

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zürich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/7412>

Ana Fred · Maria De Marsico
Mário Figueiredo (Eds.)

Pattern Recognition Applications and Methods

4th International Conference, ICPRAM 2015
Lisbon, Portugal, January 10–12, 2015
Revised Selected Papers

Editors

Ana Fred
Instituto de Telecomunicações
Instituto Superior Técnico
University of Lisbon
Lisbon
Portugal

Mário Figueiredo
Instituto de Telecomunicações
Instituto Superior Técnico
University of Lisbon
Lisbon
Portugal

Maria De Marsico
Sapienza Università di Roma
Rome
Italy

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-27676-2 ISBN 978-3-319-27677-9 (eBook)
DOI 10.1007/978-3-319-27677-9

Library of Congress Control Number: 2015957092

LNCS Sublibrary: SL6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

© Springer International Publishing Switzerland 2015

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, 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.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by SpringerNature
The registered company is Springer International Publishing AG Switzerland

Preface

The present book includes extended and revised versions of a set of selected papers from the 4th International Conference on Pattern Recognition Applications and Methods (ICPRAM 2015), held in Lisbon, Portugal, during January 10–12, 2015.

The conference was sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC) in cooperation with the ACM Special Interest Group on Artificial Intelligence (ACM SIGAI), the ACM Special Interest Group on Applied Computing (SIGAPP), the Association for the Advancement of Artificial Intelligence (AAAI), the European Association for Signal Processing (EURASIP), the Asia Pacific Neural Network Assembly (APNNA), the International Neural Network Society (INNS), and the Italian Association for Artificial Intelligence (AIIA).

The purpose of ICPRAM is to provide a major point of contact between researchers, engineers, and practitioners from several areas of pattern recognition, both from a theoretical and applications perspectives. Associated techniques can achieve relevant results for new research topics that continuously arise as technology advances. These aspects are reflected in the set of papers that make up this book. In particular, the focus is on the application of pattern recognition techniques to emerging real-world problems, interdisciplinary research, experimental and/or theoretical studies yielding new insights that advance pattern recognition methods. The final ambition is to spur new research lines and provide the occasion to start novel collaborations, mostly in interdisciplinary research scenarios.

ICPRAM 2015 received 145 submissions, from 45 countries in all continents, of which 17 % were presented at the conference as full papers, and their authors were invited to submit extended versions of their papers for this book. In order to evaluate each submission, double-blind reviewing was performed by the Program Committee. Finally, only the best 20 papers were included in this book.

We would like to highlight that ICPRAM 2015 also included four plenary keynote lectures, given by internationally distinguished researchers, namely: Hanan Samet (University of Maryland, USA), Nello Cristianini (University of Bristol, UK), Marcello Pelillo (University of Venice, Italy), and Luis Alexandre (University of Beira Interior, Portugal). We must acknowledge the invaluable contribution of all keynote speakers who, as renowned researchers in their areas, presented cutting-edge work, thus contributing toward enriching the scientific content of the conference.

We especially thank the authors, whose research and development efforts are recorded here. The knowledge and diligence of the reviewers were essential to ensure the quality of the papers presented at the conference and published in this book. Finally, a special thanks to all members of the INSTICC team, whose involvement was fundamental for organizing a smooth and successful conference.

September 2015

Ana Fred
Maria De Marsico
Mário Figueiredo

Organization

Conference Chair

Ana Fred

Instituto de Telecomunicações, Instituto Superior Técnico, University of Lisbon, Portugal

Program Co-chairs

Maria De Marsico

Sapienza Università di Roma, Italy

Mário Figueiredo

Instituto de Telecomunicações, Instituto Superior Técnico, University of Lisbon, Portugal

Program Committee

Andrea F. Abate

University of Salerno, Italy

Ashraf AbdelRaouf

Misr International University, MIU, Egypt

Shigeo Abe

Kobe University, Japan

Rahib Abiyev

Near East University, Turkey

Mayer Aladjem

Ben-Gurion University of the Negev, Israel

Rocío Alaiz-Rodríguez

Universidad de Leon, Spain

Andrea Albarelli

Università Ca' Foscari Venezia, Italy

Francisco Martínez Álvarez

Pablo de Olavide University of Seville, Spain

Annalisa Appice

Università degli Studi di Bari Aldo Moro, Italy

Juan Humberto Sossa

Centro de Investigacion en Computacion-IPN, Mexico

Azuela

Emili Balaguer-Ballester

Bournemouth University, UK

Vineeth Nallure

Indian Institute of Technology, India

Balasubramanian

Subhadip Basu

Jadavpur University, India

Jorge Batista

ISR, Institute of Systems and Robotics, Portugal

Jon Atli Benediktsson

University of Iceland, Iceland

J. Ross Beveridge

Colorado State University, USA

Anastasios Bezerianos

SINAPSE – National University of Singapore, Singapore

Monica Bianchini

Università degli Studi di Siena, Italy

Michael Biehl

University of Groningen, The Netherlands

Isabelle Bloch

Telecom ParisTech - CNRS LTCI, France

Joan Martí Bonmatí

Girona University, Spain

Mohamed-Rafik Bouguelia

LORIA, Lorraine University, France

Nizar Bouguila

Concordia University, Canada

Francesca Bovolo

Fondazione Bruno Kessler, Italy

Paula Brito	Universidade do Porto, Portugal
Hans du Buf	University of the Algarve, Portugal
Tien D. Bui	Concordia University, Canada
Samuel Rota Bulò	Fondazione Bruno Kessler, Italy
Javier Calpe	Universitat de València, Spain
Francesco Camastra	University of Naples Parthenope, Italy
Virginio Cantoni	Università di Pavia, Italy
Ramón A. Mollineda Cárdenas	Universitat Jaume I, Spain
Marco La Cascia	Università Degli Studi di Palermo, Italy
Michelangelo Ceci	University of Bari, Italy
Mehmet Celenk	Ohio University, USA
Amitava Chatterjee	Jadavpur University, India
Snigdhanu Chatterjee	University of Minnesota, USA
Rama Chellappa	University of Maryland, USA
Dmitry Chetverikov	MTA SZTAKI, Hungary
Ioannis Christou	Athens Information Technology, Greece
Miguel Coimbra	Faculdade de Ciências da Universidade do Porto, Portugal
Antoine Cornuejols	AgroParisTech, France
Michel Couprie	LIGM, France
Tom Croonenborghs	KU Leuven, Belgium
Sergio Cruces	University of Seville, Spain
Justin Dauwels	Nanyang Technological University, Singapore
Thorsten Dickhaus	Weierstrass Institute for Applied Analysis and Stochastics, Germany
Gianfranco Doretto	West Virginia University, USA
Gideon Dror	The Academic College of Tel-Aviv-Yaffo, Israel
Andrzej Drygajlo	Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland
Bernard Dubuisson	Université de Technologie de Compiègne, France
Mahmoud El-Sakka	The University of Western Ontario, Canada
Yaokai Feng	Kyushu University, Japan
Francesc J. Ferri	University of Valencia, Spain
Mário Figueiredo	Instituto de Telecomunicações, Instituto Superior Técnico, University of Lisbon, Portugal
Maurizio Filippone	University of Glasgow, UK
Gernot A. Fink	TU Dortmund, Germany
Simone Fiori	Università Politecnica delle Marche, Italy
Damien François	Université Catholique de Louvain, Belgium
Ana Fred	Instituto de Telecomunicações, Instituto Superior Técnico, University of Lisbon, Portugal
Muhammad Marwan Muhammad Fuad	University of Tromsø, Norway

Giorgio Fumera	University of Cagliari, Italy
Langis Gagnon	Centre de Recherche Informatique de Montréal, Canada
Sabrina Gaito	Università degli Studi di Milano, Italy
Vicente Garcia	Universidad Autónoma de Ciudad Juárez, Mexico
Giorgio Giacinto	University of Cagliari, Italy
Fabio Gonzalez	Universidad Nacional de Colombia, Colombia
Bernard Gosselin	University of Mons, Belgium
Sébastien Guérif	University Paris 13 - SPC, France
Amaury Habrard	Laboratoire Hubert Curien, University of St. Etienne, France
Michal Haindl	Institute of Information Theory and Automation, Czech Republic
Barbara Hammer	Bielefeld University, Germany
Robert Harrison	Georgia State University, USA
Makoto Hasegawa	Tokyo Denki University, Japan
Pablo Hennings-Yeomans	Ontario Institute for Cancer Research, Canada
Laurent Heutte	Université de Rouen, France
Kouichi Hirata	Kyushu Institute of Technology, Japan
Sean Holden	University of Cambridge, UK
Geoffrey Holmes	University of Waikato, New Zealand
Qinghua Huang	South China University of Technology, Guangzhou, China
Lazaros S. Iliadis	Democritus University of Thrace, Greece
Jose M. Iñesta	Universidad de Alicante, Spain
Akihiro Inokuchi	Kwansei Gakuin University, Japan
Yuji Iwahori	Chubu University, Japan
Sarangapani Jagannathan	Missouri University of Science and Technology, USA
Yasushi Kanazawa	Toyohashi University of Technology, Japan
Yunho Kim	Ulsan National Institute of Science and Technology, Republic of Korea
Mario Köppen	Kyushu Institute of Technology, Japan
Walter Kosters	Universiteit Leiden, The Netherlands
Constantine Kotropoulos	Aristotle University of Thessaloniki, Greece
Sotiris Kotsiantis	Educational Software Development Laboratory, University of Patras, Greece
Konstantinos Koutroumbas	National Observatory of Athens, Greece
Adam Krzyzak	Concordia University, Canada
Nojun Kwak	Seoul National University, Republic of Korea
Jaerock Kwon	Kettering University, USA
Shang-Hong Lai	National Tsing Hua University, Taiwan
Raffaella Lanzarotti	Università degli Studi di Milano, Italy
Rasmus Larsen	Technical University of Denmark, Denmark
Aristidis Likas	University of Ioannina, Greece
Hantao Liu	University of Hull, UK
Xiaohui Liu	Brunel University, UK

Luca Lombardi	University of Pavia, Italy
Nicolas Lom�nie	Universit� Paris Descartes, France
Ga�lle Loosli	Clermont Universit�, France
Alessandra Lumini	Universit� di Bologna, Italy
Juan Luo	George Mason University, USA
Francesco Marcelloni	University of Pisa, Italy
Elena Marchiori	Radboud University, The Netherlands
Gian Luca Marcialis	Universit� degli Studi di Cagliari, Italy
Urszula Markowska-Kaczmar	Wroclaw University of Technology, Poland
Maria De Marsico	Sapienza Universit� di Roma, Italy
J. Francisco Mart�nez-Trinidad	Instituto Nacional de Astrof�sica, �ptica y Electr�nica, Puebla, Mexico
Sally Mcclean	University of Ulster, UK
Stephen McKenna	University of Dundee, UK
Hongying Meng	Brunel University London, UK
Erzs�bet Mer�nyi	Rice University, USA
Piotr Mirowski	Bell Labs (Alcatel-Lucent), USA
Delia Alexandrina Mitrea	Technical University of Cluj-Napoca, Romania
Giovanni Montana	King’s College London, UK
Robert Moskovitch	Columbia University, USA
Marco Muselli	Consiglio Nazionale delle Ricerche, Italy
Laurent Najman	Universit� Paris-Est, France
Yuichi Nakamura	Kyoto University, Japan
Michele Nappi	Universit� di Salerno, Italy
Claire N�dellec	MIG, INRA Centre de Jouy-en-Josas, France
Atul Negi	University of Hyderabad, India
Mikael Nilsson	Lund University, Sweden
Il-Seok Oh	Chonbuk National University, Republic of Korea
Simon OKeefe	University of York, UK
Ahmet Okutan	Isik University, Turkey
Yoshito Otake	Johns Hopkins University, USA
Martijn van Otterlo	Radboud Universiteit Nijmegen, The Netherlands
Gonzalo Pajares	Universidad Complutense de Madrid, Spain
Vicente Palaz�n-Gonz�lez	Universitat Jaume I, Spain
Guenther Palm	University of Ulm, Institute of Neural Information Processing, Germany
Apostolos Papadopoulos	Aristotle University, Greece
Marcello Pelillo	University of Venice, Italy
Luca Piras	University of Cagliari, Italy
Fiora Pirri	University of Rome La Sapienza, Italy
Vincenzo Piuri	Universit� degli Studi di Milano, Italy
Sylvia Pont	Delft University of Technology, The Netherlands
Philippe Preux	University of Lille 3, France
Lionel Prevost	University of French West Indies and Guiana, France
Hugo Proen�a	University of Beira Interior, Portugal

Arun K. Pujari	University of Hyderabad, India
Philippe Ravier	University of Orléans, France
Bernardete M. Ribeiro	University of Coimbra, Portugal
Elisa Ricci	University of Perugia, Italy
Daniel Riccio	University of Naples, Federico II, Italy
François Rioult	GREYC CNRS UMR6072 - Université de Caen Basse-Normandie, France
Marcos Rodrigues	Sheffield Hallam University, UK
Juan J. Rodríguez	University of Burgos, Spain
Fernando Rubio	Universidad Complutense de Madrid, Spain
Indrajit Saha	University of Wroclaw, Poland
Lorenza Saitta	Università degli Studi del Piemonte Orientale Amedeo Avogadro, Italy
Antonio-José Sánchez-Salmerón	Universitat Politècnica de Valencia, Spain
Carlo Sansone	University of Naples, Italy
K.C. Santosh	US National Library of Medicine (NLM), National Institutes of Health (NIH), USA
Michele Scarpiniti	Sapienza University of Rome, Italy
Paul Scheunders	University of Antwerp, Belgium
Leizer Schnittman	Universidade Federal da Bahia (UFBA), Salvador, Bahia, Brazil
Bjoern Schuller	Technische Universität München, Germany
Friedhelm Schwenker	University of Ulm, Germany
Katsunari Shibata	Oita University, Japan
Vassilios Stathopoulos	University College London, UK
Mu-Chun Su	National Central University, Taiwan
Shiliang Sun	East China Normal University, China
Yajie Sun	Samsung Research America, USA
Zhenan Sun	Institute of Automation, Chinese Academy of Sciences (CASIA), China
Johan Suykens	KU Leuven, Belgium
Alberto Taboada-Crispi	Universidad Central Marta Abreu de Las Villas, Cuba
Andrea Tagarelli	University of Calabria, Italy
Atsuhiko Takasu	National Institute of Informatics, Japan
Ichiro Takeuchi	Nagoya Institute of Technology, Japan
Xiaoyang Tan	Nanjing University of Aeronautics and Astronautics, China
Oriol Ramos Terrades	Centre de Visió per Computador, Universitat Autònoma de Barcelona, Spain
Thomas Tolxdorff	Charité, Germany
Fabien Torre	Lille University, Inria LNE and LIFL, France
Ricardo S. Torres	University of Campinas (UNICAMP), Brazil
Andrea Torsello	Università Ca'Foscari Venezia, Italy
Godfried Toussaint	New York University Abu Dhabi, UAE
Olgierd Unold	Wroclaw University of Technology, Poland

Ernest Valveny	Universitat Autònoma de Barcelona, Spain
Mario Vento	Università Degli Studi di Salerno, Italy
Michel Verleysen	Université Catholique de Louvain, Belgium
Christian Viard-Gaudin	LUNAM Université, Université de Nantes, France
Panayiotis Vlamos	Ionian University, Greece
Asmir Vodencarevic	Reifenhäuser REICOFIL GmbH & Co. KG, Germany
Sviatoslav Voloshynovskiy	University of Geneva, Switzerland
Jian-gang Wang	Institute for Infocomm Research, Singapore
Jonathan Weber	Université de Lorraine, France
Harry Wechsler	George Mason University, USA
Laurent Wendling	LIPADE, France
Slawomir Wierzchon	Polish Academy of Sciences, Poland
Janusz Wnek	Leidos, USA
Xianghua Xie	Swansea University, UK
Xin-Shun Xu	Shandong University, China
Haiqin Yang	Chinese University of Hong Kong, Hong Kong, SAR China
Nicolas Younan	Mississippi State University, USA
Pavel Zemicik	Brno University of Technology, Czech Republic
Albrecht Zimmermann	INSA Lyon, France
Jacek M. Zurada	University of Louisville, USA
Reyer Zwiggelaar	Aberystwyth University, UK

Additional Reviewers

John Arevalo	Universidad Nacional, Colombia
Eugene Borovikov	National Library of Medicine, USA
Bertrand Coüasnon	Irisa/Insa de Rennes, France
Mohamed Dahmane	CRIM, Canada
Ivan Duran-Diaz	University of Seville, Spain
Samuel Foucher	CRIM, Canada
Francesco Gargiulo	University of Naples Federico II, Italy
Rene Grzeszick	TU Dortmund, Germany
Marc Lalonde	CRIM, Canada
Tom Landry	CRIM, Canada
Pedro Martins	ISR, Institute of Systems and Robotics, Portugal
Saeid Motiian	West Virginia University, USA
Jiyong Oh	Graduate School of Convergence Science and Technology, Republic of Korea
Gabriele Piantadosi	Università Federico II di Napoli, Italy
Marco Piccirilli	West Virginia University, USA
Jorge A. Vanegas	MindLab – Universidad Nacional de Colombia, Colombia
Matteo Zignani	Università degli Studi di Milano, Italy

Invited Speakers

Hanan Samet

Nello Cristianini

Marcello Pelillo

Luis Alexandre

University of Maryland, USA

University of Bristol, UK

University of Venice, Italy

University of Beira Interior, Portugal

Contents

Invited Paper

- 3D Computer Vision: From Points to Concepts. 3
Luis A. Alexandre

Theory and Methods

- Density Difference Detection with Application to Exploratory Visualization . . . 17
*Marko Rak, Tim König, Johannes Steffen, Dirk Joachim Lehmann,
and Klaus-Dietz Tönnies*
- Identifying and Mitigating Labelling Errors in Active Learning. 35
Mohamed-Rafik Bouguelia, Yolande Belaïd, and Abdel Belaïd
- A Holistic Classification Optimization Framework with Feature Selection,
Preprocessing, Manifold Learning and Classifiers 52
Fabian Bürger and Josef Pauli
- Feature Extraction and Learning Using Context Cue and Rényi Entropy
Based Mutual Information 69
Hong Pan, Søren Ingvor Olsen, and Yaping Zhu
- Detection of Abrupt Changes in Spatial Relationships in Video Sequences. . . 89
Abdalbassir Abou-Elailah, Valerie Gouet-Brunet, and Isabelle Bloch
- Diffusion-Based Similarity for Image Analysis 107
Jan Gaura and Eduard Sojka
- Automatic Detection and Recognition of Symbols and Text on the Road
Surface 124
Jack Greenhalgh and Majid Mirmehdi

Applications

- Using BLSTM for Spotting Regular Expressions in Handwritten
Documents. 143
Gautier Bideault, Luc Mioulet, Clément Chatelain, and Thierry Paquet
- A Similarity-Based Color Descriptor for Face Detection. 158
Eyal Braunstain and Isak Gath

Pose Estimation and Movement Detection for Mobility Assessment of Elderly People in an Ambient Assisted Living Application. 172
Julia Richter, Christian Wiede, and Gangolf Hirtz

A Non-rigid Face Tracking Method for Wide Rotation Using Synthetic Data 185
Ngoc-Trung Tran, Fakhreddine Ababsa, and Maurice Charbit

3-D Face Recognition Using Geodesic-Map Representation and Statistical Shape Modelling. 199
Wei Quan, Bogdan J. Matuszewski, and Lik-Kwan Shark

Learning Discriminative Mid-Level Patches for Fast Scene Classification. 213
Angran Lin, Xuhui Jia, and Kwok Ping Chan

Modification of Polyp Size and Shape from Two Endoscope Images Using RBF Neural Network. 229
Yuji Iwahori, Seiya Tsuda, Robert J. Woodham, M.K. Bhuyan, and Kunio Kasugai

Detecting and Dismantling Composite Visualizations in the Scientific Literature 247
Po-Shen Lee and Bill Howe

Tensor Deep Stacking Networks and Kernel Deep Convex Networks for Annotating Natural Scene Images. 267
Niharjyoti Sarangi and C. Chandra Sekhar

MOSAIC: Multi-object Segmentation for Assisted Image ReConstruction. 282
Sonia Caggiano, Maria De Marsico, Riccardo Distasi, and Daniel Riccio

Author Index 301