

Table of Contents

Invited Talks

Learning with Missing or Incomplete Data	1
<i>Bogdan Gabrys</i>	
Image Analysis and Machine Learning: How to Foster a Stronger Connection?	5
<i>Stan Matwin</i>	
Computer Analysis of Lighting in Realist Master Art: Current Methods and Future Challenges	6
<i>David G. Stork</i>	

Contest Session

First International Fingerprint Liveness Detection Competition—LivDet 2009	12
<i>Gian Luca Marcialis, Aaron Lewicke, Bozhao Tan, Pietro Coli, Dominic Grimberg, Alberto Congiu, Alessandra Tidu, Fabio Roli, and Stephanie Schuckers</i>	

Computer Graphics and Image Processing

SVR-Based Jitter Reduction for Markerless Augmented Reality	24
<i>Samuele Salti and Luigi Di Stefano</i>	
Re-photography and Environment Monitoring Using a Social Sensor Network	34
<i>Paul Chippendale, Michele Zanin, and Claudio Andreatta</i>	
Region-Based Illuminant Estimation for Effective Color Correction	43
<i>Simone Bianco, Francesca Gasparini, and Raimondo Schettini</i>	

Low and Middle Level Processing

A New Technique for Image Magnification	53
<i>Carlo Arcelli, Maria Frucchi, and Gabriella Sanniti di Baja</i>	
Nonlocal Similarity Image Filtering	62
<i>Yifei Lou, Paolo Favaro, Stefano Soatto, and Andrea Bertozzi</i>	
FESID: Finite Element Scale Invariant Detector	72
<i>Dermot Kerr, Sonya Coleman, and Bryan Scotney</i>	

2D and 3D Segmentation

Conditions for Segmentation of 2D Translations of 3D Objects	82
<i>Shafriza Nisha Basah, Alireza Bab-Hadiashar, and Reza Hoseinnezhad</i>	
Segmentation of Wood Fibres in 3D CT Images Using Graph Cuts	92
<i>Erik L.G. Wernersson, Anders Brun, and Cris L. Luengo Hendriks</i>	
Semantic-Based Segmentation and Annotation of 3D Models	103
<i>Laura Papaleo and Leila De Floriani</i>	

Feature Extraction and Image Analysis

Reducing Keypoint Database Size	113
<i>Shahar Jamshy, Eyal Krupka, and Yehezkel Yeshurun</i>	
Automatic Estimation of the Inlier Threshold in Robust Multiple Structures Fitting	123
<i>Roberto Toldo and Andrea Fusiello</i>	
Integration of Contextual Information in Online Handwriting Representation	132
<i>Sara Izadi and Ching Y. Suen</i>	

Object Detection and Recognition

Plant Leaf Identification Using Multi-scale Fractal Dimension	143
<i>André R. Backes and Odemir M. Bruno</i>	
Detection of a Hand Holding a Cellular Phone Using Multiple Image Features	151
<i>Hiroto Nagayoshi, Takashi Watanabe, Tatsuhiko Kagehiro, Hisao Ogata, Tsukasa Yasue, and Hiroshi Sako</i>	
Object Detection by Estimating and Combining High-Level Features . . .	161
<i>Geoffrey Levine and Gerald DeJong</i>	

Video Analysis and Processing

Video Event Classification Using Bag of Words and String Kernels	170
<i>Lamberto Ballan, Marco Bertini, Alberto Del Bimbo, and Giuseppe Serra</i>	
Video Sequences Association for People Re-identification across Multiple Non-overlapping Cameras	179
<i>Dung Nghi Truong Cong, Catherine Achard, Louahdi Khoudour, and Lounis Douadi</i>	

Shadow Removal in Outdoor Video Sequences by Automatic Thresholding of Division Images	190
<i>Srinivasa Rao Dammavalam, Claudio Piciarelli, Christian Micheloni, and Gian Luca Foresti</i>	

Pattern Analysis and Classification

A New Generative Feature Set Based on Entropy Distance for Discriminative Classification	199
<i>Alessandro Perina, Marco Cristani, Umberto Castellani, and Vittorio Murino</i>	
A Hybrid Approach Handling Imbalanced Datasets	209
<i>Paolo Soda</i>	
Nonlinear Embedded Map Projection for Dimensionality Reduction	219
<i>Simone Marinai, Emanuele Marino, and Giovanni Soda</i>	

Learning

A Riemannian Self-Organizing Map	229
<i>Dongjun Yu, Edwin R. Hancock, and William A.P. Smith</i>	
Towards a Theoretical Framework for Learning Multi-modal Patterns for Embodied Agents	239
<i>Nicoletta Noceti, Barbara Caputo, Claudio Castellini, Luca Baldassarre, Annalisa Barla, Lorenzo Rosasco, Francesca Odone, and Giulio Sandini</i>	
The Impact of Reliability Evaluation on a Semi-supervised Learning Approach	249
<i>Pasquale Foggia, Gennaro Percannella, Carlo Sansone, and Mario Vento</i>	

Graphs and Trees

On the Training Patterns Pruning for Optimum-Path Forest	259
<i>João P. Papa and Alexandre X. Falcão</i>	
Learning Class Specific Graph Prototypes	269
<i>Shengping Xia and Edwin R. Hancock</i>	
Tree Covering within a Graph Kernel Framework for Shape Classification	278
<i>François-Xavier Dupé and Luc Brun</i>	

Applications

Vision-Based Markerless Gaming Interface	288
<i>Pietro Azzari and Luigi Di Stefano</i>	
Quality Assessment of the MPEG-4 Scalable Video CODEC	297
<i>Florian Niedermeier, Michael Niedermeier, and Harald Kosch</i>	
An Automatic Method for Counting Annual Rings in Noisy Sawmill Images	307
<i>Kristin Norell</i>	
A License Plate Extraction Algorithm Based on Edge Statistics and Region Growing	317
<i>Manuel Vargas, Sergio L. Toral, Federico Barrero, and Francisco Cortés</i>	
Boat Speed Monitoring Using Artificial Vision	327
<i>Alberto Broggi, Pietro Cerri, Paolo Grisleri, and Marco Paterlini</i>	
Theia: Multispectral Image Analysis and Archaeological Survey	337
<i>Vito Roberto and Massimiliano Hofer</i>	
A Self-updating Multiexpert System for Face Identification	346
<i>Andrea F. Abate, Maria De Marsico, Michele Nappi, and Daniel Riccio</i>	
Characterisation of Retinal Feature Points Applied to a Biometric System	355
<i>David Calvo, Marcos Ortega, Manuel G. Penedo, José Rouco, and Beatriz Remeseiro</i>	
Coastline Detection from SAR Images by Level Set Model	364
<i>Maria Mercedes Cerimele, Luigi Cinque, Rossella Cossu, and Roberta Galiffa</i>	
Wavelet-Based Feature Extraction for Handwritten Numerals	374
<i>Diego Romero, Ana Ruedin, and Leticia Seijas</i>	
A Texture Based Shoe Retrieval System for Shoe Marks of Real Crime Scenes	384
<i>Francesca Dardi, Federico Cervelli, and Sergio Carrato</i>	
Encephalic NMR Tumor Diversification by Textural Interpretation	394
<i>Danilo Avola and Luigi Cinque</i>	
Pathnodes Integration of Standalone Particle Filters for People Tracking on Distributed Surveillance Systems	404
<i>Roberto Vezzani, Davide Baltieri, and Rita Cucchiara</i>	

On Improving the Efficiency of Eigenface Using a Novel Facial Feature Localization	414
<i>Aleksey Izmailov and Adam Krzyżak</i>	
Semiotic Design of a Hypermedia for Cultural Heritage	425
<i>Vito Roberto and Elio Toppano</i>	
An Experimental Analysis of the Relationship between Biometric Template Update and the Doddington's Zoo: A Case Study in Face Verification	434
<i>Ajita Rattani, Gian Luca Marcialis, and Fabio Roli</i>	
Similarity Searches in Face Databases	443
<i>Annalisa Franco and Dario Maio</i>	
Vision-Based Motion Capture of Interacting Multiple People	451
<i>Hiroaki Egashira, Atsushi Shimada, Daisaku Arita, and Rin-ichiro Taniguchi</i>	
Probabilistic Corner Detection for Facial Feature Extraction.....	461
<i>Edoardo Ardizzone, Marco La Cascia, and Marco Morana</i>	
License Plate Detection and Character Recognition.....	471
<i>Fabio Caccia, Roberto Marmo, and Luca Lombardi</i>	
Towards a Subject-Centered Analysis for Automated Video Surveillance	481
<i>Michela Farenzena, Loris Bazzani, Vittorio Murino, and Marco Cristani</i>	
Geometric-Aligned Cancelable Fingerprint Templates	490
<i>Bian Yang, Christoph Busch, Mohammad Derawi, Patrick Bours, and Davrondzhon Gafurov</i>	
A Hybrid Approach to Land Cover Classification from Multi Spectral Images	500
<i>Primo Zingaretti, Emanuele Frontoni, Eva Savina Malinverni, and Adriano Mancini</i>	
Improving the Accuracy of a Score Fusion Approach Based on Likelihood Ratio in Multimodal Biometric Systems.....	509
<i>Emanuela Marasco and Carlo Sansone</i>	
A 3D Scanner for Transparent Glass.....	519
<i>Gonen Eren, Olivier Aubreton, Fabrice Meriaudeau, L.A. Sanchez Secades, David Fofi, A. Teoman Naskali, Frederic Truchetet, and Aytul Ercil</i>	

Red Eye Detection through Bag-of-Keypoints Classification	528
<i>Sebastiano Battiato, Mirko Guarnera, Tony Meccio, and Giuseppe Messina</i>	
A New Large Urdu Database for Off-Line Handwriting Recognition	538
<i>Malik Waqas Sagheer, Chun Lei He, Nicola Nobile, and Ching Y. Suen</i>	
Object Matching in Distributed Video Surveillance Systems by LDA-Based Appearance Descriptors	547
<i>Liliana Lo Presti, Stan Sclaroff, and Marco La Cascia</i>	
Analysis and Classification of Crithidia Luciliae Fluorescent Images	558
<i>Paolo Soda, Leonardo Onofri, Amelia Rigon, and Giulio Iannello</i>	
Confidence Measures for Error Correction in Interactive Transcription Handwritten Text	567
<i>Lionel Tarazón, Daniel Pérez, Nicolás Serrano, Vicent Alabau, Oriol Ramos Terrades, Alberto Sanchis, and Alfons Juan</i>	
On the Quantitative Estimation of Short-Term Aging in Human Faces	575
<i>Marcos Ortega, Linda Brodo, Manuele Bicego, and Massimo Tistarelli</i>	
3D Neural Model-Based Stopped Object Detection	585
<i>Lucia Maddalena and Alfredo Petrosino</i>	
A New Linguistic-Perceptual Event Model for Spatio-Temporal Event Detection and Personalized Retrieval of Sports Video	594
<i>Minh-Son Dao, Sharma Ishan Nath, and Noboru Babaguichi</i>	
Towards Protein Interaction Analysis through Surface Labeling	604
<i>Virginio Cantoni, Riccardo Gatti, and Luca Lombardi</i>	
A Semi-automated Method for the Measurement of the Fetal Nuchal Translucency in Ultrasound Images	613
<i>Ezio Catanzariti, Giovanni Fusco, Francesco Isgrò, Salvatore Masecchia, Roberto Prevete, and Matteo Santoro</i>	
Video Background Segmentation Using Adaptive Background Models . . .	623
<i>Xiaoyu Wu, Yangsheng Wang, and Jituo Li</i>	

Shape Analysis

A New Algorithm for Polygonal Approximation Based on Ant Colony Optimization	633
<i>Cecilia Di Ruberto and Andrea Morgera</i>	

Recognition of Occluded Shapes Using Size Functions	642
<i>Barbara Di Fabio, Claudia Landi, and Filippo Medri</i>	

Discrete Distortion for Surface Meshes	652
<i>Mohammed Mostefa Mesmoudi, Leila De Florian, and Paola Magillo</i>	

Face Analysis

Webcam-Based Visual Gaze Estimation	662
<i>Roberto Valenti, Jacopo Staiano, Nicu Sebe, and Theo Gevers</i>	

Real-Time Probabilistic Tracking of Faces in Video	672
<i>Giuseppe Boccignone, Paola Campadelli, Alessandro Ferrari, and Giuseppe Lipori</i>	

A Robust Iris Localization Model Based on Phase Congruency and Least Trimmed Squares Estimation	682
<i>Lili Pan, Mei Xie, Tao Zheng, and Jianli Ren</i>	

Medical Imaging

Shape-Based Classification of 3D Head Data	692
<i>Linda G. Shapiro, Katarzyna Wilamowska, Indriyati Atmosukarto, Jia Wu, Carrie Heike, Matthew Speltz, and Michael Cunningham</i>	

Sudden Changes Detection in WCE Video	701
<i>Giovanni Gallo, Eliana Granata, and Giuseppe Scarpulla</i>	

Denoising of Digital Radiographic Images with Automatic Regularization Based on Total Variation	711
<i>Mirko Lucchese and N. Alberto Borghese</i>	

Image Analysis and Pattern Recognition

A Real-Time Occlusion Aware Hardware Structure for Disparity Map Computation	721
<i>Christos Georgoulas and Ioannis Andreadis</i>	

A Graph-Based Approach for Shape Skeleton Analysis	731
<i>André R. Backes and Odemir M. Bruno</i>	

Reconnecting Broken Ridges in Fingerprint Images	739
<i>Nadia Brancati, Maria Frucci, and Gabriella Sanniti di Baja</i>	

Optimum Sensors for ‘Chromaticity’ Constancy in the Pixel	748
<i>Sivalogeswaran Ratnasingam and Steve Collins</i>	

An Improved Adaptive Smoothing Method	757
<i>Xin Hu, Hui Peng, Joseph Kesker, Xiang Cai, William G. Wee, and Jing-Huei Lee</i>	
Objective Quality Assessment Measurement for Typhoon Cloud Image Enhancement	767
<i>Changjiang Zhang, Juan Lu, and Jinshan Wang</i>	
Fuzzy Smoothed Composition of Local Mapping Transformations for Non-rigid Image Registration	777
<i>Edoardo Ardizzone, Roberto Gallea, Orazio Gambino, and Roberto Pirrone</i>	
Many-to-Many Matching under the l_1 Norm	787
<i>M. Fatih Demirci and Yusuf Osmanhoğlu</i>	
Evaluation of a Foreground Segmentation Algorithm for 3D Camera Sensors	797
<i>Luca Bianchi, Piercarlo Dondi, Riccardo Gatti, Luca Lombardi, and Paolo Lombardi</i>	
Image Quality Assessment Based on Multi-scale Geometric Analysis	807
<i>Mingna Liu, Xin Yang, and Yanfeng Shang</i>	
Connected Component Labeling Techniques on Modern Architectures	816
<i>Costantino Grana, Daniele Borghesani, and Rita Cucchiara</i>	
Estimation of Object Position Based on Color and Shape Contextual Information	825
<i>Takashi Ishihara, Kazuhiro Hotta, and Haruhisa Takahashi</i>	
Hallucinating Faces: Global Linear Modal Based Super-Resolution and Position Based Residue Compensation	835
<i>Xiang Ma, Junping Zhang, and Chun Qi</i>	
Joint Affine and Illumination Estimation Using Scale Manipulation Features	844
<i>Kobi Bentolila and Joseph M. Francos</i>	
Real-Time Descriptorless Feature Tracking	853
<i>Antonio L. Rodríguez, Pedro E. López-de-Teruel, and Alberto Ruiz</i>	
Adaptive Sharpening with Overshoot Control	863
<i>Antonio Buemi, Gaetano Santoro, Arcangelo Bruna, and Mirko Guarnera</i>	

Applying Visual Object Categorization and Memory Colors for Automatic Color Constancy	873
<i>Esa Rahtu, Jarno Nikkanen, Juho Kannala, Leena Lepistö, and Janne Heikkilä</i>	
Anomaly-Based Detection of IRC Botnets by Means of One-Class Support Vector Classifiers	883
<i>Claudio Mazzariello and Carlo Sansone</i>	
Detection of Duplicated Regions in Tampered Digital Images by Bit-Plane Analysis	893
<i>Edoardo Ardizzone and Giuseppe Mazzola</i>	
Color Features Performance Comparison for Image Retrieval	902
<i>Daniele Borghesani, Costantino Grana, and Rita Cucchiara</i>	
An Adaptive Technique for Accurate Feature Extraction from Regular and Irregular Image Data	911
<i>Sonya Coleman, Shanmuglingam Suganthan, and Bryan Scotney</i>	
Processing Hexagonal Images in a Virtual Environment	920
<i>Sonya Coleman, Bryan Scotney, and Bryan Gardiner</i>	
Pixel Coverage Segmentation for Improved Feature Estimation	929
<i>Nataša Sladoje and Joakim Lindblad</i>	
A Generic Method of Line Matching for Central Imaging Systems under Short-Baseline Motion	939
<i>Saleh Mosaddegh, David Fofi, and Pascal Vasseur</i>	
Reconstructing 3D Facial Shape Using Spherical Harmonics	949
<i>Chengming Zou, Guanghui Zhao, and Edwin R. Hancock</i>	
Retinex Combined with Total Variation for Image Illumination Normalization	958
<i>Luigi Cinque and Gabriele Morrone</i>	
A Color-Based Interest Operator	965
<i>Marta Penas and Linda G. Shapiro</i>	
An Evaluation of Scale and Noise Sensitivity of Fibre Orientation Estimation in Volume Images	975
<i>Maria Axelsson</i>	
Real-Time Online Video Object Silhouette Extraction Using Graph Cuts on the GPU	985
<i>Zachary A. Garrett and Hideo Saito</i>	
On a New Measure of Classifier Competence Applied to the Design of Multiclassifier Systems	995
<i>Tomasz Wołoszynski and Marek Kurzynski</i>	

Multi-class Binary Symbol Classification with Circular Blurred Shape
Models 1005
 Sergio Escalera, Alicia Fornés, Oriol Pujol, and Petia Radeva

A Novel Recognition Approach for Sketch-Based Interfaces 1015
 *Danilo Avola, Andrea Del Buono, Giorgio Gianforme, and
 Stefano Paolozzi*

Simultaneous Document Margin Removal and Skew Correction Based
on Corner Detection in Projection Profiles 1025
 M. Mehdi Haji, Tien D. Bui, and Ching Y. Suen

Dense Two-Frame Stereo Correspondence by Self-organizing Neural
Network 1035
 Marco Vanetti, Ignazio Gallo, and Elisabetta Binaghi

Towards a Linear Combination of Dichotomizers by Margin
Maximization 1043
 *Claudio Marrocco, Mario Molinara, Maria Teresa Ricamato, and
 Francesco Tortorella*

Author Index 1053