



Alma Mater Studiorum
Università di Bologna



Università degli
Studi di Udine



Gruppo Italiano Ricercatori
in Pattern Recognition



International Association
for Pattern Recognition



Fondazione Flaminia
Ravenna



Casa Matha
Schola Piscatorum
Ravenna

ICIAP 2011

16th International Conference on Image Analysis and Processing

Palazzo dei Congressi, Largo Firenze 1, Ravenna, Italy,
September 14 - 16, 2011

<http://www.bologna.enea.it/iciap2011/>



First International Workshop on Pattern Recognition in Proteomics, Structural Biology and Bioinformatics PR PS BB 2011

Casa Matha, Piazza Andrea Costa 3,
Ravenna, Italy, September 13, 2011

<http://avires.dimi.uniud.it/iciap2011/>

Image Analysis and Processing – ICIAP 2011

16th International Conference
Ravenna, Italy, September 14-16, 2011

The International Conference on Image Analysis and Processing ICIAP is organized every two years by the Italian group of researchers in pattern recognition (GIRPR), which is the Italian IAPR Member Society, with the aim to bring together researchers in image processing and pattern recognition from around the world.

The 16th edition of the conference is organized by the Universities of Bologna, Ravenna site, and Udine. The main target of ICIAP 2011, is to provide a place in which the most recent approaches and goals in image analysis can be presented and discussed.

Main topics include:

- Image analysis and processing
- Pattern recognition and Vision
- Machine Learning and Multimedia
- Cultural Heritage and Applications

Organization

Organizing Institutions

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 Italian Member Society of the
 International Association for
 Pattern Recognition - GIRPR
 International Association for
 Pattern Recognition - IAPR

Sponsoring Institutions
 Fondazione Flaminia, Ravenna
 Ordine della Casa Matha, Ravenna

Satellite Events

Tutorials – September 13, 2011 – Faculty of Preservation of the Cultural Heritage

Image and Video Descriptors

Lecturer: Abdenour Hadid, University of Oulu, Finland

Beyond Features: Similarity-Based Pattern Analysis and Recognition

Lecturers: Edwin R. Hancock, Fellow, IAPR;
 Vittorio Murino, Fellow, IAPR, Senior Member, IEEE;
 Marcello Pelillo, Fellow, IAPR, Senior Member, IEEE

Video analytics on reactive camera networks

Lecturer: Christian Micheloni, University of Udine, Italy

Workshop – September 13, 2011 – Casa Matha

1st International Workshop on Pattern Recognition in Proteomics, Structural Biology and Bioinformatics - PR PS BB 2011

Organizers: Virginio Cantoni, Pavia University, Italy;
 Giuseppe Maino, ENEA & Bologna University, Italy

Scientific Program at Glance

	13/09/2011	14/09/2011	15/09/2011	16/09/2011
9:00-10:00		IAPR invited speaker K. Aagarwal	Invited speaker Roberto Cipolla	IAPR invited speaker Horst Bunke
10:00-10:20	TUTORIAL Image and Video Descriptors	Image analysis and representation	Forensics, Security and Document Analysis	Shape Analysis
10:20-10:40		54	63	133
10:40-11:00		144	183	178
11:00-11:20		114	19	18
11:20-11:40	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:40-12:00	TUTORIAL Image and Video Descriptors	Image Segmentation	Video Analysis and Processing	Special Session: Colour
12:00-12:20		200	210	84
12:20-12:40		98	27	85
12:40-13:00		157	79	202
13:00-13:20		26	131	17
13:20-14:20		60	101	206
14:20-14:40	147	153	199	
14:40-15:00	Lunch	Lunch	Lunch	Lunch
15:00-15:40	TUTORIAL Beyond Features: Similarity-Based Pattern Analysis and Recognition	Poster session Processing & Pattern Recognition	Poster session Video Analysis and Processing	Poster session Applications
15:40-16:00	TUTORIAL Video analytics on reactive camera networks	Pattern analysis & Classification I	Invited speaker Kevin Karplus	Demo session
16:00-16:20		125		Applications
16:20-16:40		179		175
16:40-17:00		158		173
17:00-17:20	Coffee Break	Coffee Break	Coffee Break	Coffee Break
17:20-17:40	TUTORIAL Beyond Features: Similarity-Based Pattern Analysis and Recognition	Pattern analysis & Classification II	Biometry	Medical Imaging
17:40-18:00		120	130	93
18:00-18:30		121	64	137
18:30-19:30	77	8	32	Round Table
20:00	ICAP 2011 Registration Welcome Cocktail	GIRPR Meeting	Gala Dinner	

Tutorials take place at the Faculty of Preservation of the Cultural Heritage, via Mariani 5.

Registration and welcome cocktail on September, Wednesday 13, held at the Palazzo dei Congressi, Largo Firenze 1.

ICIAP 2011 conference and GIRPR meeting take place at the Palazzo dei Congressi, Largo Firenze 1.

The gala dinner is hosted in the Villa Malagola, via Faentina Nord 292, Godo (Ravenna).



Palazzo Corradini, venue of the Faculty of Preservation of the Cultural Heritage, University of Bologna, Ravenna campus



Palazzo dei Congressi



Villa Malagola

Scientific Program

Invited Talks

- Recognition of Human Activities* - Jake K. Aggarwal
- Bridging the Gap between Structural and Statistical Pattern Recognition* - Horst Bunke
- Novel applications of 3D shape from uncalibrated images* - Roberto Cipolla
- Bioinformatics Methods* - Kevin Karplus

Short biographies of the invited speakers



J. K. Aggarwal has served on the faculty of The University of Texas at Austin College of Engineering since 1964. His research interests include computer vision, pattern recognition and image processing focusing on human motion. He is a Fellow of IEEE, IAPR and AAAS. More recently, he is the recipient of the 2004 K S FU prize of the International Association for Pattern Recognition, the 2005 Kirchmayer Graduate Teaching Award of the IEEE and the 2007 Okawa Prize of the Okawa Foundation of Japan. He is also a Life Fellow of IEEE and Golden Core member of IEEE Computer Society. He has authored or edited several books, chapters, conferences proceedings, and papers.



Horst Bunke is a professor of Computer Science at the University of Bern, Switzerland. He served as 1st Vice-President and Acting President of the International Association for Pattern Recognition (IAPR). He also is a Fellow of the IAPR, former Editor-in-Charge of the International Journal of Pattern Recognition and Artificial Intelligence, former Editor-in-Chief of the journal Electronic Letters of Computer Vision and Image Analysis, Editor-in-Chief of the book series on Machine Perception and Artificial Intelligence by World Scientific Publ. Co., Advisory Editor of Pattern Recognition, and an associate or former associate editor of several other journals. Horst Bunke is the recipient of the 2010 KS Fu Prize, awarded by the IAPR. Moreover, he received the IAPR/CDAR Outstanding Achievements Award in 2009 and an honorary doctor degree from the University of Szeged, Hungary, in 2007. He held visiting positions at many institutions around the world. Horst Bunke has more than 650 publications, including over 40 authored, co-authored, edited or co-edited books and special editions of journals. His h-index is 46, as determined by Google Scholar and harzing.com software.



Roberto Cipolla obtained a B.A. (Engineering) from the University of Cambridge in 1984 and an M.S.E. (Electrical Engineering) from the University of Pennsylvania in 1985. From 1985 to 1988 he studied and worked in Japan at the Osaka University of Foreign Studies (Japanese Language) and Electrotechnical Laboratory. In 1991 he was awarded a D.Phil. (Computer Vision) from the University of Oxford and from 1991-92 was a Toshiba Fellow and engineer at the Toshiba Corporation Research and Development Centre in Kawasaki, Japan. He joined the Department of Engineering, University of Cambridge in 1992 as a Lecturer and a Fellow of Jesus College. He became a Reader in Information Engineering in 1997 and a Professor in 2000. His research interests are in computer vision and robotics and include the recovery of motion and 3D shape of visible surfaces from image sequences; object detection and recognition; novel man-machine interfaces using hand, face and body gestures; real-time visual tracking for localisation and robot guidance; applications of computer vision in mobile phones, visual inspection and image-retrieval and video search. He has authored 3 books, edited 8 volumes and co-authored more than 300 papers.



Kevin Karplus is a professor at University of California, Santa Cruz, currently in the Biomolecular Engineering Department. He is probably best known for work he did as a computer science graduate student at Stanford University on the Karplus-Strong string synthesis algorithm. He taught VLSI design and computer engineering for several years, helping create the Computer Engineering Department at University of California, Santa Cruz. He made some contributions to VLSI CAD, particularly to logic minimization, where he invented the if-then-else DAG (a generalization of the binary decision diagram) and a canonical form for it, before switching to protein structure prediction and bioinformatics in 1995. He has participated in CASP (Critical Assessment of Techniques for Protein Structure Prediction) since CASP2 in 1996, and has been invited to present papers at CASP2, 3, 4, 5, 6, 7, and 8. He has served on the Board of Directors for the International Society for Computational Biology since January 2005 (term ending December 2011). Karplus has long been a bicycle advocate. In 1994, the League of American Bicyclists gave him the Phyllis W. Harmon Volunteer-of-the-Year Award. In 2001, he was given a Lifetime Achievement Award by Santa Cruz County Regional Transportation Commission for long standing commitment to improving bicycle transportation in Santa Cruz County. He was also one of the founding members of People Power, a bicycle advocacy group in Santa Cruz.

Oral presentations

Session on Image Analysis and representation

- 54 *High Order Structural Matching Using Dominant Cluster Analysis* - Ren, Peng; Wilson, Richard C.; Hancock, Edwin R.
- 144 *A probabilistic framework for complex wavelet based image registration* - Calnegru, Florina-Cristina
- 114 *Image de-noising by Bayesian regression* - Cohen, Shimon; Ben-Ari, Rami

Session on Image Segmentation

- 200 *A Rough-Fuzzy HSV Color Histogram for Image Segmentation* - Ferone, Alessio; Pal, Sankar Kumar; Petrosino, Alfredo
- 98 *Multiple Region Categorization for Scenery Images*
Avraham, Tamar; Gurvich, Ilya; Lindenbaum, Michael
- 157 *Selection of suspicious ROIs in breast DCE-MRI*
Fusco, Roberta; Sansone, Mario; Sansone, Carlo; Petrillo, Antonella
- 26 *Regions Segmentation from SAR Images* - Cossu, Rossella; Cinque, Luigi
- 60 *Adaptive model for object detection in noisy and fast-varying environment*
Truong Cong, Dung Nghi; Khoudour, Louahdi; Achard, Catherine; Flancquart, Amaury
- 147 *Shadow Segmentation Using Time-of-Flight Cameras* - Mufti, Faisal; Mahony, Robert

Session on Pattern Analysis and Classification

- 125 *Uni-orthogonal Nonnegative Tucker Decomposition for Supervised Image Classification*
Zdunek, Rafal
- 179 *A Classification Approach with a Reject Option for Multi-label Problems*
Pillai, Ignazio; Fumera, Giorgio; Roli, Fabio
- 158 *Improving Image Categorization by Using Multiple Instance Learning with Spatial Relation*
Ngo, Thanh Duc; Le, Duy-Dinh; Satoh, Shin'ichi
- 120 *Shaping the Error-Reject Curve of Error Correcting Output Coding Systems*
Tortorella, Francesco; Marrocco, Claudio; Simeone, Paolo
- 121 *Sum-of-Superellipses - A low parameter model for amplitude spectra of natural images*
Spehr, Marcel; Gumhold, Stefan; Fleming, Roland
- 77 *Dissimilarity representation in multi-feature spaces for image retrieval*
Piras, Luca; Giacinto, Giorgio

Session on Forensics, Security and Document Analysis

- 63 *Discrete Point Based Signatures and Applications to Document Matching*
Spasojevic, Nemanja; Poncin, Guillaume; Bloomberg, Dan
- 183 *Robustness Evaluation of Biometric Systems under Spoof Attacks*
Akhtar, Zahid; Fumera, Giorgio; Marcialis, Gian Luca; Roli, Fabio
- 19 *A Graph-Based Framework for Thermal Faceprint Characterization*
Papa, Joao Paulo; Osaku, Daniel; Marana, Aparecido Nilceu

Session on Video Analysis and Processing

- 210 *Reflection removal for people detection in video surveillance applications*
Vento, Mario; Percannella, Gennaro; Conte, Dajana; Foggia, Pasquale; Tufano, Francesco
- 27 *The active sampling of gaze-shifts* - Boccignone, Giuseppe; Ferraro, Mario
- 79 *SARC3D: a new 3D body model for People Tracking and Re-identification*
Baltieri, Davide; Vezzani, Roberto; Cucchiara, Rita
- 131 *Sorting Atomic Activities for Discovering Spatio-temporal Patterns in Dynamic Scenes*
Ricci, Elisa; Zen, Gloria; Messelodi, Stefano; Sebe, Nicu
- 101 *Robust Stereoscopic Head Pose Estimation in Human-Computer Interaction and a Unified Evaluation Framework* - Layher, Georg; Liebau, Hendrik; Niese, Robert; Al-Hamadi, Ayoub; Michaelis, Bernd; Neumann, Heiko
- 153 *Intelligent overhead sensor for sliding doors: a stereo based method for augmented efficiency*
Bombini, Luca; Buzzoni, Michele; Broggi, Alberto; Medici, Paolo

Session on Biometry

- 130 *Automatic generation of subject-based image transitions*
Morana, Marco; Gallea, Roberto; Ardizzone, Edoardo; La Cascia, Marco
- 64 *Learning Neighborhood Discriminative Manifolds for Video-based Face Recognition*
See, John; Ahmad Fauzi; Mohammad Faizal
- 8 *A Novel Probabilistic Linear Subspace Approach for Face Applications* - Ying, Ying; Wang, Han

Session on Shape Analysis

- 133 *Refractive Index Estimation of Naturally Occurring Surfaces using Photometric Stereo*
Saman, Gul; Hancock, Edwin
- 18 *Synchronous Detection for Robust 3-D Shape Measurement against Interreflection and Subsurface Scattering* - Hiura, Shinsaku; Furuse, Tatsuhiko; Sato, Kosuke
- 178 *Unambiguous Photometric Stereo Using Two Images* - Mecca, Roberto; Durou, Jean-Denis

Special Session on Low-Level Color Image Processing

Organizers

- M. Emre Celebi, USA Bogdan Smolka, Poland
Gerald Schaefer, UK Raimondo Schettini, Italy

Color perception plays an important role in object recognition and scene understanding both for humans and intelligent vision systems. Recent advances in digital color imaging and computer hardware technology have led to an explosion in the use of color images in a variety of applications including medical imaging, content-based image retrieval, biometrics, watermarking, digital inpainting, remote sensing, visual quality inspection, among many others. As a result, automated processing and analysis of color images has become an active area of research, which is witnessed by the large number of publications during the past two decades. The multivariate nature of color image data presents new challenges for researchers and practitioners as the numerous methods developed for single channel images are often not directly applicable to multichannel images.

- 084 *Von Kries Model Under Planckian Illuminants* - Lecca, Michela; Messelodi, Stefano
- 085 *Colour Image Coding with Matching Pursuit in Spatio-Frequency Domain*
Maciol, Ryszard; Nabney, Ian T.; Yuan, Yuan
- 202 *Color Line Detection* - Lacroix, Vinciane
- 017 *A New Perception-based Segmentation Approach Using Combinatorial Pyramids*
Antunez, Esther; Marfil, Rebeca; Bandera, Antonio
- 206 *Automatic Color Detection of Archaeological Pottery*
Stanco, Filippo; Maugeri, Valentina; Tanasi, Davide; Bruna, Arcangelo
- 199 *Image Retrieval Based on Gaussian Mixture Approach*
Luszczkiewicz-Piatek, Maria; Smolka, Bogdan
- 033 *A Method for Data Extraction from Video Sequences for Automatic Identification of Football Players* - Frejlichowski, Dariusz
- 001 *Real-Time Hand Gesture Recognition using a Color Glove* - Camastra, Francesco; Lamberti, Luigi

Session on Applications

- 175 *Improving 3D Reconstruction for Digital Art Preservation*
Santos Junior, Jurandir; Bellon, Olga; Silva, Luciano; Vrubel, Alexandre
- 173 *Exploring Cascade Classifiers for Detecting Clusters of Microcalcifications*
Tortorella, Francesco; Marrocco, Claudio; Molinara, Mario
- 197 *A Method for Scribe Distinction in Medieval Manuscripts using Page Layout Features*
Fontanella, Francesco; De Stefano, Claudio; Scotto di Freca, Alessandra; Maniaci, Marilena

Session on Medical Imaging

- 93 *Registration Parameter Spaces for Molecular Electron Tomography Images*
Svensson, Lennart; Brun, Anders; Nyström, Ingela; Sintorn, Ida-Maria
- 137 *A Multiple Kernel Learning Algorithm for Cell Nucleus Classification of Renal Cell Carcinoma*
Ulaş, Aydin; Schüffler, Peter; Castellani, Umberto; Murino, Vittorio
- 32 *Nano-Imaging and its Applications to Biomedicine* - Canetta, Elisabetta; Adya, Ashok

Poster presentations

Session on Image Analysis and Pattern Recognition

- 20 *IDEA: Intrinsic Dimension Estimation Algorithm*
Rozza, Alessandro; Lombardi, Gabriele; Rosa, Marco; Casiraghi, Elena; Campadelli, Paola
- 22 *Optimal Decision Trees Generation from OR-Decision Tables*
Grana, Costantino; Cucchiara, Rita; Borghesani, Daniele; Montanero, Manuela
- 23 *Efficient Computation of Convolution of Huge Images* - Svoboda, David
- 24 *Half Ellipse Detection* - Sergeev, Nikolai; Tschechne, Stephan
- 25 *A Robust Forensic Hash Component for Image Alignment*
Battiato, Sebastiano; Farinella, Giovanni Maria; Messina, Enrico; Puglisi, Giovanni
- 28 *Focus of Expansion Localization Through Inverse C-Velocity*
Bak, Adrien; Bouchafa, Samia; Aubert, Didier
- 49 *Automated Identification of Photoreceptor Cones using Multi-Scale Modelling and Normalized Cross-Correlation* - Turpin, Alan; Morrow, Philip; Scotney, Bryan; Anderson, Roger; Wolsley, Clive
- 57 *A Finite Element Blob Detector for Robust Features* - Coleman, Sonya; Kerr, Dermot; Scotney, Bryan
- 62 *Reducing Number of Classifiers in DAGSVM Based on Class Similarity* - Luckner, Marcin
- 71 *New Error Measures to Evaluate Features on Three-dimensional Scenes*
Tegolo, Domenico; Bellavia, Fabio
- 82 *Optimal Choice of Regularization Parameter in Image Denoising*
Lucchese, Mirko; Frosio, Iuri; Borghese, Alberto
- 86 *Neighborhood Dependent Approximation by Nonlinear Embedding for Face Recognition*
Alex, Ann Theja; Mathew, Alex; Asari, Vijayan
- 90 *Ellipse detection through decomposition of circular arcs and line segments*
Nguyen, Thanh Phuong; Kerautret, Bertrand
- 94 *Edge-directed Image Interpolation Using Color Gradient Information*
Krylov, Andrey; Nasonov, Andrey
- 97 *Spot detection in images with noisy background*
Ferraretti, Denis; Casarotti, Luca; Gamberoni, Giacomo; Lamma, Evelina
- 132 *Automatic facial expression recognition using statistical-like moments*
D'Ambrosio, Roberto; Iannello, Giulio; Soda, Paolo
- 138 *Temporal Analysis of Biometric Template Update Procedures in Uncontrolled Environment*
Rattani, Ajita; Marcialis, Gian Luca; Roli, Fabio
- 139 *Biologically Motivated Feature Extraction* - Coleman, Sonya; Scotney, Bryan; Gardiner, Bryan
- 140 *Entropy-based Localization of Textured Regions* - Lo Presti, Liliana; La Cascia, Marco
- 149 *Evaluation of global descriptors for large scale image retrieval* - Wang, Hai; Zhang, Shu wu
- 150 *Improved Content-Based Watermarking using Scale-Invariant Feature Points*
Li, Na; Zheng, Xiaoshi; Han, Lin; Hancock, Edwin
- 154 *Crop Detection Through Blocking Artefacts Analysis*
Battiato, Sebastiano; Bruna, Arcangelo; Messina, Giuseppe
- 176 *Structure from Motion and Photometric Stereo for dense 3D shape recovery*
Sabzevari, Reza; Del Bue, Alessio; Murino, Vittorio
- 180 *Genetic Normalized Convolution* - Valenti, Cesare; Albanese, Giulia; Cipolla, Marco
- 182 *Combining Probabilistic Shape-from-Shading Statistical Facial Shape Models*
Ahmad, Touqeer; Wilson, Richard; Smith, William; Haines, Tom
- 188 *Visual Saliency by Keypoints Distribution Analysis*
Bruno, Alessandro; Ardizzone, Edoardo; Mazzola, Giuseppe
- 208 *From the physical restoration for preserving to the virtual restoration for enhancing*
Maino, Giuseppe; Nencini, Elena

Session on Image and Video Analysis and Processing

- 2 *A visual blindspot monitoring system for safe lane changes*
Saboune, Jamal; Laganieri, Robert; Martel, Luc; Arezoomand, Mehdi
- 11 *Extracting Noise Elements while Preserving Edges in Spatial Domain*
Jalil, Bushra; Fauvet, Eric; Lalligant, Olivier
- 16 *Automatic human action recognition in videos by graph embedding*
Zare Borzeshi, Ehsan; Piccardi, Massimo; Xu, Richard

- 65 *Human Action Recognition by Extracting Features from Negative Space*
Rahman, Shah Atiqur; Cho, Siu-Yeung; Leung, M.K.H.
- 96 *Path analysis in multiple-target video sequences*
Cancela, Brais; Ortega, Marcos; Fernández, Alba; Penedo, Manuel G.
- 99 *Statistical Multisensor Image Segmentation in Complex Wavelet Domains*
Qin, Zengchang; Wan, Tao
- 102 *Activity Discovery using Compressed Suffix Trees*
Guha, Prithwijit; Mukerjee, Amitabha; Venkatesh, K.S.
- 111 *A Continuous Learning in a Changing Environment*
Baldassarri, Paola; Dragoni, Aldo Franco; Vallesi, Germano
- 115 *Human-Computer Interaction through Time-of-Flight and RGB Cameras*
Dondi, Piercarlo; Lombardi, Luca; Porta, Marco
- 119 *Handling Complex Events in Surveillance Tasks* - Ferretti, Marco; Bartocci, Daniele
- 122 *Face Analysis using Curve Edge Maps* - Deboeverie, Francis; Veelaert, Peter; Philips, Wilfried
- 124 *Statistical patch-based observation for single object tracking* - Zulkifley, Mohd Asyraf; Moran, Bill
- 128 *Exploiting Depth Information for Indoor-Outdoor Scene Classification*
Pillai, Ignazio; Satta, Riccardo; Fumera, Giorgio; Roli, Fabio
- 129 *A Multiple Component Matching Framework for Person Re-Identification*
Satta, Riccardo; Fumera, Giorgio; Roli, Fabio; Cristani, Marco; Murino, Vittorio
- 148 *Improving Retake Detection by Adding Motion Feature*
Le, Duy-Dinh; Nguyen, Quang Hong; Hoang, Hiep Van; Satoh, Shin'ichi
- 156 *RDVideo: A New Lossless Video Codec on GPU* - Dondi, Piercarlo; Lombardi, Luca; Cinque, Luigi
- 161 *A new algorithm for image segmentation via watershed transformation*
Frucci, Maria; Sanniti di Baja, Gabriella
- 164 *Supervised Learning Based Stereo Matching using Neural Tree*
Kumar, Sanjeev; Foresti, Gian Luca; Rani, Asha; Micheloni, Christian
- 166 *Pre-Emptive camera activation for Video-Surveillance HCI* - Martinel, Niki; Micheloni, Christian
- 170 *Space-time Zernike Moments and Pyramid Kernel Descriptors for Action Classification*
Serra, Giuseppe; Del Bimbo, Alberto; Costantini, Luca; Seidenari, Lorenzo; Capodiferro, Lica
- 172 *A Low Complexity Motion Segmentation Based on Semantic Representation of Encoded Video Streams* - Mariano, Paola; D'Elia, Ciro; Abbate, Maurizio
- 181 *Audio-video analysis of musical expressive intentions*
Roda', Antonio; Visentini, Ingrid; Snidaro, Lauro; Canazza, Sergio
- 195 *Image segmentation using Normalized Cuts and Efficient Graph-based segmentation*
Ferjani, Imene; Doggaz, Narjes

Session on Applications

- 12 *Stability Analysis of Static Signatures for Automatic Signature Verification*
Impedovo, Donato; Pirlo, Giuseppe
- 28 *Multispectral imaging and digital restoration for paintings documentation*
Maino, Giuseppe; Landi, Marco
- 29 *Segmentation Strategy of Handwritten Connected Digits (SSHCD)*
Abdeldjalil, Gattal; Youcef, Chibani
- 35 *An experimental comparison of different methods for combining biometric identification systems*
Marasco, Emanuela; Sansone, Carlo
- 40 *Using Geometric Constraints to Solve the Point Correspondence Problem in Fringe Projection Based 3D Measuring Systems* - Bräuer-Burchardt, Christian; Notni, Gunther; Kühmstedt, Peter; Heinze, Matthias; Munkelt, Christoph
- 43 *Retrospective Illumination Correction of Greyscale Historical Aerial Photos*
Hast, Anders; Marchetti, Andrea
- 45 *Multibeam Echosounder Simulator Applying Noise Generator for the Purpose of Sea Bottom Visualization* - Frejlichowski, Dariusz; Maleika, Wojciech; Palczynski, Michal
- 46 *Automatic Segmentation of Digital Orthopantomograms for Forensic Human Identification*
Frejlichowski, Dariusz; Wanat, Robert
- 81 *Common scab detection on potatoes using an infrared hyperspectral imaging system* - Dacal-Nieto, Angel; Formella, Arno; Carrion, Pilar; Vazquez-Fernandez, Esteban; Fernandez-Delgado, Manuel

- 88 *Automatic Template Labeling in Extensible Multiagent Biometric Systems*
Riccio, Daniel; De Marsico, Maria; Nappi, Michele; Tortora, Genny
- 104 *Automatic bus line number localization and recognition on mobile phones: A computer vision aid for the visually impaired* - Colombo, Carlo; Guida, Claudio; Comanducci, Dario
- 105 *The use of high-pass filters and the inpainting method to clouds removal and their impact on satellite images classification* - Siravenha, Ana Carolina; Sousa, Danilo; Bispo, Aline; Pelaez, Evaldo
- 118 *Hybrid Filter Based Simultaneous Localization and Mapping for a Mobile Robot*
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- 123 *Mitotic HEP-2 cells recognition under class skew* - Soda, Paolo; Percannella, Gennaro; Vento, Mario
- 134 *Error Compensation by Sensor Re-Calibration in Fringe Projection Based Optical 3D Stereo Scanners* - Bräuer-Burchardt, Christian; Notni, Gunther; Kühmstedt, Peter
- 135 *Advanced safety sensor for gate automation* - Bombini, Luca; Broggi, Alberto; Debattisti, Stefano
- 152 *Using Blood Vessels Location Information in Optic Disk Segmentation*
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- 162 *Orthophotoplan segmentation and colorimetric invariants for roof detection*
El Merabet, Youssef; Touahni, Rajaa; Sbihi, Abderrahmane; Ruichek, Yassine; Meurie, Cyril
- 167 *A simulation framework to assess pattern matching algorithms in a space mission*
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- 169 *A Novel T-CAD Framework to Support Medical Image Analysis and Reconstruction*
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- 171 *Fast Vision-based Road Tunnel Detection*
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- 185 *A new dissimilarity measure for clustering seismic signals* - Lo Bosco, Giosué; Benvegna, Francesco; D'Alessandro, Antonino; Luzio, Dario; Pinello, Luca; Tegolo, Domenico
- 187 *Character Segmentation for License Plate Recognition by K-means Algorithm* - Zheng, Lihong
- 193 *A video grammar-based approach for TV News Localization and Intra-Structure Identification in TV Streams* - Zlitni, Tarek; Ben-Abdallah, Hanene; Mahdi, Walid
- 211 *Virtual reality models for the preservation of the Unesco historical and artistical heritage*
Menghi, Roberta; Maino, Giuseppe; Panebarco, Marianna
- 212 *Image processing and a virtual restoration hypothesis for mosaics and their cartoons*
Monti, Mariapaola; Maino, Giuseppe

Demo Session

Traffic monitoring embedded on smart cameras

Fabrizio Dini, Walter Nunziati
Magenta srl - Firenze, Italy

The growing mobility of people and goods has a very high societal cost in terms of traffic congestion and of fatalities and injured people every year. The management of a road network needs efficient ways for assessment at minimal costs. Road monitoring is a relevant part of road management, especially for safety, optimal traffic flow and for investigating new sustainable transport patterns. On the road side, there are several technologies used for collecting detection and surveillance information: sophisticated automated systems such as in-roadway or over-roadway sensors, closed circuit television (CCTV) system for viewing real-time video images of the roadway or road weather information systems for monitoring pavement and weather. Current monitoring systems based on video lack of optimal usage of networks and are difficult to be extended efficiently.

Project ORUSSI (Optimal Road sURveillance System based on Scalable video) focuses on road monitoring through a network of roadside sensors (mainly cameras) that can be dynamically deployed and added to the surveillance systems in an efficient way. The main objective of the project is to develop an optimized platform offering innovative real-time media (video and data) applications for road monitoring in real scenarios. The project will develop a novel platform based on the synergetic bundling of current research results in the field of semantic transcoding, the recently approved standard Scalable Video Coding standard (SVC), wireless communication and roadside equipment.

In the scope of ORUSSI project, we present an embedded solution of video analysis for traffic surveillance and modeling. Our solution exploits the Axis Development Platform, a framework produced by Axis(tm) intendend for the development of embedded video analysis on several Axis camera servers. These smart cameras provide a low-powered hardware platform based on ARTPEC-3 processor, which are capable of running customized applications specifically written for this architecture. The particular hardware platform, which impose several programming constraints (the processor has no FPU and memory buffers must be aligned for performance reasons), together with the absence of high-level image processing libraries make the development of effective computer vision algorithms a challenging task.

The goal of the presented prototype is to be able to stream analytic information about the observed scenes in a textual, descriptive format, so to reduce the bandwidth consumption and to distribute the computational cost amongst the (smart) nodes of an hypothetical surveillance network. As a textual output format, our final solution is going to exploit the standard protocol defined by ONVIF, an open industry forum promoted by Axis, Bosch and Sony, now boasting 17 full members and 22 contributing members amongst the most known tech companies (not counting the 240 user members). The ONVIF forum aims at the standardization of communication between IP-based physical security devices. To this end, it issues the specification of an XML-based protocol that can be used to describe the audio/video stream properties, like for example the annotations produced by a video analysis application.

VirtualLife – an innovative virtual framework for promoting cultural heritage

Presented by Nergal Srl (Project Coordinator of VirtualLife) and Panebarco di D. Panebarco & C. sas (Exploitation Partner within VirtualLife Consortium)

VirtualLife is an experimental and innovative framework developed within a project co-funded by EC under FP7-ICT Networked Media (the full project name is VirtualLife - Secure, Trusted and Legally Ruled Collaboration Environment in VirtualLife FP7-216064). VirtualLife framework contains advanced tools and options for creating 3d immersive and collaborative on line applications. VirtualLife is not solely a virtual world, nor a stand-alone application, it is a scalable and customizable platform containing some basic modules and based on some fundamental innovative pillars (peer-to-peer architecture, expandable and sophisticated scripting language, legal framework, secure communication infrastructure and finally the concept of virtual identity bound to the real one); thanks to its extreme flexibility, additional modules can be built on top of it on demand.

The workshop will include a detailed overview of the platform and a live demo session of it.

Multidisciplinary assessment of historic centres through remote sensing, direct survey and GIS approach

Maurizio Indirli, Elena Candigliota, Francesco Immordino, Lorenzo Moretti (UTSISM, ENEA Bologna)

Dante Abate, Graziano Furini, Samuele Pierattini (UTICT, ENEA Bologna)

Augusto Screpanti (UTPRA, ENEA Roma)

Matteo Angelini, Teresa Gambatesa, Chiara Massaia (Master in “Bio-sustainable Architecture”, University of Bologna)

About two years after the April 6th, 2009 Abruzzo (Italy) seismic event, a scientific team set up by ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) with Universities of Pescara-Chieti, Naples “Federico II” and Ferrara visited the Municipality of Arsità (district of Teramo), a small town damaged by the earthquake, to show its resources for training and demonstration activities within the Master in “Bio-sustainable Architecture” of University of Bologna.

The main goal of the investigation was to show the effectiveness of a multidisciplinary prompt approach, based on the simultaneous application of updated remote sensing technologies and skills, together with quick procedures for survey and vulnerability evaluation, in order to check hazard, vulnerability and risk due to natural disasters (mainly earthquake and landslide) in the historical center, and propose mitigation actions and urban habitat rehabilitation strategies.

In a one-week stay, a group of about twenty researchers and stage graduates (architects, structural engineers, geologists, remote sensing experts, art historians, and other technicians) worked hardy in multi-faceted activities,

as landscape analyses (to identify hazard phenomena through images in great scale), surveys (topography, damage, vulnerability, maintenance, materials features and architectural details of buildings, open space and viability), urban planning, and infrastructure characteristics.

In this context, image processing data (satellite and aerial photos) drove to the characterization of the study area both in synoptic and multi-temporal mode, in order to extract themes such as landscape, land use, morphology, construction aggregates, etc., and check/correct the maps provided by the municipality. The topographic survey consisted firstly by a set of about ten points along the city center main street, measured by DGPS (Differential Global Positioning System), in order to provide sharp geographic coordinates; moreover, a Laser Scanner survey has been done, aiming to: build up a high-definition three-dimensional database and create a volumetric model of the historic center; document the conservation state of the front façade of each construction along the principal streets; obtain images of the damaged buildings for cracks analysis. From the acquired point cloud, it will be also possible to extract CAD drawings (prospects, plans, sections) as well as high definition ortho-photos of the digitized buildings from multiple point of views.

Another engaging work carried out by the researchers and the stage graduates has been to fill up several forms to evaluate damage/vulnerability/maintenance of masonry construction aggregates and structural units present in the Arsitia historic centre. The energy aspects of the built environment have been also taken into account.

The in situ investigation allowed to collect a lot of data at different levels, which necessitate a well organized storage: remote sensing, DGPS, historic, geologic, statistic, architectonic, structural, urban planning, infrastructure, etc. Therefore, a GIS (Geographical Information System) digitized database and building inventory will be now implemented, with the aim to describe, analyze, question and represent all the different layers of the information.

In fact, when a multidisciplinary approach is followed in the study, as in our case, the geo-database surely represents the best solution and synthesis, providing an updated "vision" of the territory, which is always complex and stratified, made of people, history and culture, also for the little village of Arsitia.

Finally, all the materials, present in the geo-database, will be available on line to the researchers, for immediate consultation, modification, update and query.

In addition to the authors, the working group is composed by Roberta Chiarini, Stefania Bruni, Fabio Geremei, Maria Anna Segreto, Giuseppe Nigliaccio, ENEA Bologna; Enrico Miccadei, Samuele Biondi, Enrico Spacone, Matteo Cavalera, University of Chieti-Pescara; Antonio Formisano, Gilda Florio, Antonio Fornaro, Roberta Forni, University of Naples; Carmela Vaccaro, University of Ferrara.

Processing Cathodoluminescence imagery in ancient material analysis

Rémy Chapoulie, Yannick Lefrais, Nadia Cantin, Béatrice Robert, Agnès Rohfritsch, Renaud Joannes-Boyau
IRAMAT-CRP2A UMR 5060 CNRS, Université Bordeaux
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Cathodoluminescence (CL) is quite a well-known phenomenon which can find applications in the study of cultural heritage materials such as ceramic, glass, stone... The classical approach when investigating the nature of these ancient materials is mainly to use petrographic microscopy, X ray diffraction and scanning electron microscopy with energy dispersive X ray spectrometry. To these methods is added the cathodoluminescence imagery which today appears as compulsory, notably for any ceramic study when provenance and making processes are searched for. Applications to ceramic series from Peru (Mochica period) and from Syria (chalcolithic and first millennium BC period) are here shown. Some more exotic materials like marine shells from the antique port of Delos are presented; they will be used to produce radiocarbon dates only if we can demonstrate their structure is homogeneous. Another specific case concerns the chemical nature and the making of glass pearls from Quebec (17th c. AD) which were used as exchange money against furs.

This is a methodological aspect which is here enhanced as it is the whole investigation process which is renewed. In each case, the CL imagery proves essential to bring data that the human eye could hardly detect or that would be completely overlooked with the afore-mentioned methods.

Tutorials

September 13, Faculty of Preservation of the Cultural Heritage, via Mariani 5

Image and Video Descriptors

Lecturer: Abdenour Hadid
 Machine Vision Group, Dept. of Electrical and Information Engineering,
 University of Oulu, Finland
<http://www.ee.oulu.fi/~hadid/>

Developing pattern recognition systems involves two crucial issues: image representation and classifier design. The aim of image representation is to derive a set of features from the raw images which minimizes the intra-class variations (i.e. within instances of a same object) and maximizes the extra-class variations (i.e. between images of different objects). Obviously, if inadequate representations are adopted, even the most sophisticated classifiers fail to accomplish the recognition task. Therefore, it is important to carefully decide on what representation to adopt when designing pattern recognition systems. Ideally, the representation should: (i) discriminate different objects well while tolerating within-class variations; (ii) be easily extracted from the raw images/videos in order to allow fast processing; and (iii) lie in a low dimensional space (short vector length) in order to avoid a computationally expensive classifier. Naturally, it is not easy to find features which meet all these criteria because of the large variability in object appearances due to different imaging factors such as scale, orientation, pose, lighting conditions, etc. Thus, a key issue in pattern recognition and computer vision is finding efficient image and video descriptors.

Feature (or descriptor) extraction from images and videos is indeed a very crucial task in almost all computer vision systems. It consists of extracting characteristics describing important information in the images and videos. In literature, different global (or holistic) methods such as Principal Component Analysis (PCA) have been widely studied and applied but lately local descriptors (such as LBPWLD, LPQ, SIFT, Gabor, DCT and HOG) have gained more attention due to their robustness to challenges such as pose and illumination changes. This tutorial gives an exhaustive overview of different image and video descriptors which can be found in literature with an emphasis on the most recent developments in the field. The tutorial will then focus on one or two state-of-the-art descriptors to demonstrate step by step how to successfully apply them to various computer vision problems such as biometrics, texture analysis, image and video retrieval, motion and activity analysis, human-computer interaction etc. The tutorial will also address the emerging applications and recent use of texture features in pattern analysis especially from video sequences.

To explain and demonstrate the use of image and video descriptors, the local binary pattern (LBP) operator will be chosen as an example of methods for computing descriptors. LBP is shown to be very efficient in describing image and video appearances and provides outstanding results in representing and analyzing different patterns in both still images and video sequences. The LBP operator is defined as a grayscale invariant texture measure, derived from a general definition of texture in a local neighborhood. Due to its discriminative power and computational simplicity, the LBP texture operator has become a popular approach in various applications, including visual inspection, image retrieval, remote sensing, biomedical image analysis, face image analysis, motion analysis, environment modeling, and outdoor scene analysis. After the presentation, the participants will become aware of the state-of-the-art in image and video descriptors and their development in computer vision. Particularly, they will understand the fundamental theory behind Local Binary Patterns (LBP). They will also be advised on effective and proper use of LBP in various applications.

Short Biography



Adj. Prof. Abdenour Hadid received his Engineer Diploma in Computing from the National Institute of Informatics (INI, Algiers), in 1997, and the Doctor of Science in Technology degree in electrical and information engineering from the University of Oulu, Finland, in 2005. Now, he is an Adjunct Professor and senior researcher in the Machine Vision Group, University of Oulu. His research interests include: biometrics and facial image analysis, local binary patterns, manifold learning, human-machine interaction, and mobile applications. He has authored several papers in international conferences and journals, and served as a reviewer for many international conferences and journals. He is a member of the Pattern Recognition Society of Finland and the international Association for Pattern Recognition (IAPR).

He served as a member of the organizing committee of several international workshops. He gave several invited talks and tutorials in international events. He has been visiting the Institute of Automation at the Chinese Academy of Science (Beijing, China) in spring 2006, the Institute of Industrial Science at the University of Tokyo (Tokyo, Japan) in summer 2009, and Eurecom Institute at Sophia Antipolis (France) in summer 2010. He is currently coauthoring a Springer book on Computer Vision Using Local Binary Patterns that will be published in spring 2011.

Beyond Features: Similarity-Based Pattern Analysis and Recognition

Lecturers: Edwin R. Hancock, Fellow, IAPR
 Vittorio Murino, Fellow, IAPR, Senior Member, IEEE
 Marcello Pelillo, Fellow, IAPR, Senior Member, IEEE

Traditional pattern recognition techniques are intimately linked to the notion of "feature spaces." Adopting this view, each object is described in terms of a vector of numerical attributes and is therefore mapped to a point in a Euclidean (geometric) vector space so that the distances between the points reflect the observed (dis)similarities between the respective objects. This kind of representation is attractive because geometric spaces offer powerful analytical as well as computational tools that are simply not available in other representations. Indeed, classical pattern recognition methods are tightly related to geometrical concepts and numerous powerful tools have been developed during the last few decades, starting from the maximal likelihood method in the 1920's, to perceptrons in the 1960's, to kernel machines in the 1990's.

However, the geometric approach suffers from a major intrinsic limitation, which concerns the representational power of vectorial, feature-based descriptions. In fact, there are numerous application domains where either it is not possible to find satisfactory features or they are inefficient for learning purposes. This modeling difficulty typically occurs in cases when experts cannot define features in a straightforward way (e.g., protein descriptors vs. alignments), when data are high dimensional (e.g., images), when features consist of both numerical and categorical variables (e.g., person data, like weight, sex, eye color, etc.), and in the presence of missing or inhomogeneous data. But, probably, this situation arises most commonly when objects are described in terms of structural properties, such as parts and relations between parts, as is the case in shape recognition.

In the last few years, interest around purely similarity-based techniques has grown considerably. For example, within the supervised learning paradigm (where expert-labeled training data is assumed to be available) the now famous "kernel trick" shifts the focus from the choice of an appropriate set of features to the choice of a suitable kernel, which is related to object similarities. However, this shift of focus is only partial, as the classical interpretation of the notion of a kernel is that it provides an implicit transformation of the feature space rather than a purely similarity-based representation. Similarly, in the unsupervised domain, there has been an increasing interest around pairwise or even multiway algorithms, such as spectral and graph-theoretic clustering methods, which avoid the use of features altogether.

By departing from vector-space representations one is confronted with the challenging problem of dealing with (dis)similarities that do not necessarily possess the Euclidean behavior or not even obey the requirements of a metric. The lack of the Euclidean and/or metric properties undermines the very foundations of traditional pattern recognition theories and algorithms, and poses totally new theoretical/computational questions and challenges. The EU-FP7 SIMBAD project (<http://simbad-fp7.eu>) represents the first systematic attempt at bringing to full maturation a paradigm shift that is currently just emerging within the pattern recognition and machine learning domains, where researchers are becoming increasingly aware of the importance of similarity information per se, as opposed to the classical (feature-based) approach.

The goal of this tutorial is to offer an introduction to the latest developments achieved within SIMBAD in the area of similarity-based pattern recognition and to provide a critical overview of their main applications in computer vision and pattern recognition. The presentation will revolve around two main themes, which basically correspond to the two fundamental questions that arise when abandoning the realm of vectorial, feature-based representations, namely:

- How can one obtain suitable similarity information from data representations that are more powerful than, or simply different from, the vectorial?
- How can similarity information be used in order to perform learning and classification tasks?

Topics covered

1. Introduction to similarity-based pattern recognition
2. Deriving similarities for non-vectorial data
 - Hybrid generative/discriminative classification
 - Generative kernels
3. Imposing geometricity on non-geometric similarities
 - Embedding and rectifying non-metric similarity data
 - Characterising graphs and hypergraphs for clustering and classification (and links with random walks)
 - Complexity characterizations of relational structures
 - Graph and hypergraph matching
4. Learning with non-(geo)metric similarities
 - Game-theoretic models of pattern recognition
 - Polymatrix games and contextual pattern recognition
 - Evolutionary games and data clustering
5. Applications to MRI image analysis

Lecturers

Edwin R. Hancock
Department of Computer Science - University of York, UK

Vittorio Murino
1. Dipartimento di Informatica, Università di Verona - Strada Le Grazie 15, 37134 Verona, Italy
2. Istituto Italiano di Tecnologia (IIT) - Via Morego 30, 16163 Genova, Italy

Marcello Pelillo
Dipartimento di Informatica - Università Ca' Foscari di Venezia - Via Torino 155 – 30172 Venezia Mestre, Italy

Brief resumé of lecturers

Edwin R. Hancock holds a BSc degree in physics (1977), a PhD degree in high-energy physics (1981) and a D.Sc. Degree (2008) from the University of Durham. From 1981-1991 he worked as a researcher in the fields of high-energy nuclear physics and pattern recognition at the Rutherford-Appleton Laboratory (now the Central Research Laboratory of the Research Councils). During this period, he also held adjunct teaching posts at the University of Surrey and the Open University. In 1991, he moved to the University of York as a lecturer in the Department of Computer Science, where he has held a senior professorial appointment in Computer Vision since 1998. He leads a group of some 30 faculty, research staff, and PhD students working in the areas of computer vision and pattern recognition.

His main research interests are in the use of optimization and probabilistic methods for high and intermediate level vision. He is also interested in the methodology of structural and statistical pattern recognition. He is currently working on graph matching, shape-from-X, image databases, and statistical learning theory. His work has found applications in areas such as radar terrain analysis, seismic section analysis, remote sensing, and medical imaging. He has published about 138 journal papers and 550 refereed conference publications. He was awarded the Pattern Recognition Society medal in 1991 and an outstanding paper award in 1997 by the journal Pattern Recognition. He has also received best paper prizes at CAIP 2001, ACCV 2002, ICPR 2006, BMVC 2007 and ICIAP 2009. In 2009 he was awarded a Royal Society Wolfson Research Merit Award. In 1998, he became a fellow of the International Association for Pattern Recognition. He is also a fellow of the Institute of Physics, the Institute of Engineering and Technology, and the British Computer Society. He has been a member of the editorial boards of the journals IEEE Transactions on Pattern Analysis and Machine Intelligence, Pattern Recognition, Computer Vision and Image Understanding, and Image and Vision Computing. In 2006, he was appointed as the founding editor-in-chief of the IET Computer Vision Journal. He has been conference chair for BMVC 1994, Track Chair for ICPR 2004 and Area Chair at ECCV 2006 and CVPR 2008, and in 1997 established the EMMCVPR workshop series.

Vittorio Murino is full professor at the University of Verona, Italy. He took the Laurea degree in Electronic Engineering in 1989 and the Ph.D. in Electronic Engineering and Computer Science in 1993 at the University of Genova, Italy. He held a post-doctoral position from 1993 to 1995, working in the Signal Processing and Understanding Group of the Dept. of Biophysical and Electronic Engineering of the University of Genova as supervisor of research activities on image processing for object recognition and pattern classification in underwater environments. From 1995 to 1998, he was assistant professor at the Dept. of Mathematics and Computer Science of the University of Udine, Italy. Since 1998 he works at the University of Verona where he founded and is responsible of the VIPS laboratory (Vision, Image Processing, and Sound). Currently, he is also establishing and managing the PLUS (Pattern analysis, Learning, and image Understanding Systems) laboratory in the Istituto Italiano di Tecnologia (IIT), Genova, Italy. He was among the founders and chairman of the Department of Computer Science of the University of Verona from 2001 to 2007.

He is scientific supervisor of several national and European projects, and evaluator of EU project proposals related to different scientific programmes and frameworks. His main research interests include: computer vision and pattern recognition, in particular, probabilistic techniques for image and video processing, with applications on video surveillance, biomedical image analysis and, recently, bioinformatics. Prof. Murino is author or co-author of more than 200 papers published in refereed journals and international conferences, reviewer for several international journals, and member of the technical committees of important conferences (ECCV, ICPR, ICIP). He is also member of the editorial board of the following journals: Pattern Recognition, IEEE Transactions on Systems Man, and Cybernetics, Pattern Analysis and Applications, Machine Vision & Applications. Finally, prof. Murino is also senior member of the IEEE and Fellow of the IAPR.

Marcello Pelillo joined in 1991 the faculty of the University of Bari, Italy, as an assistant professor of computer science. Since 1995, he has been with the University of Venice, Italy, where he is currently a professor of computer science and leads the Computer Vision and Pattern Recognition group. He held visiting research positions at Yale University, the University College London, McGill University, the University of Vienna, York University (UK), and the National ICT Australia (NICTA). Prof. Pelillo has published more than a hundred technical papers in refereed journals, handbooks, and conference proceedings in the areas of computer vision, pattern recognition and neural computation. He has been actively involved in the organization of several scientific meetings including the NIPS*99 Workshop on "Complexity and Neural Computation: The Average and the Worst Case," the 2008 International Workshop on Computer Vision (<http://dsi.unive.it/~iwcv>) and the ICML 2010 Workshop on "Learning in non-(geo)metric spaces." In 1997, he co-established a new series of international conferences devoted to energy minimization methods in computer vision and pattern recognition (EMMCVPR), which has now reached the seventh edition. He was a guest coeditor of four journal special issues: two for IEEE Transactions on Pattern Analysis and Machine Intelligence and two for Pattern Recognition, the last one, in 2006, being devoted to "similarity-based pattern recognition." He serves on the editorial board for the journals IEEE Transactions on Pattern Analysis and Machine Intelligence and Pattern Recognition, and is regularly on the program committees of the major international conferences and workshops of his fields.

He is (or has been) scientific coordinator of several research projects, including SIMBAD, an EU-FP7 project devoted to similarity-based pattern analysis and recognition (<http://simbad-fp7.eu>). Prof. Pelillo is a Fellow of the IAPR and a Senior Member of the IEEE.

Video analytics on reactive camera networks

Lecturer: Christian Micheloni
 Università degli Studi di Udine
 Dipartimento di Matematica e Informatica
 Via delle Scienze 206, Udine, Italy

Video-surveillance networks are usually based on static cameras that always provide footages with the same point of view and resolution. Pan-Tilt-Zoom (PTZ) cameras are able to dynamically modify their field of view. This functionality introduces new capabilities to camera networks such as increasing the resolution of moving targets and adapting the sensor coverage. On the other hand, PTZ functionality requires solutions to new challenges such as controlling the PTZ parameters, estimating the ego-motion of the cameras and calibrating the moving cameras. This tutorial provides an overview of the main video processing techniques and the current trends in this active

field of research. Autonomous PTZ cameras mainly aim to detect and track targets with the largest possible resolution. The most recent techniques for image registration and ego-motion compensation will be presented for detection purposes. Feature tracking and clustering will be introduced for object tracking. Furthermore, since autonomous PTZ operation is activated once the network detects and identifies an object as sensible target and requires accurate control of the PTZ parameters and coordination among the cameras in the network, cooperative localisation and tracking methods will be presented. In particular, this tutorial will propose a multi-camera approach to jointly compute the target's properties such as ground-plane position and velocity. Hence, stereo vision, exploiting PTZ cameras with wide baselines deployments, will be proposed to compute 3D target localisation.

Outline

- Introduction
- Low Level processing (object segmentation, object detection, etc.)
- Image differencing (frame-by-frame Vs. frame to background)
- Image registration
 - o Translation
 - o Affine
 - o Perspective
- Feature based image registration
- o Feature tracking
- o Outlier detection
- o Transform computation
- Feature based tracking
- Stereo Vision on PTZ cameras
 - o Wide base-line problems
 - o Homographies and chain of homographies
 - o Stereo localization

Short biography



Christian Micheloni (M.Sc.'02, Ph.D. '06) received the Laurea degree (cum Laude) as well as a Ph.D. in Computer Science respectively in 2002 and 2006 from the University of Udine, Udine, Italy. He is assistant professor at the University of Udine. Since 2000 he has taken part to European research being under contract for several European Projects. He has co-authored more than 60 scientific works published in International Journals and Refereed International Conferences. He serves as a reviewer for several International Journals and Conferences. Dr. Micheloni's main interests involve active vision for scene understanding by means of images acquired by moving cameras, neural networks for the classification and recognition of moving objects. He is also interested in pattern recognition techniques for trajectory analysis and clustering, for camera parameters configuration and recently for reactive networks management (reconfiguration and cooperation). All these techniques are mainly developed and applied for video surveillance purposes. He is member of the International Association of Pattern Recognition (IAPR) and member of the IEEE.

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**1st International Workshop
on Pattern Recognition in Proteomics, Structural Biology and Bioinformatics
PR PS BB 2011**

September 13, 2011

Ravenna, Italy

<http://avires.dimi.uniud.it/iciap2011/>

MOTIVATIONS AND AIMS

Pattern recognition, after many years of studies and researches successfully developed in several applicative areas, has now know-how, computing strategies, technologies, methods and tools to exploit in new fields such as proteomics, structural biology and bioinformatics.

PR PS BB 2011 integrates and continues the tradition of the international conferences on image analysis and processing, one of the longest running international conferences, that started in Italy, in 1980. Through its informal nature, the workshop is intended to become the foremost platform for exchanging ideas and giving to top researchers, practitioners and students from around the world, of the computing and biological communities, excellent opportunities to meet, interact and rise synergies. The amount and complexity of bioinformatics data such as DNA and protein sequences, genetic information, biomedical text and molecular data had a sort of explosion in the past decade. As of Tuesday Feb 15, 2011 at 4 PM PST there are 71264 experimentally determined 3D structures of protein deposited in the Protein Data Bank (with an increment of about 700 new molecules for month). The importance of the study such amounts of data, for the analysis of structural building blocks, their comparison and their classification are instrumental to practical problems of the maximum impact, such as the design of a small molecule to bind a known protein or the scan of drugs libraries to detect a suitable inhibitor for a target molecule.

Advanced pattern recognition methods can also have a significant role in high-throughput functional genomics and system biology, where the classification of complex large scale expression profiles, and their link with motif discovery and inference of gene regulatory network, is a major research challenge in the field of Computational Biology. However, current pattern recognition techniques to tackle these huge data are still not sufficient: the development of approaches for the improvement of the current performances is the scope of the workshop.

Topics:

- Alignment and comparison of biological structures
- All-to-all comparison and research of structural motifs
- Blocks retrieval in databases
- Classification of known structures
- Computational and comparative genomics
- Docking between proteins and between protein and ligand
- Folding and prediction from amino sequences
- Morphological study for molecules interaction and comparison
- Prediction of links between protein and potential drugs
- Structural genomics and proteomics
- Pathway and network analysis
- Gene and protein expression analysis and classification
- Pattern discovery and motif detection
- High content screening and analysis

ORGANIZATION

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Alfredo Petrosino, Parthenope University

WORKSHOP VENUE

The workshop takes place at the Casa Matha building. Casa Matha is the oldest establishment of university education in Ravenna and is located in the center of the town near Piazza del Popolo.



Casa Matha, Ravenna

Scientific Program

9.00-9.30 *Opening addresses*

Invited talks

9.30-10.15 *Recent developments on the inverse Ising problem* - Erik Aurell

10.15-11.00 *Better than Chance: the importance of null models* - Kevin Karplus

11.00-11.20 Coffee break

11.20-12.00 *Large scale annotation of proteins with labelling methods* - Rita Casadio

Oral presentations

12.00-12.20 *Segmentation, tracking and lineage analysis of yeast cells in bright field microscopy images* - R. La Brocca, F. Menolascina, D. di Bernardo, C. Sansone

12.20-12.40 *A comparative study of Gaussian Graphical Model approaches for genomic data* - P.F. Stifanelli, T.M. Creanza, R. Anglani, V.C. Liuzzi, S. Mukherjee, N. Ancona

12.40-13.00 *A Variational Model for Joint Segmentation of Copy Number Data* - S. Morganella, M. Ceccarelli

13.00-15.00 Lunch

15.00-15.20 *Investigating bias in semantic similarity measures for analysis of protein interactions* - M. Mina, P. H. Guzzi

15.20-15.40 *Protein structure analysis through Hough transform and range tree* - V. Cantoni, E. Mattia

15.40-16.00 *Protein motif retrieval through secondary structure spatial co-occurrences* - V. Cantoni, A. Ferone, A. Petrosino

16.00-16.20 *Protein Gaussian Image (PGI): a protein structural representation based on the spatial attitude of secondary structure* - V. Cantoni, A. Ferone, R. Oliva, A. Petrosino

16.20-16.40 *A new approach for binding sites screening in protein-ligand docking* - V. Cantoni, A. Gaggia, L. Lombardi

16.40-17.00 Coffee break

17.00-17.20 *Analysis of geometrical and topological aptitude for protein-protein interaction* - V. Cantoni, R. Gatti, L. Lombardi

17.20-17.40 *Continuous global optimization for protein structure analysis* - P. Bertolazzi, C. Guerra, F. Lampariello, G. Liuzzi

17.40-18.00 *Functional-theory and algebraic descriptions of macromolecules and proteins dynamical properties* - G. Maino

Cultural events

September 14 – 16, 2011, Congress Palace

- **Photo exhibition:**

"Il vero viaggio non sta nel cercare nuove terre, ma nel guardare con occhi nuovi"

"The true journey is not looking for new earths, but looking with new eyes", A unusual vision of Ravenna, by Sara Armaroli Neel

- **Art&Vision**, by Donatella Lombardo, Mariapaola Monti and Liu Wan

Information about both exhibitions and reproductions of paintings and photographs are available to ICIAP participants at the website <http://www.nerea-aida.it>

September 15, 2011, Casa Matha, 5 p.m.

- *"From Ravenna to Venice. Film-making for the Preservation of the Cultural Heritage and of the Environment"*, presentation by Eleonora Cavallini, University of Bologna, Ravenna site

- Projection of the cartoon 3D film *"The Roman harbor of Classe"*, realized and produced by Giuseppe Rossini

- Projection of the film *"Don't violate Mother earth"*, screenplay by Eleonora Cavallini, direction by Bibi Bozzato

How To Reach Ravenna

Ravenna is at about 75 km from Bologna, 35 km from Forlì and 50 km from Rimini.

- **By air:**

Bologna, Forlì, Rimini and Venice airports run main line and charter services among the major Italian and European cities.

From each one of these airports you can rent a car (see how to reach Ravenna by car) or go to the railway station (by bus) and take a train to Ravenna.

- **By train:**

Trains currently run between Bologna, Rimini, Forlì, Venice and Ravenna. Please, check timetables and travel times on <http://www.trenitalia.com/en/index.html>

- **By car:**

From Bologna: Motorway (in Italian Autostrada) A14; about 6 km after Imola exit, follow the deviation to Ravenna.

From Rimini: Motorway (in Italian Autostrada) A14. Leave the motorway at Cesena Nord and take the "Superstrada" E45.

From Forlì: State road SS 67 Tosco-Romagnola

From Rome: "Superstrada" E45

From Venice: State road SS 309 Romea.

Conference Locations

- Facoltà di Conservazione dei Beni Culturali, Palazzo Corradini, Via Mariani 5, Ravenna
- Casa Matha, Piazza Andrea Costa 3, Ravenna
- Palazzo dei Congressi, Largo Firenze 1, Ravenna

Ravenna Monuments

Monuments in the Unesco World Heritage List

- A . Mausoleum of Galla Placidia (5th C.)
Contains the earliest wall mosaics in Ravenna.
- B . Neonian Baptistry (5th C.)
Contains Greco-Roman style mosaics.
- C . Basilica of S. Apollinare Nuovo
(6th C.). Originally Theodoric's palatine church. Its wall mosaics, including the ceremonial processions of martyrs and female saints, rank among the largest to have come down to us from antiquity.
- D . Arian Baptistry (6th C.)
- E . Cappella di S. Andrea (5th C.)
- F . Mausoleum of Theodoric (6th C.)
Built by the King himself, its monolithic dome is in Istria stone.
- G . Church of S. Vitale (6th C.)
One of the marvels of Western Byzantium. Marbles, capitals and mosaics including depictions of the retinues of Justinian and Theodora.
- H . Basilica of S. Apollinare in Classe (6th C.) Set in a green landscape, it is grandiose for its architecture and its mosaics depicting the Transfiguration.

Monuments

- 1 . Rocca Brancaleone (15th C.)
- 2 . National Museum
Remarkable Roman, Early-Christian, Byzantine and Mediaeval collections.
- 3 . Church of Sant'Eufemia (1742-1747)
The church is decorated with eighteenth century paintings.
- 4 . Domus of the Stone Carpets (5-6th C. AD.)

- entrance church of S. Eufemia
Magnificent floor mosaics of a large Byzantine Palace covering about 800 square metres.
- 5 . City Tower (12th C.)
- 6 . Church of the Holy Spirit
- 7 . Basilica of San Giovanni Evangelista (5th C.)
- 8 . Church of Intercession
Consecrated 1728.
- 9 . Alighieri Theatre (19th C.)
- 10 . Palazzetto Veneziano (15th C.)
Town Hall.
- 11 . Palazzo del Mutilato (sala mosaici)
- 12 . Dante's Tomb (1780) and Dante Museum
- 13 . Church of S. Francesco (5th C.)
- 14 . The so-called Palace of Theodoric (7-8th C.)
- 15 . Rasi Theatre
- 16 . City Art Museum - Loggetta Lombardesca (1508)
Home of the museum and of the Municipal Pictures Gallery.
- 17 . Basilica of S. Maria in Porto (1533-1606)
- 18 . Public Park
- 19 . Planetarium
- 20 . Duomo (1734) and Archiepiscopal Museum. The Duomo contains an ambo dating back to the time of Bishop Agnellus (6th C.), 5th-century sarcophagi, and a 10th-century crypt. The Museum houses the "ivory throne" which belonged to Bishop Maximian (6th C.).
- 21 . Classense Library (16th C.)
- 22 . Church of San Nicolò (8th C.)
A very large church with a single aisle, which became "la Cavallerizza", a military riding stable.
- 23 . Church of S. Agata Maggiore (5th C.)
- 24 . Park of Peace
Contemporary mosaics by artists from various nations.

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