST, Japan
A. Kong	Nanyang Technological University, Singapore
Q. Li	Western Kentucky University, USA
X. Li	University of London, UK
J. Liang	Simon Fraser University, Canada
R. Lins	Universidade Federal de Pernambuco, Brazil
L. Liu	McGill University, Canada
L. Lopes	University of Aveiro, Portugal
J. Lorenzo-Ginori	Universidad Central "Marta Abreu" de Las Villas, Cuba

R. Lukac	University of Toronto, Canada
A. Mansouri	Université de Bourgogne, France
A. Marçal	University of Porto, Portugal
J. Marques	Technical University of Lisbon, Portugal
M. Melkemi	Univeriste de Haute Alsace, France
A. Mendonça	University of Porto, Portugal
J. Meunier	University of Montreal, Canada
M. Mignotte	University of Montreal, Canada
A. Mohammed	Imam University, Saudi Arabia
A. Monteiro	University of Porto, Portugal
A. Mosquera	Universidade de Santiago de Compostela, Spain
M. Nappi	University of Salerno, Italy
A. Padilha	University of Porto, Portugal
G. Pedro	University of Alcalá, Spain
M. Penedo	Universidade de Coruña, Spain
F. Perales	University of the Balearic Islands, Spain
F. Pereira	Technical University of Lisbon, Portugal
E. Petrakis	Technical University of Crete, Greece
P. Pina	Technical University of Lisbon, Portugal
A. Pinho	University of Aveiro, Portugal
J. Pinto	Technical University of Lisbon, Portugal
P. Quelhas	Biomedical Engineering Institute, Portugal
M. Queluz	Technical University of Lisbon, Portugal
P. Radeva	Autonomous University of Barcelona, Spain
B. Raducanu	Autonomous University of Barcelona, Spain
S. Rahnamayan	University of Ontario Institute of Technology (UOIT), Canada
E. Ribeiro	Florida Institute of Technology, USA
G. Rohde	Carnegie Mellon University, USA
J. Sanches	Technical University of Lisbon, Portugal
J. Sánchez	University of Las Palmas de Gran Canaria, Spain
B. Santos	University of Aveiro, Portugal
A. Sappa	Computer Vision Center, Spain
F. Sattar	University of Waterloo, Canada
A. Sayedelahl	University of Waterloo, Canada
G. Schaefer	Nottingham Trent University, UK
P. Scheunders	University of Antwerp, Belgium
J. Sequeira	Ecole Supérieure d'Ingénieurs de Luminy, France
J. Silva	University of Porto, Portugal
B. Smolka	Silesian University of Technology, Poland
M. Song	Hong Kong Polytechnical University, Hong Kong
J. Sousa	Technical University of Lisbon, Portugal
H. Suesse	Friedrich-Schiller University Jena, Germany

S. Sural	Indian Institute of Technology, India
S. Suthaharan	USA
A. Taboada-Crispí	Universidad Central "Marta Abreu" de las Villas, Cuba
Y. Tang	Chinese Academy of Sciences, China
D. Tao	NTU, Singapore
E. Trucco	University of Dundee, UK
M. Vento	University of Salerno, Italy
J. Vitria	Computer Vision Center, Spain
Y. Voisin	Université de Bourgogne, France
E. Vrscay	University of Waterloo, Canada
Z. Wang	University of Waterloo, Canada
M. Wirth	University of Guelph, Canada
J. Wu	University of Windsor, Canada
P. Yan	Chinese Academy of Sciences, China
F. Yarman-Vural	Middle East Technical University, Turkey
J. Zelek	University of Waterloo, Canada
L. Zhang	The Hong Kong Polytechnic University, Hong Kong
Q. Zhang	Waseda University, Japan
T. Zhang	University of Pennsylvania, USA
G. Zheng	University of Bern, Switzerland
H. Zhou	Queen Mary College, UK
D. Ziou	University of Sherbrooke, Canada

Reviewers

A. Abdel-Dayem	Laurentian University, Canada
M. Afonso	Technical University of Lisbon, Portugal
R. Araujo	University of Waterloo, Canada
J. Ferreira	University of Porto, Portugal
D. Frejlichowski	West Pomeranian University of Technology, Poland
M. Gangeh	University of Waterloo, Canada
M. Hortas	Universidade de Coruña, Spain
S. Mahmoud	University of Waterloo, Canada
Y. Miao	University of Waterloo, Canada
F. Monteiro	IPB, Portugal
R. Rocha	Biomedical Engineering Institute, Portugal
N. Rodriguez	Universidade de Coruña, Spain
J. Rouco	Univeristy of A Coruña, Spain
K. Roy	University of Waterloo, Canada

Supported by

AIMI – Association for Image and Machine Intelligence

Department of Electrical and Computer Engineering
Faculty of Engineering
University of Porto
Portugal

INEB – Instituto de Engenharia Biomédica
Portugal

PAMI – Pattern Analysis and Machine Intelligence Group
University of Waterloo
Canada

Table of Contents – Part I

Clustering and Classification

Localized Graph-Based Feature Selection for Clustering 1
Zhihong Zhang and Edwin R. Hancock

Optimal "Anti-Bayesian" Parametric Pattern Classification for the Exponential Family Using Order Statistics Criteria 11
A. Thomas and B. John Oommen

Cast Shadow Detection Based on Semi-supervised Learning 19
Salma Kammoun Jarraya, Rania Rebai Boukhriss, Mohamed Hammami, and Hanene Ben-Abdallah

k-Nearest Neighbor Classification Using Dissimilarity Increments 27
Helena Aidos and Ana Fred

Using Permutation Tests to Study How the Dimensionality, the Number of Classes, and the Number of Samples Affect Classification Analysis . . . 34
Mohammed Sadeq Al-Rawi and João Paulo Silva Cunha

Determining the Number of Clusters with Rate-Distortion Curve Modeling 43
Alexander Kolesnikov and Elena Trichina

Hierarchical Classification-Based Region Growing (HCBRG): A Collaborative Approach for Object Segmentation and Classification 51
Aymen Sellaouti, Atef Hamouda, Aline Deruyver, and Cédric Wemmert

Clustering through SOM Consistency 61
Nicolau Gonçalves and Ricardo Vigário

Image Processing

Max and Min Values of the Structural Similarity Function $S(x, a)$ on the L^2 Sphere $S_R(a), a \in \mathbb{R}^N$ 69
D. Glew and Edward R. Vrscay

Biologically Motivated Local Contextual Modulation Improves Low-Level Visual Feature Representations 79
Xun Shi, Neil D.B. Bruce, and John K. Tsotsos

A Statistical Operator for Detecting Weak Edges in Low Contrast Images 89
Ajay Mittal, Sanjeev Sofat, Edwin Hancock, and Stéphane Mousset

Color Correction Using 3D Gaussian Mixture Models 97
Miguel Oliveira, Angel D. Sappa, and Vítor Santos

Blind Noise Level Detection 107
Anna Tomaszewska

Foreground Detection by Robust PCA Solved via a Linearized Alternating Direction Method 115
Charles Guyon, Thierry Bouwmans, and El-Hadi Zahzah

A Mixture of Experts Approach to Multi-strategy Image Quality Assessment 123
Peng Peng and Ze-Nian Li

Self-similarity of Images in the Wavelet Domain in Terms of ℓ^2 and Structural Similarity (SSIM) 131
D. Glew and Edward R. Vrscay

Image Analysis

Arabic Bank Check Analysis and Zone Extraction 141
Irfan Ahmad and Sabri A. Mahmoud

Image Segmentation of Vickers Indentations Using Shape from Focus . . . 149
Michael Gadermayr and Andreas Uhl

On the Detection of Unknown Locally Repeating Patterns in Images . . . 158
Diogo Pratas and Armando J. Pinho

A Performance Evaluation of SIFT and SURF for Multispectral Image Matching 166
Sajid Saleem, Abdul Bais, and Robert Sablatnig

Motion Analysis and Tracking

Real-Time Image Alignment for a Gyro-visual Hybrid Pointing Device 174
Jun Zheng and Minglun Gong

Error Analysis for Lucas-Kanade Based Schemes 184
Patricia Márquez-Valle, Debora Gil, and Aura Hernàndez-Sabaté

Vortex Tracking in High Density Vector Fields 192
Clément Guérin, Petra Gomez-Krämer, Michel Ménard, and Damien Coisne

Independent Motion Detection in the Light of the Aperture Problem . . . 200
László Czúni and Mónika Gál

Dense and Sparse Optic Flows Aggregation for Accurate Motion Segmentation in Monocular Video Sequences 208
Mihai Făgădar-Cosma, Vladimir-Ioan Creţu, and Mihai Victor Micea

An Improved Basic Sequential Clustering Algorithm for Background Construction and Motion Detection 216
Mohcene Benalia and Samy Ait-Aoudia

GPU Accelerated Real Time Rotation, Scale and Translation Invariant Image Registration Method 224
Sudhakar Sah, Jan Vanek, YoungJun Roh, and Ratul Wasnik

Gaussian Propagation Model Based Dense Optical Flow for Objects Tracking 234
Houssam Salmane, Yassine Ruichek, and Louahdi Khoudour

Real Time Semi-dense Point Tracking 245
Matthieu Garrigues and Antoine Manzanera

Shape Representation

A Precise Ellipse Fitting Method for Noisy Data 253
Dilip K. Prasad, Chai Quek, and Maylor K.H. Leung

Shape Reconstruction from an Unorganized Point Cloud with Outliers 261
Yvan Maillot, Benoît Presles, and Johan Debayle

A Non-heuristic Dominant Point Detection Based on Suppression of Break Points 269
Dilip K. Prasad, Chai Quek, and Maylor K.H. Leung

A Unifying Framework for Correspondence-Less Linear Shape Alignment 277
Zoltan Kato

3D Imaging

Go With the Flow: Hand Trajectories in 3D via Clustered Scene Flow 285
Simon Hadfield and Richard Bowden

Cortical Multiscale Line-Edge Disparity Model 296
J.M.F. Rodrigues, J.A. Martins, R. Lam, and J.M.H. du Buf

Mathematical Models for the Calibration of Cameras Mounted on a Tripod Using Primitive Tracking 304
L. Alvarez, P. Henríquez, and L. Mazorra

3D-2D Laser Range Finder Calibration Using a Conic Based Geometry Shape 312
Miguel Almeida, Paulo Dias, Miguel Oliveira, and Vítor Santos

Evaluation of Similarity Functions in Multimodal Stereo 320
Fernando Barrera, Felipe Lumbreras, and Angel D. Sappa

An Unbiased and Intervoxel Watershed Algorithm for 3D Image Segmentation 330
Fabien Baldacci

Applications

Model-Based Ambient Occlusion for Inverse Rendering 338
Oswald Aldrian and William A.P. Smith

Extraction of Leaf Parts by Image Analysis 348
Olfa Mzoughi, Itheri Yahiaoui, and Nozha Boujemaa

Compression of Whole Genome Alignments Using a Mixture of Finite-Context Models 359
Luís M.O. Matos, Diogo Pratas, and Armando J. Pinho

Implementation of HDR Photographic Pipeline in Mobile Devices 367
Radosław Mantiuk, Michał Cichowicz, and Miłosław Smyk

A Markovian Engine for Text Recognition: Cursive Arabic Text, Statistical Features and Interconnected HMMs 375
M.S. Khorsheed and H. Al-Omari

A Central Reconstruction Based Strategy for Selecting Projection Angles in Binary Tomography 382
Péter Balázs and Kees Joost Batenburg

An A-contrario Approach for Obstacle Detection in Assistance Driving Systems 392
Moez Ammar, Sylvie Le Hégarat-Mascle, Marius Vasiliu, and Hugues Mounier

Real-Time Spherical Harmonics Based Subsurface Scattering 402
Anna Tomaszewska and Krzysztof Stefanowski

DOG_I: An Annotation System for Images of Dog Breeds 410
Antonios Dimas, Pyrros Koletsis, and Euripides G.M. Petrakis

Rectangular Discrete Radon Transform for Buildings Extraction from High Resolution Satellite Images 418
Elouedi Ines, Hamouda Atef, and Rojbani Hmida

Clustering-Based Feature Selection for Content Based Remote Sensing Image Retrieval 427
Shijin Li, Jiali Zhu, Jun Feng, and Dingsheng Wan

Author Index 437

Table of Contents – Part II

Biometrics and Face Recognition

Multi-stage Visible Wavelength and Near Infrared Iris Segmentation Framework 1
Andreas Uhl and Peter Wild

Two Unconstrained Biometric Databases 11
Hélder P. Oliveira and Filipe Magalhães

Multibiometric System Using Level Set Method and Particle Swarm Optimization 20
Kaushik Roy and Mohamed S. Kamel

Explicit Integration of Identity Information from Skin Regions to Improve Face Recognition 30
Garsah Farhan Al-Qarni and Farzin Deravi

Hand-Geometry Based Recognition System: A Non Restricted Acquisition Approach 38
Hélder Matos, Hélder P. Oliveira, and Filipe Magalhães

Local Gradient Increasing Pattern (LGIP) for Facial Representation and Gender Recognition 46
Lu Bing Zhou and Han Wang

Quality-Based Fingerprint Segmentation 54
Ntethelelo A. Mngenge, Fulufhelo V. Nelwamondo, Tendani Malumedzha, and Ntsika Msimang

A New Multi-camera Based Facial Expression Analysis Concept 64
Robert Niese, Ayoub Al-Hamadi, and Bernd Michaelis

Entropy in Biometric Face Template Analysis 72
Maria De Marsico, Michele Nappi, and Daniel Riccio

Combining Face with Face-Part Detectors under Gaussian Assumption 80
Andreas Uhl and Peter Wild

Generalized Local Discriminant Embedding for Face Recognition 90
F. Dornaika and A. Bosaghzadeh

Human Activity Recognition

Depth Information in Human Gait Analysis: An Experimental Study on Gender Recognition 98
Ricard Borràs, Àgata Lapedriza, and Laura Igual

A Depth Camera Based Fall Recognition System for the Elderly 106
Rachit Dubey, Bingbing Ni, and Pierre Moulin

Heuristic and Voxel-Based Signature for Hand Posture Recognition Using a Range Camera 114
Hervé Lahamy and Derek Lichti

A Compound Eigenspace for Recognizing Directed Human Activities . . . 122
Abdunnaser Diaf, Boubakeur Boufama, and Rachid Benlamri

Hand Detection and Tracking Using the Skeleton of the Blob for Medical Rehabilitation Applications 130
Pedro Gil-Jiménez, Beatriz Losilla-López, Rafael Torres-Cueco, Aurélio Campilho, and Roberto López-Sastre

Biomedical Image Analysis

Denoising 3D Medical Images Using a Second Order Variational Model and Wavelet Shrinkage 138
Minh-Phuong Tran, Renaud Péteri, and Maitine Bergounioux

Robust Impulse-Noise Filtering for Biomedical Images Using Numerical Interpolation 146
Jinwei Xu and Tuan D. Pham

Segmenting Multiple Sclerosis Lesions Using a Spatially Constrained K-Nearest Neighbour Approach 156
Mark Lyksborg, Rasmus Larsen, Per Soelberg Sørensen, Morten Blinkenberg, Ellen Garde, Hartwig R. Siebner, and Tim Bjørn Dyrby

A Segmentation Model and Application to Endoscopic Images 164
Isabel N. Figueiredo, Juan Carlos Moreno, V.B. Surya Prasath, and Pedro N. Figueiredo

Dental X-Ray Image Segmentation and Object Detection Based on Phase Congruency 172
F. Sattar and F.O. Karray

Automatic Lane Detection in Chromatography Images 180
Bruno M. Moreira, António V. Sousa, Ana M. Mendonça, and Aurélio Campilho

Segmentation and Detection of Colorectal Polyps Using Local Polynomial Approximation 188
Filipe Condessa and José Bioucas-Dias

Hemoglobin and Melanin Quantification on Skin Images 198
Hao Gong and Michel Desvignes

Lung Tumor Segmentation Using Electric Flow Lines for Graph Cuts . . . 206
Christian Hollensen, George Cannon, Donald Cannon, Søren Bentzen, and Rasmus Larsen

Segmentation and Analysis of the Oral and Nasal Cavities from MR Time Sequences 214
Samuel Silva, Paula Martins, Catarina Oliveira, Augusto Silva, and António Teixeira

Automatic Internal Segmentation of Caudate Nucleus for Diagnosis of Attention-Deficit/Hyperactivity Disorder 222
Laura Igual, Joan Carles Soliva, Roger Gimeno, Sergio Escalera, Oscar Vilarroya, and Petia Radeva

Automated Segmentation of Brain Tumor Using Optimal Texture Features and Support Vector Machine Classifier 230
Karim Gasmi, Ahmed Kharrat, Mohamed Ben Messaoud, and Mohamed Abid

Class-Specific Mahalanobis Distance Metric Learning for Biological Image Classification 240
B.S. Shajee Mohan and C. Chandra Sekhar

Supervised Content Based Image Retrieval Using Radiology Reports . . . 249
José Ramos, Thessa Kockelkorn, Bram van Ginneken, Max A. Viergever, Rui Ramos, and Aurélio Campilho

Computer Aided Diagnosis of Alzheimer's Disease from MRI Brain Images 259
Namita Aggarwal, Bharti, and R.K. Agrawal

Separability Analysis of Color Classes on Dermoscopic Images 268
Cátia S.P. Silva, André R.S. Marcal, Marta A. Pereira, Teresa Mendonça, and Jorge Rozeira

Pedicle Detection in Planar Radiographs Based on Image Descriptors . . . 278
Pedro Cunha, Daniel C. Moura, and Jorge G. Barbosa

Function-Valued Mappings, Total Variation and Compressed Sensing for diffusion MRI 286
O. Michailovich, D. La Torre, and Edward R. Vrscay

Structure from Motion Based Approaches to 3D Reconstruction in Minimal Invasive Laparoscopy 296
Andrés F. Mármol Vélez, Jan Marek Marcinczak, and Rolf-Rainer Grigat

Non-rigid Diffeomorphic Image Registration of Medical Images Using Polynomial Expansion 304
Daniel Forsberg, Mats Andersson, and Hans Knutsson

An Illumination Model of the Trachea Appearance in Videobronchoscopy Images 313
Carles Sánchez, Javier Sánchez, Antoni Rosell, and Debora Gil

Adaptive Windowing for Optimal Visualization of Medical Images Based on a Structural Fidelity Measure 321
Hojatollah Yeganeh, Zhou Wang, and Edward R. Vrscay

Descriptive Image Feature for Object Detection in Medical Images 331
Fabian Lecron, Mohammed Benjelloun, and Saïd Mahmoudi

Retinal Image Analysis

3D Retinal Vascular Network from Optical Coherence Tomography Data 339
Pedro Guimarães, Pedro Rodrigues, Pedro Serranho, and Rui Bernardes

The Significance of the Vessel Registration for a Reliable Computation of Arteriovenous Ratio 347
S.G. Vázquez, N. Barreira, Manuel G. Penedo, and M. Rodríguez-Blanco

Fast Segmentation of Retinal Blood Vessels Using a Deformable Contour Model 355
María J. Carreira, Lucia Espona, Manuel G. Penedo, and Antonio Mosquera

Detection of Retinal Vascular Bifurcations by Rotation- and Scale-Invariant COSFIRE Filters 363
George Azzopardi and Nicolai Petkov

Detection of Neovascularization for Screening of Proliferative Diabetic Retinopathy 372
M. Usman Akram, Anam Tariq, and Shoab A. Khan

Ensemble Classification System Applied for Retinal Vessel Segmentation on Child Images Containing Various Vessel Profiles 380
M.M. Fraz, P. Remagnino, A. Hoppe, B. Uyyanonvara, A.R. Rudnicka, C.G. Owen, and S.A. Barman

Automatic Cup-to-Disc Ratio Estimation Using Active Contours and Color Clustering in Fundus Images for Glaucoma Diagnosis 390
Irene Fondón, Francisco Núñez, Mercedes Tirado, Soledad Jiménez, Pedro Alemany, Qaisar Abbas, Carmen Serrano, and Begoña Acha

Detection of Peri-Papillary Atrophy and RNFL Defect from Retinal Images 400
Gopal Datt Joshi, Jayanthi Sivaswamy, R. Prashanth, and S.R. Krishnadas

Automatic Photoreceptor Detection in In-Vivo Adaptive Optics Retinal Images: Statistical Validation 408
Kevin Loquin, Isabelle Bloch, Kiyoko Nakashima, Florence Rossant, Pierre-Yves Boelle, and Michel Paques

Automatic Detection of Optic Disc from Retinal Fundus Images Using Dynamic Programming 416
Qaisar Abbas, Irene Fondón, Soledad Jiménez, and Pedro Alemany

Automatic Localization of the Optic Disc in Retinal Images Based on the Entropy of Vascular Directions 424
Ana Maria Mendonça, Filipe Cardoso, António V. Sousa, and Aurélio Campilho

Cell Detection and Modelling

Automatic Assessment of Leishmania Infection Indexes on *In Vitro* Macrophage Cell Cultures 432
Pedro Leal, Luís Ferro, Marco Marques, Susana Romão, Tânia Cruz, Ana M. Tomá, Helena Castro, and Pedro Quelhas

Analysis of Whole Slide Images of Equine Tendinopathy 440
M. Toutain, O. Lézoray, F. Audigié, V. Busoni, G. Rossi, F. Parillo, and A. Elmoataz

Curvelet-Based Texture Description to Classify Intact and Damaged Boar Spermatozoa 448
Víctor González-Castro, Enrique Alegre, Oscar García-Olalla, Diego García-Ordás, María Teresa García-Ordás, and Laura Fernández-Robles

Comparison of Methods for Splitting of Touching and Overlapping Macrophages in Fluorescent Micrographs 456
Christian Held, Jens Wenzel, Roland Lang, Ralf Palmisano, and Thomas Wittenberg

Segmentation of Muscle Fibres in Fluorescence Microscopy Images 465
Aurora Sáez, Adoración Montero-Sánchez, Luis M. Escudero, Begoña Acha, and Carmen Serrano

Generation of Synthetic Image Datasets for Time-Lapse Fluorescence Microscopy 473
David Svoboda and Vladimír Ulman

Cervical Cell Classification Based Exclusively on Nucleus Features 483
Marina E. Plissiti and Christophoros Nikou

Author Index 491