

*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*

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

*University of Dortmund, Germany*

Madhu Sudan

*Massachusetts Institute of Technology, MA, USA*

Demetri Terzopoulos

*University of California, Los Angeles, CA, USA*

Doug Tygar

*University of California, Berkeley, CA, USA*

Moshe Y. Vardi

*Rice University, Houston, TX, USA*

Gerhard Weikum

*Max-Planck Institute of Computer Science, Saarbruecken, Germany*

Luis Rueda Domingo Mery Josef Kittler (Eds.)

# Progress in Pattern Recognition, Image Analysis and Applications

12th Iberoamerican Congress  
on Pattern Recognition, CIARP 2007  
Viña del Mar-Valparaíso, Chile, November 13-16, 2007  
Proceedings

## Volume Editors

Luis Rueda

Universidad de Concepción, Chile

Department of Computer Science

E-mail: lrueda@udec.cl

Domingo Mery

Pontificia Universidad Católica de Chile

Department of Computer Science, Santiago 22, Chile

E-mail: dmery@ing.puc.cl

Josef Kittler

University of Surrey

Department of Electronic Engineering

Guildford GU2 7XH, UK

E-mail: J.Kittler@surrey.ac.uk

Library of Congress Control Number: Applied for

CR Subject Classification (1998): I.5, I.4, I.2.10, I.2.7, F.2.2

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

ISSN 0302-9743

ISBN-10 3-540-76724-X Springer Berlin Heidelberg New York

ISBN-13 978-3-540-76724-4 Springer Berlin Heidelberg New York

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.

Springer is a part of Springer Science+Business Media

[springer.com](http://springer.com)

© Springer-Verlag Berlin Heidelberg 2007

Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India  
Printed on acid-free paper SPIN: 12190614 06/3180 5 4 3 2 1 0

# Preface

These proceedings offer a written account of the scientific contributions presented at the 12th Iberoamerican Congress on Pattern Recognition (CIARP 2007), held in Viña del Mar-Valparaíso, Chile. The aim of the congress was to promote and disseminate ongoing research and mathematical methods for pattern recognition, image analysis, and applications in such diverse areas as computer vision, bioinformatics, robotics and remote sensing, industry, health, space exploration, data mining, document analysis, natural language processing and speech recognition, among others. The volume is a manifestation of the ongoing success of the Iberoamerican Congress on Pattern Recognition (CIARP) that has featured in the landscape of international scientific conferences on pattern recognition and computer vision in the past few years. It provides evidence of the growing stature of the Iberoamerican scientific community in this subject area and of the interest its scientific contributions generate worldwide. As in the previous years, CIARP 2007 hosted participants from all over the world.

CIARP 2007 was organized by the Department of Informatics Engineering of the University of Santiago de Chile (USACH) and the Department of Informatics of the Technical University Federico Santa María (USM). The event was sponsored by the Advanced Technologies Application Center of Cuba (CENATAV), the Mexican Association for Computer Vision, Neurocomputing and Robotics (MACVNR), the Cuban Association for Pattern Recognition (ACRP), the Portuguese Association for Pattern Recognition (APRP), the Spanish Association for Pattern Recognition and Image Analysis (AERFAI), the Special Interest Group on Pattern Recognition of the Brazilian Computer Society (SIGPR-SBC), the Chilean Society for Computer Science by means of its technical committee, the Chilean Association for Pattern Recognition (AChiRP), the International Institute for Innovation and Entrepreneurship (3IE) and the Southeastern Pacific Research Institute for Advanced Technologies (SEPARI). CIARP 2007 was endorsed by the International Association for Pattern Recognition (IAPR).

CIARP 2007 received contributions from 36 countries, registering a total of 200 papers submitted, out of which 97 were accepted for publication in these proceedings and for presentation at the conference. The review process was carried out by the Scientific Committee composed of internationally recognized scientists, all experts in their respective fields. Each paper was subject to a double-blind review, carried out by at least two reviewers. We are especially indebted to the reviewers for their effort, ensuring the quality of the papers selected for the proceedings.

The conference program was augmented by invited keynote papers, presented by internationally renowned scientists. The talks addressed an interesting mix of topics in theory and applications of pattern recognition and were given by:

- Prof. Anil Jain, Department of Computer Science and Engineering, Michigan State University, USA.
- Prof. Horst Bunke, Institute of Computer Science and Applied Mathematics, University of Bern, Switzerland.
- Prof. Maria Petrou, Department of Electrical and Electronic Engineering, Imperial College, UK.
- Prof. Sorin Draghici, Department of Computer Science, Wayne State University, USA.

We would like to express our thanks to the members of the Organizing Committee for their contribution to the success of the conference and to these proceedings. We would also like to convey our special thanks to the members of the Local Committees for their help in the submission and reviewing process, as well as in editing these proceedings. Finally, we would like to express our gratitude to the members of the Steering Committee for their support and help in bringing this congress to Chile for the first time.

Luis Rueda  
Domingo Mery  
Josef Kittler

## Organization

CIARP 2007 was organized by the Department of Informatics Engineering of the University of Santiago de Chile (USACH) and the Department of Informatics of the Technical University Federico Santa María (USM)

## General Conference Co-chairs

|                |   |
|----------------|---|
| Max Chacón     | Department of Informatics Engineering,<br>Universidad de Santiago de Chile, Chile |
| Héctor Allende | Department of Informatics, Universidad<br>Técnica Federico Santa María, Chile     |

## Program Committee Co-chairs

|               |   |
|---------------|---|
| Luis Rueda    | Department of Computer Science,<br>Universidad de Concepción, Chile       |
| Domingo Mery  | Department of Computer Science, Pontificia<br>Universidad Católica, Chile |
| Josef Kittler | Department of Electrical Engineering, Surrey<br>University, UK            |

## Steering Committee

|                          |                   |
|--------------------------|-------------------|
| José Ruiz Shulcloper     | ACRP, Cuba        |
| Alberto Sanfeliu         | AERFAI, Spain     |
| Aurélio Campilho         | APRP, Portugal    |
| Eduardo Bayro-Corrochano | MACVNR, Mexico    |
| Héctor Allende           | AChiRP, Chile     |
| Herman Martin Gomes      | SIGPR-SBC, Brazil |

## Local Committee

Cesar San Martín Department of Electrical Engineering,  
Universidad de La Frontera, Chile

## Local Arrangements Committee

Claudia Arancibia Department of Informatics, Universidad  
Técnica Federico Santa María, Chile

## Scientific Committee

Ablameyko S.V.

The National Academy of Sciences of Belarus,  
Republic of Belarus

Acuña G.

Universidad de Santiago de Chile, Chile

Aggarwal J.K.

University of Texas at Austin, USA

Alquezar-Mancho R.

Universidad Politécnica de Cataluña, Spain

Altamirano-Robles A.

Instituto Nacional de Astronomía, Óptica y  
Electrónica, Mexico

Araujo H.

Universidade de Coimbra, Portugal

Atkinson J.

Universidad de Concepción, Chile

Bayro-Corrochano E.

Centro de Investigación y de Estudios

Avanzados del Instituto Politécnico  
Nacional, Mexico

Bertalmío M.

Universitat Pompeu Fabra, Spain

Bezdek J.

University of West Florida, USA

Bioucas-Dias J.

Instituto Superior Técnico, Portugal

Bloch I.

Escuela Nacional Superior de  
Telecomunicaciones, France

Borges D.

Universidade do Brasilia, Brazil

Bunke H.

University of Bern, Switzerland

Campilho A.

Universidade do Porto, Portugal

Cano S.

Universidad de Oriente, Cuba

Carrasco-Ochoa J. A.

Instituto Nacional de Astronomía, Óptica y  
Electrónica, Mexico

Chacón M.

Universidad de Santiago de Chile, Chile

Colmenares G.

Universidad de los Andes, Venezuela

Corchado E.

Universidad de Burgos, Spain

d'Avila-Mascarenhas N.

Universidade Federal de Sao Carlos, Brazil

Desachy J.

Université des Antilles et de la Guyane, France

Diday E.

Universite Paris Dauphine, France

Facon J.

Pontifícia Universidade Católica de Paraná,  
Brazil

Figueiredo M.

Instituto de Telecomunicaciones, Portugal

Fred A.

Instituto de Telecomunicaciones, Portugal

Gelbukh A.

Instituto Nacional Politécnico, Mexico

Gibert K.

Universidad Politécnica de Cataluña, Spain

Gomes H.M.

Universidade Federal de Campina, Brazil

Gomez-Gil M.

Universidad de las Américas - Puebla, Mexico

Gomez-Ramirez E.

Universidad La Salle, Mexico

Gordillo J.L.

Center for IS, Tecnológico de Monterrey,  
Mexico

Graña M.

Universidad del País Vasco, Spain

Grau A.

Universidad Politécnica de Cataluña, Spain

|                        |  |
|------------------------|--|
| Haindl M.              | Czech Academy of Sciences, Czech Republic                      |
| Hancock E.             | University of York, UK   |
| Hernando J.            | Universidad Politécnica de Cataluña, Spain                     |
| Jain A.                | Michigan State University, USA                                 |
| Kamel M.               | Univeristy of Waterloo, Canada                                 |
| Kasturi R.             | University of South Florida, USA                               |
| Kittler J.             | University of Surrey, UK                                       |
| Koschan A.             | Universidad de Tennessee, USA                                  |
| Kropatsch W.G.         | Vienna University of Technology, Austria                       |
| Kuncheva L.I.          | University of Wales, UK  |
| Lazo-Cortés M.         | Instituto de Cibernetica, Matemáticas y Física, Cuba           |
| Levachkine S.          | Instituto Politécnico Nacional, Mexico                         |
| Lopez de Ipiña K.      | Universidad del País Vasco, Spain                              |
| Lopez-Lopez A.         | Instituto Nacional de Astronomía, Óptica y Electrónica, Mexico |
| Lorenzo-Ginori J.V.    | Universidad Central "Marta Abreu" de Las Villa, Cuba           |
| Marques J. S.          | Universidade Técnica de Lisboa, Portugal                       |
| Martinez-Trinidad J.F. | Instituto Nacional de Astronomía, Óptica y Electrónica, Mexico |
| Medioni G.             | University of Soutern California, USA                          |
| Mery D.                | Pontificia Universidad Católica de Chile, Chile                |
| Moctezuma-Flores M.    | Universidad Nacional Autónoma de México, Mexico                |
| Morales E.             | Instituto Nacional de Astronomía, Óptica y Electrónica, Mexico |
| Nascimento J.          | Universidade Técnica de Lisboa, Portugal                       |
| Ngom A.                | University of Windsor, Canada                                  |
| Novovicova J.          | Czech Academy of Sciences, Czech Republic                      |
| Padilha A. J.          | Universidade do Porto, Portugal                                |
| Peña M.                | Universidad Nacional Autónoma de México, Mexico                |
| Perales F.             | Universidad de las Islas Baleares, Spain                       |
| Pereira F.             | Instituto de Telecomunicacões, Portugal                        |
| Perez de la Blanca N.  | Universidad de Granada, Spain                                  |
| Petrou M.              | Imperial College, UK   |
| Pham Tuan              | James Cook University, Australia                               |
| Pina P.                | Instituto Superior Técnico, Portugal                           |
| Pinho A.               | Universidade de Aveiro, Portugal                               |
| Pinto C.               | Universidade Técnica de Lisboa, Portugal                       |
| Pla F.                 | Universitat Jaume I, Spain                                     |
| Randall G.             | Universidad de la República, Uruguay                           |

## X Organization

|                    |  |
|--------------------|--|
| Rannou F.          | Universidad de Santiago de Chile, Chile                        |
| Reyes-García C.A.  | Instituto Nacional de Astronomía, Óptica y Electrónica, Mexico |
| Riazanov V.        | Russian Academic of Science, Russia                            |
| Rodríguez R.       | Instituto de Cibernética, Matemáticas y Física, Cuba           |
| Roman-Osorio R.    | Universidad Nacional Autónoma de México, Mexico                |
| Ross A.            | West Virginia University, USA                                  |
| Rueda L.           | Universidad de Concepción, Chile                               |
| Ruiz del Solar J.  | Universidad de Chile, Chile                                    |
| Ruiz-Shulcloper J. | Centro de Aplicaciones de Tecnología de Avanzada, Cuba         |
| Sanfeliu A.        | Universidad Politécnica de Cataluña, Spain                     |
| Sang-Woon Kim      | Myongji University, South Korea                                |
| Sanniti di Baja G. | National Research Council, Italy                               |
| Sansone C.         | Universita' di Napoli "Federico II", Italy                     |
| Sbarbaro D.        | Universidad de Concepción, Chile                               |
| Shirai Y.          | Ritsumeikan University, Japan                                  |
| Sossa-Azuela J.H.  | Instituto Politécnico Nacional, Mexico                         |
| Soto A.            | Pontificia Universidad Católica de Chile, Chile                |
| Sucar E.           | Instituto Nacional de Astronomía, Óptica y Electrónica, Mexico |
| Taboada-Crispi A.  | Universidad Central "Marta Abreu" de Las Villa, Cuba           |
| Torres M.I.        | Universidad del País Vasco, Spain                              |
| Trucco E.          | Heriot Watt University, UK                                     |
| Valev V.           | Saint Louis University, USA                                    |
| Verri A.           | Universita degli Studi di Genova, Italy                        |
| Vidal E.           | Universidad Politécnica de Valencia, Spain                     |
| Villanueva J.J.    | Universidad Autónoma de Barcelona, Spain                       |
| Wang S.            | University of Sherbrooke, Canada                               |
| Zegers P.          | Universidad de los Andes, Chile                                |
| Zhang D.           | Hong Kong Polytechnic University, Hong Kong                    |

## Sponsoring Institutions

University of Santiago de Chile USACH  
Technical University Federico Santa María USM  
The International Institute for Innovation and Entrepreneurship (3IE)  
The Southeastern Pacific Research Institute for Advanced Technologies SEPARI  
Chilean Association for Pattern Recognition AChiRP

The International Association for Pattern Recognition IARP

Cuban Association for Pattern Recognition ACRP

Mexican Association for Computer Vision, Neural Computing and Robotics

MACVNR

Special Interest Group of the Brazilian Computer Society SIGPR-SBC

Spanish Association for Pattern Recognition and Image Analysis AERFAI

Portuguese Association for Pattern Recognition (APRP)

# Table of Contents

## Keynote Lectures

|  |    |
|--|----|
| Learning in Computer Vision: Some Thoughts . . . . .   | 1  |
| <i>Maria Petrou</i>  |    |
| Biometric Recognition: Overview and Recent Advances . . . . .                                | 13 |
| <i>Anil K. Jain</i>  |    |
| A Family of Novel Graph Kernels for Structural Pattern Recognition . . . . .                 | 20 |
| <i>Horst Bunke and Kaspar Riesen</i>   |    |
| A System Biology Approach for the Steady-State Analysis of Gene Signaling Networks . . . . . | 32 |
| <i>Purvesh Khatri, Sorin Draghici, Adi L. Tarca, Sonia S. Hassan, and Roberto Romero</i>     |    |

## Signal Processing and Analysis

|  |    |
|--|----|
| $\Sigma\text{-}\Delta$ Background Subtraction and the Zipf Law . . . . .   | 42 |
| <i>Antoine Manzanera</i>   |    |
| Model-Based Correlation Measure for Nonuniformity Gain and Offset Parameters of Infrared Focal-Plane-Array Sensors . . . . . | 52 |
| <i>César San Martin and Sergio N. Torres</i>   |    |
| A Cyclostationary Analysis Applied to Detection and Diagnosis of Faults in Helicopter Gearboxes . . . . .                    | 61 |
| <i>Edgar Estupiñan, Paul White, and César San Martin</i>   |    |
| Robust Industrial Machine Sounds Identification Based on Frequency Spectrum Analysis . . . . .                               | 71 |
| <i>Antoni Grau, Yolanda Bolea, and Manuel Manzanares</i>   |    |
| Using Adaptive Filter to Increase Automatic Speech Recognition Rate in a Digit Corpus . . . . .                              | 78 |
| <i>José Luis Oropeza Rodríguez, Sergio Suárez Guerra, and Luis Pastor Sánchez Fernández</i>                                  |    |
| SSM – A Novel Method to Recognize the Fundamental Frequency in Voice Signals . . . . .                                       | 88 |
| <i>György Várallyay Jr.</i>  |    |
| Channel / Handset Mismatch Evaluation in a Biometric Speaker Verification Using Shifted Delta Cepstral Features . . . . .    | 96 |
| <i>José R. Calvo, Rafael Fernández, and Gabriel Hernández</i>  |    |

|  |     |
|--|-----|
| Phone-Segments Based Language Identification for Spanish, Basque and English .....         | 106 |
| <i>Víctor Guijarrubia and M. Inés Torres</i>   |     |
| <b>Image Coding, Processing and Analysis</b>   |     |
| A New Algorithm to Compute the Distance Between Multi-dimensional Histograms.....          | 115 |
| <i>Francesc Serratosa, Gerard Sanromà, and Alberto Sanfeliu</i>                            |     |
| Fuzzy Vector Directional Filters for Multichannel Image Denoising .....                    | 124 |
| <i>Alberto Rosales-Silva, Volodymyr I. Ponomaryov, and Francisco J. Gallegos-Funes</i>     |     |
| EZW-Based Image Compression with Omission and Restoration of Wavelet Subbands .....        | 134 |
| <i>Francisco A. Pujol, Higinio Mora, José Luis Sánchez, and Antonio Jimeno</i>             |     |
| Multi-class Binary Object Categorization Using Blurred Shape Models .....                  | 142 |
| <i>Sergio Escalera, Alicia Fornès, Oriol Pujol, Josep Lladós, and Petia Radeva</i>         |     |
| Video Analysis Via Nonlinear Dimensionality Reduction .....                                | 152 |
| <i>Alvaro Pardo</i>  |     |
| Graph Cuts Approach to MRF Based Linear Feature Extraction in Satellite Images .....       | 162 |
| <i>Anesto del-Toro-Almenares, Cosmin Mihai, Iris Vanhamel, and Hichem Sahli</i>            |     |
| A Multiple Substructure Matching Algorithm for Fingerprint Verification .....              | 172 |
| <i>Mabel Iglesias Ham, Yilian Bazán Pereira, and Edel B. García Reyes</i>                  |     |
| Bayesian Edge Regularization in Range Image Segmentation .....                             | 182 |
| <i>Smaine Mazouzi and Mohamed Batouche</i>   |     |
| Image Segmentation Using Automatic Seeded Region Growing and Instance-Based Learning ..... | 192 |
| <i>Octavio Gómez, Jesús A. González, and Eduardo F. Morales</i>                            |     |
| Morphological Distinguished Regions .....  | 202 |
| <i>Allan Hanbury</i>   |     |
| Set of Methods for Spontaneous ICH Segmentation and Tracking from CT Head Images .....     | 212 |
| <i>Noel Pérez, José A. Valdés, Miguel A. Guevara, Luis A. Rodríguez, and J.M. Molina</i>   |     |

## Shape and Texture Analysis

|   |     |
|---|-----|
| Efficient Rotation-Discriminative Template Matching .....   | 221 |
| <i>David Marimon and Touradj Ebrahimi</i>   |     |
| Texture Classification Through Combination of Sequential Colour<br>Texture Classifiers .....              | 231 |
| <i>Francesco Bianconi, Antonio Fernández, Elena González, and Fernando Ribas</i>                          |     |
| Deterministic Component of 2-D Wold Decomposition for Geometry<br>and Texture Descriptors Discovery ..... | 241 |
| <i>Erika Danaé López-Espinoza and Leopoldo Altamirano-Robles</i>  |     |

## Computer Vision

|  |     |
|--|-----|
| Robust Feature Descriptors for Efficient Vision-Based Tracking .....   | 251 |
| <i>Gerardo Carrera, Jesus Savage, and Walterio Mayol-Cuevas</i>  |     |
| Smooth Image Surface Approximation by Piecewise Cubic<br>Polynomials .....                                       | 261 |
| <i>Oliver Matias van Kaick and Helio Pedrini</i>   |     |
| An Analysis of Automatic Gender Classification .....   | 271 |
| <i>Modesto Castrillón-Santana and Quoc C. Vuong</i>  |     |
| A Method for Segmentation of Local Illumination Variations and<br>Photometric Normalization in Face Images ..... | 281 |
| <i>Eduardo Garea Llano, Jose Luis Gil Rodríguez, and Sandro Vega</i>   |     |
| Computing the Eccentricity Transform of a Polygonal Shape .....  | 291 |
| <i>Walter G. Kropatsch, Adrian Ion, and Samuel Peltier</i>   |     |
| Robust Color Contour Object Detection Invariant to Shadows .....   | 301 |
| <i>Jorge Scandaliaris, Michael Villamizar, Juan Andrade-Cetto, and Alberto Sanfeliu</i>                          |     |
| An Evaluation of Video Cut Detection Techniques .....  | 311 |
| <i>Sandberg Marcel Santos, Díbio Leandro Borges, and Herman Martins Gomes</i>                                    |     |
| Surface-Normal Estimation with Neighborhood Reorganization for 3D<br>Reconstruction .....                        | 321 |
| <i>Felix Calderon, Ubaldo Ruiz, and Mariano Rivera</i>   |     |
| Weighted Principal Geodesic Analysis for Facial Gender<br>Classification .....                                   | 331 |
| <i>Jing Wu, W.A.P. Smith, and E.R. Hancock</i>   |     |

|  |     |
|--|-----|
| Range and Intensity Vision for Rock-Scene Segmentation . . . . . | 340 |
| <i>Simphiwe Mkwelo, Frederick Nicolls, and Gerhard de Jager</i>  |     |

|  |     |
|--|-----|
| Human Detection in Indoor Environments Using Multiple Visual Cues and a Mobile Robot . . . . . | 350 |
| <i>Stefan Pszczółkowski and Alvaro Soto</i>  |     |

|  |     |
|--|-----|
| A Method for Estimating Authentication Performance over Time, with Applications to Face Biometrics . . . . . | 360 |
| <i>Norman Poh, Josef Kittler, Ray Smith, and J. Rafael Tena</i>  |     |

## **Pattern Recognition Principles**

|  |     |
|--|-----|
| Generalizing Dissimilarity Representations Using Feature Lines . . . . .           | 370 |
| <i>Mauricio Orozco-Alzate, Robert Duin, and César Germán Castellanos-Domínguez</i> |     |

|  |     |
|--|-----|
| FS-EX Plus: A New Algorithm for the Calculation of Typical FS-Testor Set . . . . . | 380 |
| <i>Luis Roberto Morales-Manilla and Guillermo Sanchez-Díaz</i>                     |     |

|  |     |
|--|-----|
| Confusion Matrix Disagreement for Multiple Classifiers . . . . .   | 387 |
| <i>Cinthia O.A. Freitas, João M. de Carvalho, José Josemar Oliveira Jr, Simone B.K. Aires, and Robert Sabourin</i> |     |

|  |     |
|--|-----|
| An Empirical Study of the Behavior of Classifiers on Imbalanced and Overlapped Data Sets . . . . . | 397 |
| <i>Vicente García, Jose Sánchez, and Ramon Mollineda</i>   |     |

|  |     |
|--|-----|
| Fast $k$ Most Similar Neighbor Classifier for Mixed Data Based on a Tree Structure . . . . .   | 407 |
| <i>Selene Hernández-Rodríguez, J. Francisco Martínez-Trinidad, and J. Ariel Carrasco-Ochoa</i> |     |

|  |     |
|--|-----|
| Conditional Mutual Information Based Feature Selection for Classification Task . . . . . | 417 |
| <i>Jana Novovičová, Petr Somol, Michal Haindl, and Pavel Pudil</i>                       |     |

|  |     |
|--|-----|
| Robust Alternating AdaBoost . . . . .  | 427 |
| <i>Héctor Allende-Cid, Rodrigo Salas, Héctor Allende, and Ricardo Ñanculef</i> |     |

## **Artificial Intelligence Techniques and Recognition**

|  |     |
|--|-----|
| Face Recognition Using Some Aspects of the Infant Vision System and Associative Memories . . . . . | 437 |
| <i>Roberto A. Vazquez, Humberto Sossa, and Beatriz A. Garro</i>                                    |     |

|   |     |
|---|-----|
| Two-Stage ACO to Solve the Job Shop Scheduling Problem .....  | 447 |
| <i>Amilkar Puris, Rafael Bello, Yaima Trujillo, Ann Nowe, and<br/>Yailen Martínez</i>                             |     |
| A Novel Hybrid Taguchi-Grey-Based Method for Feature Subset Selection .....                                       | 457 |
| <i>Hsin-Yun Chang and Chung-Shan Sun</i>  |     |
| On Using a Pre-clustering Technique to Optimize LDA-Based Classifiers for Appearance-Based Face Recognition ..... | 466 |
| <i>Sang-Woon Kim and Robert Duin</i>  |     |
| Certainty Measure of Pairwise Line Segment Perceptual Relations Using Fuzzy Logic .....                           | 477 |
| <i>José Rouco, Marta Penas, Manuel G. Penedo, Marcos Ortega, and<br/>Carmen Alonso-Montes</i>                     |     |
| Automatic Image Annotation Using a Semi-supervised Ensemble of Classifiers .....                                  | 487 |
| <i>Heidy Marin-Castro, Enrique Sucar, and Eduardo F. Morales</i>  |     |
| <b>Logical Combinatorial Pattern Recognition</b>  |     |
| Object Selection Based on Subclass Error Correcting for ALVOT .....   | 496 |
| <i>Miguel Angel Medina-Pérez, Milton García-Borroto, and<br/>José Ruiz-Shulcloper</i>                             |     |
| CT-EXT: An Algorithm for Computing Typical Testor Set .....   | 506 |
| <i>Guillermo Sanchez-Díaz and Manuel Lazo-Cortés</i>  |     |
| <b>Neural Networks</b>  |     |
| Evaluating a Zoning Mechanism and Class-Modular Architecture for Handwritten Characters Recognition .....         | 515 |
| <i>Sandra de Avila, Leonardo Matos, Cinthia O.A. Freitas, and<br/>João M. de Carvalho</i>                         |     |
| Median M-Type Radial Basis Function Neural Network .....  | 525 |
| <i>José A. Moreno-Escobar, Francisco J. Gallegos-Funes, and<br/>Volodymyr I. Ponomaryov</i>                       |     |
| A Precise Electrical Disturbance Generator for Neural Network Training with Real Level Output .....               | 534 |
| <i>Antonio García, Carlos León, Iñigo Monedero, and Jorge Ropero</i>  |     |
| A New Algorithm for Training Multi-layered Morphological Networks...  | 546 |
| <i>Ricardo Barrón, Humberto Sossa, and Benjamín Cruz</i>  |     |

## Kernel Machines

|   |     |
|---|-----|
| Joint Diagonalization of Kernels for Information Fusion . . . . .     | 556 |
| <i>Alberto Muñoz and Javier González</i>                              |     |
| Support Vector Regression Methods for Functional Data . . . . .       | 564 |
| <i>Noslen Hernández, Rolando J. Biscay, and Isneri Talavera</i>       |     |
| Monitoring Nonlinear Profiles Using Support Vector Machines . . . . . | 574 |
| <i>Javier M. Moguerza, Alberto Muñoz, and Stelios Psarakis</i>        |     |
| MP-Polynomial Kernel for Training Support Vector Machines . . . . .   | 584 |
| <i>Iván Mejía-Guevara and Ángel Kuri-Morales</i>                      |     |
| Adaptive ECG Compression Using Support Vector Machine . . . . .       | 594 |
| <i>Sándor M. Szilágyi, László Szilágyi, and Zoltán Benyó</i>          |     |

## Bioinformatics

|   |     |
|---|-----|
| Incremental Multiple Sequence Alignment . . . . .   | 604 |
| <i>Marcelino Campos, Damián López, and Piedachu Peris</i>                                   |     |
| Mass Spectrometry Based Cancer Classification Using Fuzzy Fractal Dimensions . . . . .      | 614 |
| <i>Tuan D. Pham</i>   |     |
| Bayesian Detection of Coding Regions in DNA/RNA Sequences Through Event Factoring . . . . . | 624 |
| <i>Renatha Oliva Capua, Helena Cristina da Gama Leitão, and Jorge Stolfi</i>                |     |

|   |     |
|---|-----|
| Coding Region Prediction in Genomic Sequences Using a Combination of Digital Signal Processing Approaches . . . . . | 635 |
| <i>Aníbal Rodríguez Fuentes, Juan V. Lorenzo Ginori, and Ricardo Grau Ábalo</i>                                     |     |

## Data Mining

|   |     |
|---|-----|
| Using Typical Testors for Feature Selection in Text Categorization . . . . .      | 643 |
| <i>Aurora Pons-Porrata, Reynaldo Gil-García, and Rafael Berlanga-Llavori</i>      |     |
| Towards Automatic Generation of Conceptual Interpretation of Clustering . . . . . | 653 |
| <i>Alejandra Pérez-Bonilla and Karina Gibert</i>                                  |     |
| ACONS: A New Algorithm for Clustering Documents . . . . .                         | 664 |
| <i>Andrés Gago Alonso, Airel Pérez Suárez, and José E. Medina Pagola</i>          |     |

|  |     |
|--|-----|
| Mixed Data Object Selection Based on Clustering and Border Objects .....                               | 674 |
| <i>J. Arturo Olvera-López, J. Francisco Martínez-Trinidad, and J. Ariel Carrasco-Ochoa</i>             |     |
| Modification of the Growing Neural Gas Algorithm for Cluster Analysis .....                            | 684 |
| <i>Fernando Canales and Max Chacón</i>   |     |
| Bagging with Asymmetric Costs for Misclassified and Correctly Classified Examples .....                | 694 |
| <i>Ricardo Nanculef, Carlos Valle, Héctor Allende, and Claudio Moraga</i>                              |     |
| <b>Natural Language Processing and Recognition</b>   |     |
| Distribution-Based Semantic Similarity of Nouns .....  | 704 |
| <i>Igor A. Bolshakov and Alexander Gelbukh</i>   |     |
| Segment-Based Classes for Language Modeling Within the Field of CSR .....                              | 714 |
| <i>Raquel Justo and M. Inés Torres</i>   |     |
| TextLec: A Novel Method of Segmentation by Topic Using Lower Windows and Lexical Cohesion .....        | 724 |
| <i>Laritza Hernández Rojas and José E. Medina Pagola</i>   |     |
| European Portuguese Accent in Acoustic Models for Non-native English Speakers .....                    | 734 |
| <i>Carla Simões, Carlos Teixeira, Miguel Dias, Daniela Braga, and António Calado</i>                   |     |
| A Statistical User Simulation Technique for the Improvement of a Spoken Dialog System .....            | 743 |
| <i>Lluís F. Hurtado, David Griol, Emilio Sanchis, and Encarna Segarra</i>                              |     |
| <b>Industrial and Medical Applications of Pattern Recognition</b>                                      |     |
| A New Approach for Cervical Vertebrae Segmentation .....   | 753 |
| <i>Saïd Mahmoudi and Mohammed Benjelloun</i>   |     |
| Automatic Clump Splitting for Cell Quantification in Microscopical Images .....                        | 763 |
| <i>Gloria Díaz, Fabio Gonzalez, and Eduardo Romero</i>   |     |
| A Semi-supervised Learning Method for Motility Disease Diagnostic .....                                | 773 |
| <i>Santi Seguí, Laura Igual, Petia Radeva, Carolina Malagelada, Fernando Azpiroz, and Jordi Vitrià</i> |     |

|  |     |
|--|-----|
| Lung Structure Classification Using 3D Geometric Measurements and SVM .....  | 783 |
| <i>João Rodrigo Ferreira da Silva Sousa,<br/>Aristófanes Corrêa Silva, and Anselmo Cardoso de Paiva</i>                      |     |
| Edge Detection in Ventriculograms Using Support Vector Machine Classifiers and Deformable Models .....                       | 793 |
| <i>Antonio Bravo, Miguel Vera, and Rubén Medina</i>  |     |
| Breast Cancer Diagnosis Based on a Suitable Combination of Deformable Models and Artificial Neural Networks Techniques ..... | 803 |
| <i>Yosvany López, Andra Novoa, Miguel A. Guevara, and Augusto Silva</i>  |     |
| Infected Cell Identification in Thin Blood Images Based on Color Pixel Classification: Comparison and Analysis .....         | 812 |
| <i>Gloria Díaz, Fabio Gonzalez, and Eduardo Romero</i>   |     |
| Coregistration of Small Animal PET and Autoradiography for <i>in vivo-ex vivo</i> Comparison .....                           | 822 |
| <i>Soo-Min Song, Min-Jeong Kim, Joung-Min Lee, Hye-Jin Park,<br/>KyeongMin Kim, Gi-Jeong Cheon, and Myoung-Hee Kim</i>       |     |
| Noise Pattern Recognition of Airplanes Taking Off: Task for a Monitoring System .....  | 831 |
| <i>Luis Pastor Sánchez Fernández, Oleksiy Pogrebnyak,<br/>José Luis Oropeza Rodríguez, and Sergio Suárez Guerra</i>          |     |
| Echocardiographic Image Sequence Compression Based on Spatial Active Appearance Model .....                                  | 841 |
| <i>Sándor M. Szilágyi, László Szilágyi, and Zoltán Benyó</i>   |     |
| Unified Neural Network Based Pathologic Event Reconstruction Using Spatial Heart Model .....                                 | 851 |
| <i>Sándor M. Szilágyi, László Szilágyi, Attila Frigy,<br/>Levente K. Görög, and Zoltán Benyó</i>                             |     |
| Fuzzy Spatial Growing for Glioblastoma Multiforme Segmentation on Brain Magnetic Resonance Imaging .....                     | 861 |
| <i>Alejandro Veloz, Steren Chabert, Rodrigo Salas,<br/>Antonio Orellana, and Juan Vielma</i>                                 |     |
| Conformal Geometric Algebra for Endoscope-Traking System Calibration in Neurosurgery .....                                   | 871 |
| <i>Silena Herold-García, Jorge Rivera-Rovelo, and<br/>Eduardo Bayro-Corrochano</i>   |     |
| Quality Controlled Multimodal Fusion of Biometric Experts .....  | 881 |
| <i>Omolara Fatukasi, Josef Kittler, and Norman Poh</i>   |     |

## Robotics and Remote Sensing Applications of Pattern Recognition

- Fully Automatic and Robust Approach for Remote Sensing Image Registration ..... 891

*Chi-Farn Chen, Min-Hsin Chen, and Hsiang-Tsu Li*

- Robust Local Localization of a Mobile Robot in Indoor Environments Using Virtual Corners ..... 901

*Carlos Lara and Leonardo Romero*

## Document Processing and Recognition

- An Algorithm for Foreground-Background Separation in Low Quality Patrimonial Document Images ..... 911

*Carlos A.B. Mello*

- Information Extraction and Classification from Free Text Using a Neural Approach ..... 921

*Ignazio Gallo and Elisabetta Binaghi*

- Formal Distance vs. Association Strength in Text Processing ..... 930

*José E. Medina Pagola, Ansel Y. Rodríguez González, and Abdel Hechavarria Díaz*

- Restoration of Double-Sided Ancient Music Documents with Bleed-Through ..... 940

*Pedro Castro, R.J. Almeida, and J.R. Caldas Pinto*

## Fuzzy and Hybrid Techniques in Pattern Recognition

- Multiple Assessment for Multiple Users in Virtual Reality Training Environments ..... 950

*Ronei M. Moraes and Liliane S. Machado*

- Dynamic Penalty Based GA for Inducing Fuzzy Inference Systems ..... 957

*Tomás Arredondo V., Félix Vásquez M., Diego Candel C., Lioubov Dombrovskaja, Loreine Agulló, Macarena Córdova H., Valeria Latorre-Reyes, Felipe Calderón B., and Michael Seeger P.*

- Author Index** ..... 967