
# 18TH INTERNATIONAL CONFERENCE ON IMAGE ANALYSIS AND PROCESSING

7-11 SEPTEMBER 2015
GENOVA, ITALY

Photos: Agnese Abrusci, Italian Institute of Technology, Italy

# Welcome to Genova!

ICIAP 2015, The International Conference on Image Analysis and Processing (www.iciap2015.eu) is the eighteenth edition of a series of conferences promoted biennially by the Italian Member Society (GIRPR) of the International Association for Pattern Recognition (IAPR). The conference traditionally covers both classic and most recent trends in computer vision, pattern recognition and image processing, addressing both theoretical and applicative aspects.

The first edition was held in Pavia in 1980, with subsequent conferences in Selva di Fasano in 1982, Rapallo in 1987, Cefalù in 1987, Positano in 1989, Como in 1991, Bari in 1993, Sanremo in 1995, Firenze in 1997, Venezia in 1999, Palermo in 2001, Mantova in 2003, Cagliari in 2005, Modena in 2007, Vietri sul Mare in 2009, Ravenna in 2011, and Napoli in 2013.

The format of the conference is not changed along the years, and consists of a single-track scheme with oral and poster sessions, interleaved by a number of invited talks. Following most recent trends, we start with an invited talk, poster and oral sessions in the morning, and, after lunch time, we start with posters and invited talk, and, finally, an oral session concludes every day of the conference. This will allow a bit more flexibility for feeding our belly, after having fed our minds.

Following the Naples edition in 2013, the main conference is preceded by a series of workshops and tutorials lasting two days, 7 and 8 of September 2015.

We thank all the workshop organizers and tutorial speakers who made possible such an interesting pre-conference program. Please, have a look at the website to see their names, http://www.iciap2015.eu/program/program-workshops.html and http://www.iciap2015.eu/program/tutorials.html.

Similarly, we also subdivided the program in topic areas managed by two Area Chairs (ACs), one Italian together with a collegue from abroad, who managed the review process. The selected topic areas are: Video Analysis & Understanding, Multiview Geometry and 3D Computer Vision, Pattern Recognition and Machine Learning, Image Analysis, Detection and Recognition, Shape Analysis and Modeling, Multimedia, and Biomedical Applications. Conflict of interest was also considered, avoiding ACs and program/general chairs to manage own works.

We received 234 submissions, ultimately led to the selection of 129 high-quality manuscripts, 27 orals and 102 posters, with an overall acceptance rate of about 55% (about 11% for orals). The origin of the scholars is spread all over the world, including Algeria, Brazil, Canada, China, Colombia, Czech Republic, Egypt, Finland, France, Germany, Italy, Japan, Korea, Lebanon, Morocco, New Zealand, Pakistan, Poland, Qatar, Romania, Russia, Saudi Arabia, Spain, Switzerland, Thailand, The Netherlands, Tunisia, Turkey, United Kingdom, USA and Vietnam. The ICIAP 2015 Proceedings are published as volumes of the Lecture Notes of Computer Science (LNCS) series by Springer, and includes both main conference and workshop papers.

ICIAP 2015 is organized by the Pattern Analysis and Computer Vision (PAVIS) department (www.iit.it/pavis) of the Istituto Italiano di Tecnologia (IIT), with the valuable support of University of Genova and University of Verona, and is supported by the International Association for Pattern Recognition (IAPR), the Italian Member Society of IAPR (GIRPR), the IEEE Computer Society Technical Committee on Pattern Analysis and Machine Intelligence (TCPAMI). Moreover, it received the institutional support of Regione Liguria, Comune di Genova and Camera di Commercio of Genova.

Notable sponsorships come from several industrial partners such as Datalogic, Google, Centro Studi Gruppo Orizzonti Holding, Ansaldo Energia, Ebit Esaote, Softeco, eVS embedded Vision Systems, 3DFlow, and Camelot Biomedical Systems, as well as Istituto Italiano di Tecnologia, University of Genova and University of Verona.

The program also included six invited talks by distinguished scientists in Computer Vision Pattern Recognition and Image Analysis. We enjoyed the plenary lectures of Arnold Smeulders, University of Amsterdam (The Netherlands), Michal Irani, Weizmann Institute of Science (Israel), Bernt Schiele, Max Planck Institute for Informatics (Germany), Kristen Grauman, University of Texas at Austin (USA), Xiaogang Wang, The Chinese University of Hong Kong (China), and Samy Bengio, Google Inc. (USA), who addressed very interesting and recent research approaches and paradigms such as deep learning, big data, search and retrieval, semantic scene understanding, visual cognition and image enhancement.

I think to speak on behalf of the entire GIRPR association in commemorating with a few words professor Stefano Levialdi, who passed away recently. He was one of the "founder" members and promoter of our scientific association and of the ICIAP conferences, and we want to remember here for his career and pioneering activities in Image Analysis and Pattern Recognition.

The organization and the success of ICIAP 2015 were made possible thanks to the cooperation of many persons. Other than the Program Chairs, Enrico and Gianni, which I thank very much indeed for the support, actual help and encouragement, my special thanks goes to the Area Chairs and the Program Committee, as well as the additional reviewers. Moreover, Workshop, Tutorial, Industrial, Publicity, USA/Asia chairs, as well as all the rest of the organization figures did a truly good job in making this conference a successful one and have my full gratitude. Sponsors gave a very good and appreciated hand in alleviating the burden of the organizational costs. Last but not least, an immense thank goes to all local organizers and volunteers who helped us before and during the conference. Please, have a look at the website to see their names, http://www.iciap2015.eu/committees.html.

I hope you can fully enjoy ICIAP 2015 and the city of Genova.

**Vittorio Murino**

*ICIAP 2015 General Chair*

# Organisation

**General Chair**

Vittorio Murino - Pattern Analysis and Computer Vision (PAVIS), Istituto Italiano di Tecnologia (IIT), Italy
Department of Computer Science, University of Verona, Italy

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Enrico Puppo - University of Genova, Italy
Gianni Vernazza - University of Genova, Italy

**Organizing Institution**

Pattern Analysis and Computer Vision (PAVIS)
Istituto Italiano di Tecnologia (IIT), Genova, Italy
www.iit.it/pavis

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|---|---|
| **Workshop Chairs** | Marco Cristani - University of Verona, Italy<br>Carlo Sansone - University of Napoli "Federico II", Italy |
| **Tutorial Chair** | Alessio Del Bue - PAVIS, Istituto Italiano di Tecnologia, Italy |
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## Area Chairs

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|---|---|
| *Video Analysis & Understanding* | Rita Cucchiara -University of Modena e Reggio Emilia, Italy<br>Jordi Gonzàlez - Universitat Autònoma de Barcelona, Spain |
| *Multiview Geometry and 3D Computer Vision* | Andrea Fusiello - University of Udine, Italy<br>Michael Goesele - TU Darmstadt, Germany |
| *Pattern Recognition and Machine Learning* | Marcello Pelillo - University of Venezia, Italy<br>Tiberio Caetano - NICTA, Australia |
| *Image Analysis, Detection and Recognition* | Raimondo Schettini - University of Milano-Bicocca, Italy<br>Theo Gevers - University of Amsterdam, The Netherlands |
| *Shape Analysis and Modeling* | Leila De Floriani - University of Genova, Italy<br>Gunilla Borgefors - Uppsala University |
| *Multimedia* | Nicu Sebe - University of Trento, Italy<br>Cees Snoek - University of Amsterdam, The Netherlands |
| *Biomedical Applications* | Silvana Dellepiane - University of Genova, Italy<br>Dimitri Van De Ville - EPFL & University of Genève, Switzerland |

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Matteo Bustreo - PAVIS, Istituto Italiano di Tecnologia
Nicholas Dring - Istituto Italiano di Tecnologia
Carlos Beltran - PAVIS, Istituto Italiano di Tecnologia

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|---|---|
| **Endorsing Institutions** | International Association for Pattern Recognition (IAPR)<br>Italian Group of Researchers in Pattern Recognition (GIRPR)<br>IEEE Computer Society's Technical Committee on Pattern Analysis and Machine Intelligence (IEEE-TCPAMI) |
| **Institutional Patronage** | Istituto Italiano di Tecnologia, Italy<br>University of Genova, Italy<br>University of Verona, Italy<br>Regione Liguria<br>Comune di Genova |
| **Sponsoring and Supporting Institutions** | Istituto Italiano di Tecnologia, Italy<br>Datalogic, Italy<br>Google Inc., USA<br>Centro Studi Gruppo Orizzonti Holding, Italy<br>EBIT Esaote, Italy<br>Ansaldo Energia, Italy<br>Softeco, Italy<br>eVS embedded Vision Systems S.r.l., Italy<br>3DFlow S.r.l., Italy<br>Camelot Biomedical Systems S.r.l., Italy<br>University of Genova, Italy<br>University of Verona, Italy<br>Camera di Commercio di Genova, Italy |

**Acknowledgments** We kindly acknowledge Camera di Commercio of Genova for the availability of the conference location of "Sala delle Urla" in Stock Exchange building, and related services.

# Wi-Fi

Wireless internet connections are available on main conference and workshops/tutorials premises.

Please, note that, in the Sala delle Grida of Palazzo della Borsa (main event), every attendees/device has a different account and password to access the WiFi.

Detailed information are enclosed in the Welcome Kit.

For more information, please refer to Registration Desk.

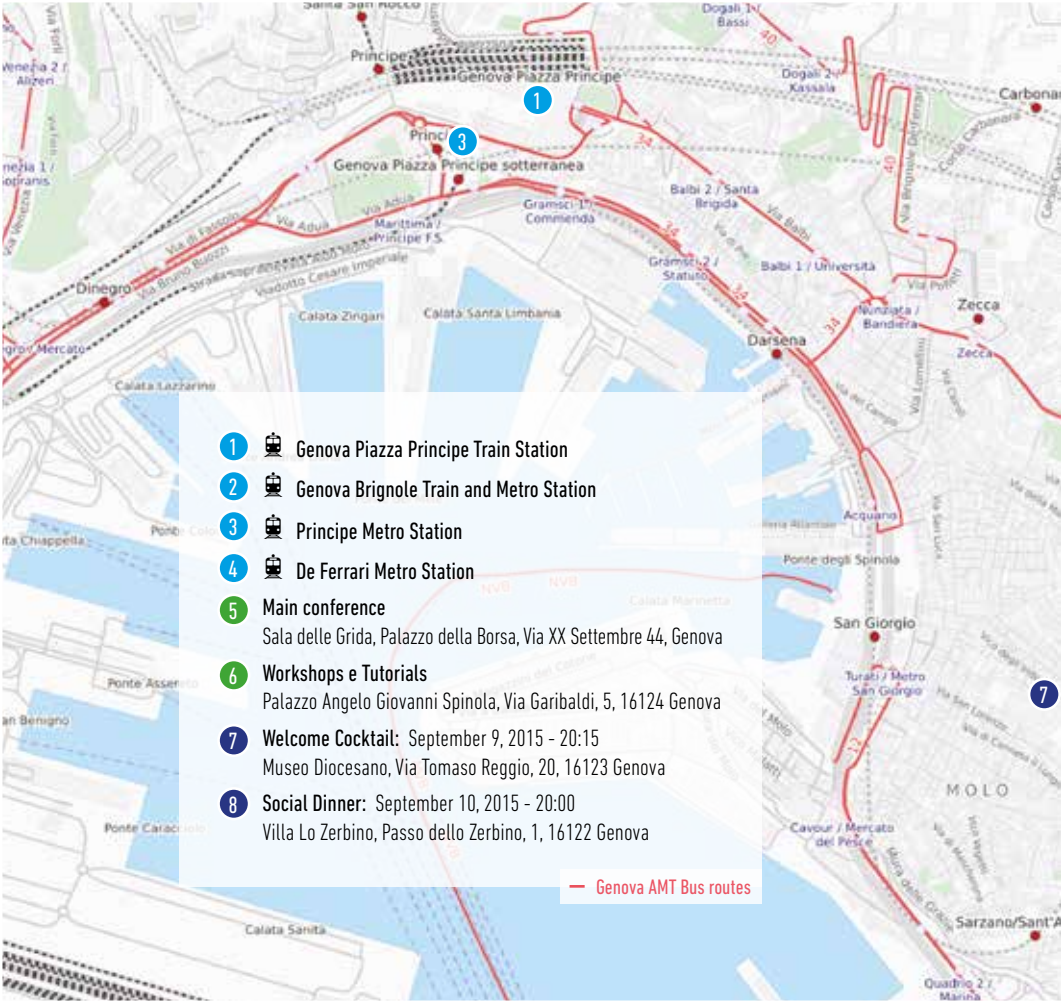
# Venues

ICIAP 2015 takes place at the Palazzo della Borsa, the former Stock Exchange Center of the city, built in 1912.
**Address** Piazza de Ferrari, Genova (Entrance nearby in Via XX settembre)

**Workshop and Tutorials** are scheduled on September 7th and 8th, 2015, and take place in Palazzo Spinola, one of the numerous historical buildings of Via Garibaldi and belonging to the UNESCO World Heritage.
**Address** Via Garibaldi 5, Genova (see map for directions).

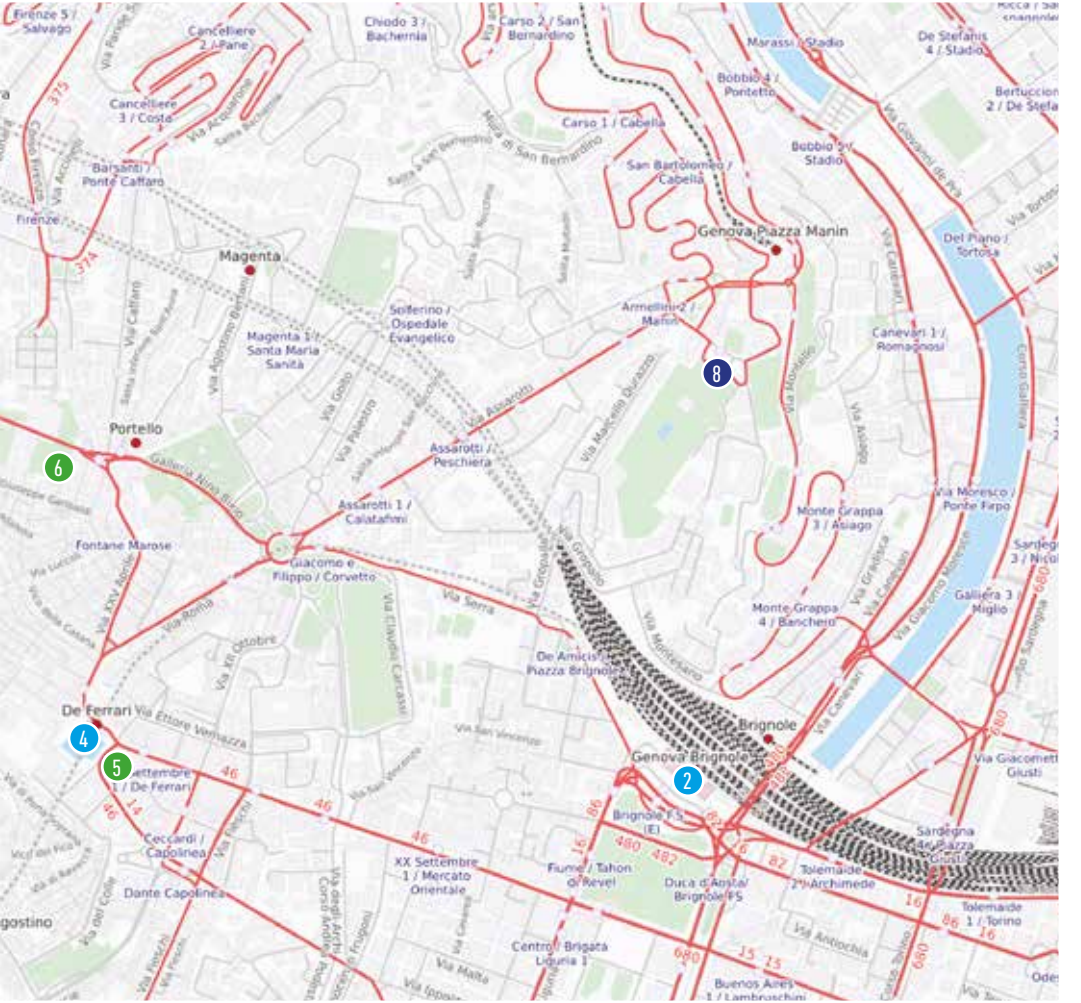
**The Welcome Cocktail** is held on Wednesday September 9 at 20:15 in Museo Diocesano, Via Tomaso Reggio 20, Genova.
The Museo Diocesano is at walking distance from Palazzo della Borsa. You need to walk to Piazza Matteotti, and facing Palazzo Ducale turn to your left. You will find yourself facing the beginning of Via San Lorenzo, a pedestrian street. Enter the first street to the right just before the beginning of Via San Lorenzo. Museo Diocesano is visible right after the bend.

**The Social Dinner** takes place on Thursday September 10 at 20:00 in Villa Lo Zerbino, Passo dello Zerbino 1, Genova.
Villa Lo Zerbino is about 20mins walk from the city centre (Piazza de Ferrari) or you can take bus number 36 in the direction of 'Fanti d'Italia' from Piazza De Ferrari or Via Roma. Otherwise from Piazza De Ferrari walk up to Via Roma, cross Piazza Corvetto, walk uphill in Via Assarotti and reach Piazza Manin. Enter the first street to the right, Villa Zerbino is after the bend.




1. Genova Piazza Principe Train Station
2. Genova Brignole Train and Metro Station
3. Principe Metro Station
4. De Ferrari Metro Station
5. **Main conference**
   Sala delle Grida, Palazzo della Borsa, Via XX Settembre 44, Genova
6. **Workshops e Tutorials**
   Palazzo Angelo Giovanni Spinola, Via Garibaldi, 5, 16124 Genova
7. **Welcome Cocktail:** September 9, 2015 - 20:15
   Museo Diocesano, Via Tomaso Reggio, 20, 16123 Genova
8. **Social Dinner:** September 10, 2015 - 20:00
   Villa Lo Zerbino, Passo dello Zerbino, 1, 16122 Genova

— Genova AMT Bus routes


Firenze 5 / Salvago
Cancelliere 2 / Pane
Chiodo 3 / Bachernia
Carso 2 / San Bernardino
Marassi / Stadio
De Stefanis 4 / Stadio
Bobbio 4 / Pontetto
Bertuccion 2 / De Stefa
Cancelliere 3 / Costa
Carso 1 / Cabella
Bobbio 3 / Stadio
Barsanti / Ponte Caffaro
San Bartolomeo / Cabella
Firenze
Genova Piazza Manin
Magenta
Del Piano / Tortosa
Solferino / Ospedale Evangelico
Armellini 2 / Martiri
Canevari 1 / Roenagnosi
Magenta 1 / Santa Maria Sanità
Portello
Assarotti / Peschiera
Assarotti 1 / Calatafimi
Monte Grappa 3 / Asiago
Via Moresco / Ponte Firpo
Fontane Marose
Giacomo e Filippo / Corvetto
Monte Grappa 4 / Banchero
Galliera 3 Miglio
De Amicis / Piazza Brignole
De Ferrari
Brignole
Genova Brignole
Via Giacometti Giusti
Brignole FS (E)
Sardegna / Piazza Giusti
Cecchardi / Capolinea
XX Settembre 1 / Mercato Orientale
Fiume / Tahon di Revel
Duca d'Aosta / Brignole FS
Tolemaide 2 / Archimede
Dante Capolinea
Tolemaide 1 / Torino
Centro / Brigata Liguria 1
Buenos Aires 1 / Lambruschini
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# Program at a glance

## Monday 7 September 2015

### Workshops

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|---|---|
| 09:30 - 18.00 | **BIOFOR 2015** INTERNATIONAL WORKSHOP ON RECENT ADVANCES IN DIGITAL SECURITY: BIOMETRICS AND FORENSICS |
| 09:00 - 12:45 | **CTMR 2015** COLOR IN TEXTURE AND MATERIAL RECOGNITION |
| 14:00 - 18.00 | **RHEUMA 2015** MEDICAL IMAGING IN RHEUMATOLOGY: ADVANCED APPLICATIONS FOR THE ANALYSIS OF INFLAMMATION AND DAMAGE IN THE RHEUMATOID JOINT |

### Tutorials

| | |
|---|---|
| 09:00 - 18:00 | STRUCTURE FROM MOTION: HISTORICAL OVERVIEW AND RECENT TRENDS |
| 14:00 - 18:00 | LIFE LONG LEARNING IN COMPUTER AND ROBOT VISION |

## Tuesday 8 September 2015

### Workshops

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|---|---|
| 09:00 - 18.00 | **ISCA 2015** IMAGE-BASED SMART CITY APPLICATION |
| 09:00 - 18:00 | **MADIMA 2015** 1ST INTERNATIONAL WORKSHOP ON MULTIMEDIA ASSISTED DIETARY MANAGEMENT |
| 09:00 - 13:30 | **SBMI 2015** SCENE BACKGROUND MODELING AND INITIALIZATION |
| 14:00 - 18.00 | **QOEM 2015** WORKSHOP ON IMAGE AND VIDEO PROCESSING FOR QUALITY OF MULTIMEDIA EXPERIENCE |

### Tutorials

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|---|---|
| 09:00 18:00 | DEEP LEARNING IN COMPUTER VISION |
| 14:00 - 18:00 | PROBING HUMAN BRAIN NETWORK ARCHITECTURE AND DYNAMICS USING MRI |

## Wednesday 9 September 2015

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|---|---|
| **09:00 - 18.00** | Exhibits (Datalogic, Evs Embedded Vision Systems, 3Dflow, Camelot Biomed) |

| | |
|---|---|
| **08:45 - 09:00** | Welcome |
| **09:00 - 09.50** | Invited Talk 1: Arnold Smeulders |
| **09:50 - 11.20** | Poster Session 1: Pattern Recognition & Machine Learning |
| **11:00 - 11:30** | Coffee Break |
| **11:30 - 13.10** | Oral Session 1: Pattern Recognition & Machine Learning |
| **13:10 - 14.30** | Lunch |
| **14:30 - 16.00** | Poster Session 2:  Image Analysis 1 |
| **15:45 - 16:15** | Coffee Break |
| **16:15 - 17:05** | Invited Talk 2: Michal Irani |
| **17:05 - 18.05** | Oral Session 2: Image Analysis 1 |
| **18:15 - 20:00** | GIRPR Meeting (Palazzo della Borsa) |
| **20:15** | Welcome Cocktail (Museo Diocesano, Via Tomaso Reggio, 20) |

## Thursday 10 September 2015

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|---|---|
| **09:00 - 18.00** | Exhibits (Datalogic, Evs Embedded Vision Systems, 3Dflow, Camelot Biomed) |

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| **09:00 - 09.50** | Invited Talk 3: Bernt Schiele |
| **09:50 - 11.20** | Poster Session 3: Image Analysis 2 |
| **11:00 - 11:30** | Coffee Break |
| **11:30 - 13:10** | Oral Session 3: Image Analysis 2 |
| **13:10 - 14.30** | Lunch |
| **14:30 - 16.00** | Poster Session 4: Shape Analysis, 3D Computer Vision & Multimedia |
| **15:45 - 16:15** | Coffee Break |
| **16:15 - 17.05** | Invited Talk 4: Kristen Grauman |
| **17:05 - 18.45** | Oral Session 4: Shape Analysis & 3D Computer Vision |
| **20:00** | Social Dinner (Villa lo Zerbino, Passo dello Zerbino,1) |

## Friday 11 September 2015

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|---|---|
| **09:00 - 16.00** | Exhibits (Datalogic, eVS embedded Vision Systems, 3DFlow, Camelot Biomed) |

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| **09:00 - 09.50** | Invited Talk 5: Xiaogang Wang |
| **09:50 11.20** | Poster Session 5: Biomedical Applications & Video Analysis |
| **11:00 - 11:30** | Coffee Break |
| **11:30 - 13:10** | Oral Session 5: Biomedical Applications |
| **13:10 - 14.30** | Lunch |
| **14:30 - 15.20** | Invited Talk 6: Samy Bengio |
| **15:20 - 16:45** | Oral Session 6: Video Analysis & Multimedia |
| **17:00** | Closing |

# Tutorials

## Structure from motion: historical overview and recent trends

### Organizer

**Andrea Fusiello,** University of Udine, Italy

### Schedule: full day 09:00-18:00

This tutorial will deal with the process of recovering the 3D position of points (structure) framed from different locations and angular attitude (motion). Historically, this issue have been dealt with in Photogrammetry since the first photographic camera was invented (~ 1840). More recently (~ 1980) Computer Vision re-discovered some of the old findings and also contributed his own results. I will try to give a unified view of the classical results from both disciplines and an outlook on recent trends.

## Life long learning in computer and robot vision

### Organizer

**Barbara Caputo** - University of Rome "La Sapienza", Italy

### Schedule: half day 14:00 – 18:00

Robots are meant to operate in the real world. However, even the best system we can engineer today is bound to fail whenever the setting is not heavily constrained. This is because the real world is generally too nuanced and unpredictable to be summarized within a limited set of specifications. There will be inevitably novel situations and the system will always have gaps or ambiguities in its own knowledge. This calls for robots able to learn continuously over time. In this tutorial I will focus mainly on the life long learning of perceptual and semantic object knowledge.

This tutorial will introduce the audience to these research threads from the point of view of computer and robot vision, identifying current trends and open issues in both communities, successful examples of cross fertilizations and identifying open challenges in the fields. Links to resources available online and ongoing research projects will be provided. For each of the topics discussed, a strong emphasis will be placed on the differences between computer and robot vision coming from the reality of the robot of having a moving body (embodiment), and its need to perform actions in its surrounding world (situatedness).

# Tutorials

## Deep Learning in Computer Vision

### Organizer

**Xiaogang Wang** - The Chinese University of Hong Kong

### Schedule: full day 09:00-18:00

Deep learning has become a major breakthrough in artificial intelligence and achieved amazing success on solving grand challenges in many fields including computer vision, speech recognition, and natural language processing. Its success benefits from big training data and super parallel computational power emerging in recent years, as well as advanced model design and training strategies. The most important breakthrough of deep learning in computer vision happened in 2012. Hinton's group won the ImageNet object recognition challenge with the deep convolutional neural network and beat conventional computer vision technologies with a large margin.

In this tutorial, I will introduce deep learning and its applications in computer vision. It starts with a historical overview of deep learning and introduction on several classical deep models. Through concrete examples on image classification, face recognition, object detection, image segmentation, and video understanding, I will explain why deep learning works in computer vision and how design effective deep models and learning strategies. Some open questions related to deep learning will also be discussed in the end.

## Probing human brain network architecture and dynamics using mri

### Organizer

**Maria Giulia Preti** - EPFL, Switzerland

### Schedule: half day 14:00 – 18:00

Brain functional and structural connectivity can be assessed with advanced techniques of magnetic resonance imaging (MRI), namely functional MRI (fMRI) and diffusion tensor imaging (DTI). In particular, resting-state fMRI represents a powerful means for the observation of functional interactions during rest condition. Using this technique, the existence of network patterns characterized by coherent spontaneous activity in the human resting brain has been demonstrated and is nowadays considered a fundamental property of brain functional organization. The analysis of these networks requires the development and application of several mathematical and statistical methods. New approaches are continuously emerging in the attempt of providing a more complete and thorough description of functional network architecture. For example, recent findings highlighted the non-stationarity of functional networks, which is missed by conventional functional connectivity analysis that relies upon correlation computed over the full duration of the scan (i.e., several minutes). This observation encouraged the development of new methods for the exploration of brain network dynamics, particularly relevant in the application to brain diseases involving dynamic neuronal processes, like epilepsy. Furthermore, understanding the link between functional connectivity and the underlying structural architecture remains still one major challenge of the field and would be important in order to obtain a complete picture the human brain organization. This tutorial will be focused on novel emerging methods to explore human brain connectivity and their potential value in the application to the clinical field.

# Workshops

## Biofor 2015 - International Workshop on Recent Advances in Digital Security: Biometrics and Forensics

### Organizers

**Modesto Castrillón Santana**, Universidad de Las Palmas de Gran Canaria, Spain
**Matthias Kirchner**, Binghamton University, USA
**Daniel Riccio**, Università Federico II di Napoli, Italy
**Luisa Verdoliva**, Università Federico II di Napoli, Italy

### Schedule full day 09:00-18:00

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|---|---|
| 09:30 - 09:40 | **Opening** |
| 09:40 - 10:05 | **Reflectance Normalization in Illumination-Based Image Manipulation Detection**<br>Christian Riess, Sven Pfaller and Elli Angelopoulou |
| 10:05 - 10:30 | **Evaluation of residual-based local features for camera model identification**<br>Francesco Marra, Giovanni Poggi, Carlo Sansone and Luisa Verdoliva |
| 10:30 - 11:00 | **Morning Break** |
| 11:00 - 11:25 | **Biometric Walk Recognizer**<br>Maria De Marsico and Alessio Mecca |
| 11:25 - 11:50 | **Touchstroke: Smartphone User Authentication based on Touch-typing Biometrics**<br>Attaullah Buriro, Bruno Crispo, Filippo Del Frari and Konrad Wrona |

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| 11:50 - 12:15 | **EEG/ECG signal fusion aimed at biometric recognition**<br>Silvio Barra, Andrea Casanova, Matteo Fraschini and Michele Nappi |
| 12:15 - 14:00 | **Lunch** |
| 14:00 - 14:25 | **Fusion of holistic and part based features for gender recognition in the wild**<br>Modesto Castrillón Santana, Javier Lorenzo and Enrique Ramón-Balmaseda |
| 14:25 - 14:50 | **A Hand Gesture Approach to Biometrics**<br>Nahumi Nugrahaningsih, Marco Porta and Giuseppe Scarpello |
| 14:50 - 15:15 | **Quis-Campi: Extending In The Wild Biometric Recognition to Surveillance Environments**<br>Gil Santos, João Neves, Sílvio Filipe, Emanuel Grancho, Silvio Barra, Fabio Narducci and Hugo Proença |

## CTMR 2015 - Color in Texture and Material Recognition Workshop

### Organizers

**Claudio Cusano**, University of Pavia, Italy
**Paolo Napoletano**, University of Milan-Bicocca, Italy
**Raimondo Schettini**, University of Milan-Bicocca Italy
**Joost van de Weijer**, Autonomous University of Barcelona, Spain

### Schedule: half day, morning

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|---|---|
| 09:00 - 09:15 | **Methods for predicting spectral response of fiber blends**<br>Rocco Furferi, Lapo Governi, Yary Volpe |
| 09:15 - 09:30 | **Analysis of albedo influence on surface urban heat island by spaceborne detection and airborne thermography**<br>Giorgio Baldinelli, Stefania Bonafoni |
| 09:30 - 09:45 | **On comparing colour spaces from a performance perspective: Application to automated classification of polished natural stones**<br>Francesco Bianconi, Raquel Bello, Antonio Fernández, Elena González |
| 09:45 - 10:00 | **Complexity perception of texture images**<br>Gianluigi Ciocca, Silvia Corchs, Francesca Gasparini |
| 10:00 - 10:15 | **An interactive tool for speed up the analysis of UV images of Stradivari violins**<br>Piercarlo Dondi, Luca Lombardi, Marco Malagodi, Maurizio Licchelli, Tommaso Rovetta, Claudia Invernizzi |

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| 10:15 - 10:30 | **Texture classification using rotation invariant LBP based on digital polygons**<br>Juan Pardo-Balado , Antonio Fernández, Francesco Bianconi |
| 10:30 - 11:00 | **Coffee break** |
| 11:00 - 11:15 | **Local Angular Patterns for Color Texture Classification**<br>Claudio Cusano, Paolo Napoletano, Raimondo Schettini |
| 11:15 - 12:00 | **Invited talk: Domain adaptation and attributes vs Material Recognition: are they going to get together, at last?**<br>Barbara Caputo |
| 12:00 - 12:45 | **Round Table** |

## RHEUMA 2015 Workshop – Medical Imaging in Rheumatology: Advanced Applications for the Analysis of Inflammation and Damage in the Rheumatoid Joint

### Organizers

**Marco A. Cimmino**, Research Laboratory and Academic Unit of Clinical Rheumatology, DIMI, Università degli Studi di Genova, Genoa, Italy
**Silvana Dellepiane**, DITEN, Polytechnic School, Università degli Studi di Genova, Genoa, Italy
**Gianni Viano**, Softeco Sismat S.r.l., Genoa, Italy

### Schedule: half day, afternoon

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|---|---|
| 14:00 - 14:15 | **Workshop opening** – M.A. Cimmino, S. Dellepiane, G. Viano |
| 14:15 - 14:45 | **Invited Talk - Quantification of inflammation in the synovial membrane through dynamic contrast-enhanced MR**<br>Mikael Boesen, Department of Radiology and Parker Institute, Bispebjerg and Frederiksberg Hospital, Copenhagen |
| 14:45 - 15:15 | **Invited Talk - 3D gray-level histomorphometry of trabecular bone**<br>Zbisław Tabor, Faculty of Physics, Mathematics and Computer Science, Cracow University of Technology |
| 15:15 - 15:35 | **An MRI study of bone erosions healing in the wrist and metacarpophalangeal joints of patients with rheumatoid arthritis**<br>F. Barbieri, V. Tomatis, G. Zampogna, M.A. Cimmino, E. Aleo, V. Prono, S. Migone (DIMI, Università di Genova), P. Parascandolo, L. Cesario, G. Viano (Softeco Sismat Srl) |

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| 15:35 - 15:50 | **RheumaSCORE: a CAD system for Rheumatoid Arthritis diagnosis and follow-up**<br>P. Parascandolo, L. Cesario, L. Vosilla, G. Viano (SoftecoSismat Srl) |
| 15:50 - 16:05 | **Novel automatic tool for magnetic resonance imaging quantification of bone erosion scoring in rheumatoid arthritis**<br>P. Parascandolo, L. Cesario, L. Vosilla, G. Viano (SoftecoSismat Srl), M.A. Cimmino, F. Barbieri (DIMI, Università di Genova) |
| 16:05 - 16:30 | **Afternoon Break** |
| 16:30 - 16:45 | **A database of segmented MRI images of the wrist and the hand in patients with rheumatic diseases**<br>M.A. Cimmino, V. Tomatis, F. Barbieri (DIMI, Università di Genova), G. Troglio, P. Parascandolo, L. Cesario, G. Viano (Softeco Sismat Srl), A. Schiappacasse, M. Moraldo, M. Santoro (Camelot Biomedical Systems Srl): |
| 16:45 - 17:00 | **Non-contrast MRI relaxometric maps: improving detection of cartilage and bone anomalies**<br>Luca Balbi (Esaote Group) |
| 17:00 - 17:15 | **Unsupervised analysis of DCE MR Image sequences using machine learning techniques**<br>Matteo Santoro (Camelot Biomedical Systems Srl) |
| 17:15 - 17:30 | **MRI extremities dedicated systems and Fusion Imaging US/MRI metacarpophalangeal joints in rheumatoid arthritis**<br>Luigi Satragno, Massimo Olmi (Esaote Group) |

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| 17:30 - 17:45 | **Optimizing and evaluating a graph-based segmentation of MRI wrist bones**<br>S. Nardotto, R. Ferretti, L. Gemme, S. Dellepiane (DITEN, Università di Genova) |
| 17:45 - 18:00 | **Generation of 3D Canonical Anatomical Models: An Experience on Carpal Bones**<br>I. Banerjee, G. Patané, M. Spagnuolo (CNR-IMATI, Italy), H. Laga (University of South Australia), S. Kurtek (Ohio State University), A. Srivastava (Florida State University) |

# Workshops

## ISCA 2015 - Image-Based Smart City Application Workshop

### Organizers

Giuseppe Pirlo, University of Bari, Italy
Donato Impedovo, DyrectaLab, Italy
Byron Leite Dantas Bezerra, University of Pernambuco, Brazil

### Schedule: full day

| | |
|---|---|
| 09:00 - 09:10 | **Opening** |
| 09:10 - 09:30 | **Saliency-based Keypoint Reduction for Augmented-Reality Applications in Smart Cities**<br>Simone Buoncompagni, Dario Maio, Davide Maltoni, Serena Papi |
| 09:30 - 09:50 | **A Likelihood-Based Background Model for Real Time Processing of Color Filter Array Videos**<br>Vito Renò, Roberto Marani, Nicola Mosca, Massimiliano Nitti, Tiziana D'Orazio, Ettore Stella |
| 09:50 - 10:10 | **Smart Maintenance to Support Digital Life**<br>Federico Bergenti, Massimo Chiappone, Danilo Gotta |
| 10:10 - 10:30 | **CLICK TEATRO Project: Augmented Reality and Promotion of Theater Events**<br>Donato Barbuzzi, Bachir Boussahel, Francesca De Carlo, Angelo Galiano, Donato Impedovo, Annalisa Longo |

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| 10:30 - 11:00 | **Morning Break** |
| 11:00 - 11:20 | **FSSGR: Feature Selection System to Dynamic Gesture Recognition**<br>Diego G. S. Santos, Rodrigo C. Neto, Bruno Fernandes, Byron Bezerra |
| 11:20 - 11:40 | **Interoperability of Biometric Systems: Analysis of Geometric Characteristics of Handwritten Signatures**<br>Giuseppe Pirlo Fabrizio Rizzi Annalisa Vacca Donato Impedovo |
| 11:40 - 12:00 | **Crosswalk recognition through point-cloud processing and deep-learning suited to a wearable mobility aid for the visually impaired**<br>Matteo Poggi, Luca Nanni, Stefano Mattoccia |
| 12:00 - 12:20 | **Analytical Method and Research of Uygur Language Chunks based on Digital Forensics**<br>Yasen Aizezi, Anwar Jamal, Dilxat Mamat, Ruxianguli Abdurexit, Kurban Ubul |
| 12:20 - 14:40 | **Lunch** |
| 14:40 - 15:00 | **DicomPrint, an Application for Managing DICOM Images**<br>Edlira Kalemi, Edlira Martiri, Brunela Manaj, Dionis Prifti |
| 15:00 - 15:20 | **An hippocampal segmentation tool within an open cloud infrastructure**<br>Nicola Amoroso, Sabina Tangaro, Rosangela Errico, Elena Garuccio, Anna Monda, Francesco Sensi, Andrea Tateo, Roberto Bellotti |
| 15:20 - 15:40 | **Computer Aided Evaluation (CAE) of morphologic changes in pigmented skin lesions**<br>Maria Rizzi, Matteo D'Aloia, Gianpaolo Cice |

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| 15:40 - 16:00 | **Early Diagnosis of Neurodegenerative Diseases by Handwritten Signature Analysis**<br>Giuseppe Pirlo, Moises Diaz, Miguel Angel Ferrer, Donato Impedovo, Fabrizio Occhionero, Urbano Zurlo |
| 16:00 - 16:30 | **Afternoon Break** |
| 16:30 - 16:50 | **Accurate positioning and orientation estimation in urban environment based on 3D models**<br>Giorgio Ghinamo, Cecilia Corbi, Piero Lovisolo, Andrea Lingua, Irene Aicardi, Nives Grasso |
| 16:50 - 17:10 | **A Survey on Traffic Light Detection**<br>Moises Diaz, Pietro Cerri, Giuseppe Pirlo, Miguel A. Ferrer, Donato Impedovo |
| 17:10 - 17:30 | **A Marker-Based Image Processing Method for Detecting Available Parking Slots from UAVs**<br>Matteo D'Aloia, Maria Rizzi, Ruggero Russo, Marianna Notarnicola, Leonardo Pellicani |
| 17:30 - 17:50 | **A New Context-Aware Computing Method for Urban Safety**<br>Hyeon-Woo Kang, Hang-Bong Kang |
| 17:50 - 18:00 | **Conclusion** |

## MADiMa 2015 - 1st International Workshop on Multimedia Assisted Dietary Management

### Organizers

Stavroula Mougiakakou, University of Bern, Switzerland
Giovanni Maria Farinella, University of Catania, Italy
Keiji Yanai, The University of Electro-Communications, Tokyo, Japan

### Schedule: full day

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|---|---|
| 9:00 - 09:15 | **Workshop Opening** |
| 9:15 - 10:00 | **Invited Speaker 1**<br>**The Role of Food Scanning in the Portfolio of the EU Well-Being**<br>Gerald Cultot, Research Programme Officer - European Commission, Directorate-General |
| 10:00 - 10:30 | **Oral Session 1** |
| 10:00 - 10:15 | **Highly Accurate Food/Non-Food Image Classification Based on a Deep Convolutional Neural Network**<br>Hokuto Kagaya, Kiyoharu Aizawa |
| 10:15 - 10:30 | **Tastes and Textures Estimation of Foods Based on the Analysis of its Ingredients List and Image**<br>Hiroki Matsunaga, Keisuke Doman, Takatsugu Hirayama, Ichiro Ide, Daisuke Deguchi, Hiroshi Murase |
| 10:30 - 11:00 | **Coffee Break** |

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| 11:00 - 11:45 | **Oral Session 2** |
| 11:00 - 11:15 | **A Model-Based Approach to Use Small Checkerboards as Size Reference**<br>Hamid Hassannejad, Guido Matrella, Monica Mordonini, Stefano Cagnoni |
| 11:15 - 11:30 | **Dish Detection and Segmentation for Dietary Assessment on Smartphones**<br>Joachim Dehais, Marios Anthimopoulos, Stavroula Mougiakakou |
| 11:30 - 11:45 | **CNN-Based Food Image Segmentation** Wataru Shimoda, Keiji Yanai |
| 11:45 - 12:45 | **Poster Session 1** |
| | 1 **Tastes and Textures Estimation of Foods Based on the Analysis of its Ingredients List and Image**<br>Hiroki Matsunaga, Keisuke Doman, Takatsugu Hirayama, Ichiro Ide, Daisuke Deguchi, Hiroshi Murase |
| | 2 **Highly Accurate Food/Non-Food Image Classification Based on a Deep Convolutional Neural Network**<br>Hokuto Kagaya, Kiyoharu Aizawa |
| | 3 **Food Object Recognition Using a Mobile Device: State of the Art**<br>Simon Knez, Luka Šajn |
| | 4 **Food Recognition Using Consensus Vocabularies**<br>Giovanni Maria Farinella, Marco Moltisanti, Sebastiano Battiato |
| | 5 **A Model-Based Approach to Use Small Checkerboards as Size Reference**<br>Hamid Hassannejad, Guido Matrella, Monica Mordonini, Stefano Cagnoni |

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|---|---|
| | 6 Dish Detection and Segmentation for Dietary Assessment on Smartphones<br>Joachim Dehais, Marios Anthimopoulos, Stavroula Mougiakakou |
| | 7 CNN-Based Food Image Segmentation<br>Wataru Shimoda, Keiji Yanai |
| | 8 FooDD: An Image-Based Food Detection Dataset for Calorie Measurement<br>Parisa Pouladzadeh, Abdulsalam Yassine, Shervin Shirmohammadi |
| | 9 Food Recognition for Dietary Assessment Using Deep Convolutional Neural Networks<br>Stergios Christodoulidis, Marios Anthimopoulos, Stavroula Mougiakakou |
| 12:45 - 14:30 | Lunch Break |
| 14:30 - 15:15 | Invited Speaker 2<br>Wearable Solutions for Detection and Characterization of Food Intake<br>Prof. Edward Sazonov, Department of Electrical and Computer Engineering, University of Alabama, USA |
| 15:15 - 16:00 | Oral Session 3 |
| 15:15 - 15:30 | Fractal Nature of Chewing Sounds<br>Vasileios Papapanagiotou, Christos Diou, Zhou Lingchuan, Janet van den Boer, Monica Mars, Anastasios Delopoulos |
| 15:30 - 15:45 | The Use of Temporal Information In Food Image Analysis<br>Yu Wang, Ye He, Fengqing Zhu, Carol Boushey, Edward Delp |

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| 15:45 - 16:00 | **MANGO - Mobile Augmented Reality with Functional Eating Guidance and Food Awareness**<br>Georg Waltner, Michael Schwarz, Stefan Ladstätter, Anna Weber, Patrick Luley, Horst Bischof, Meinrad Lindschinger, Irene Schmid, Lucas Paletta |
| 16:00 - 16:30 | **Coffee Break** |
| 16:30 - 17:00 | **Oral Session 4** |
| 16:30 - 16:45 | **Food Recognition and Leftover Estimation for Daily Diet Monitoring**<br>Gianluigi Ciocca, Paolo Napoletano, Raimondo Schettini |
| 16:45 - 17:00 | **On the Exploitation of One Class Classification to Distinguish Food vs Non-Food Images**<br>Giovanni Maria Farinella, Dario Allegra, Filippo Stanco,Sebastiano Battiato |
| 17:00 - 18:00 | **Poster Session 2** |
| | **1 Estimating the nutrient content of commercial foods from their label using numerical optimization**<br>Jieun Kim, Mireille Boutin |
| | **2 The Use of Temporal Information in Food Image Analysis**<br>Yu Wang, Ye He, Fengqing Zhu, Carol Boushey, Edward Delp |
| | **3 Food Recognition and Leftover Estimation for Daily Diet Monitoring**<br>Gianluigi Ciocca, Paolo Napoletano, Raimondo Schettini |
| | **4 Mobile Computing and Artificial Intelligence for Diet Management**<br>Alessandro Mazzei, Luca Anselma, Franco De Michieli, Matteo Casu, Andrea Bolioli, Jelle Gerbrandy, Ivan Lunardi |

5 A Printer Indexing System For Color Calibration With Applications In Dietary Assessment
Shaobo Fang, Chang Liu, Fengqing Zhu, Carol Boushey, Edward Delp

6 On the Exploitation of One Class Classification to Distinguish Food vs Non-Food Images
Giovanni Maria Farinella, Dario Allegra, Filippo Stanco,Sebastiano Battiato

7 Fractal Nature of Chewing Sounds
Vasileios Papapanagiotou, Christos Diou, Zhou Lingchuan, Janet van den Boer, Monica Mars, Anastasios Delopoulos

8 Objective and Subjective Meal Registration via a Smartphone Application
Ioannis Moulos, Christos Maramis, Ioannis Ioakimidis, Janet van den Boer, Jenny Nolstam, Monica Mars, Cecilia Bergh, Nicos Maglaveras

9 Towards an Engaging Mobile Food Record for Teenagers
Maurizio Caon, Stefano Carrino, Federica Prinelli, Valentina Ciociola, Fulvio Adorni, Claudio Lafortuna, Sarah Tabozzi, José Serrano, Laura Condon, Omar Abou Khaled, Elena Mugellini

10 MANGO - Mobile Augmented Reality with Functional Eating Guidance and Food Awareness
Georg Waltner, Michael Schwarz, Stefan Ladstätter, Anna Weber, Patrick Luley, Horst Bischof, Meinrad Lindschinger, Irene Schmid, Lucas Paletta

## SBMI 2015 - Scene Background Modeling and Initialization Workshop

### Organizers

Lucia Maddalena, National Research Council, Italy
Thierry Bouwmans, Université de La Rochelle, France

### Schedule: half day, morning

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|---|---|
| 9:00 - 9:10 | **Opening** |
| 9:10 - 9:50 | **Invited Talk - Motion Detection: Unsolved Issues and [Potential] Solutions**<br>Pierre-Marc Jodoin, University of Sherbrooke, Canada |
| 9:50 - 10:10 | **Simple Median-based Method for Stationary Background Generation Using Background Subtraction Algorithms**<br>Benjamin Laugraud, Sébastien Piérard, Marc Braham and Marc Van Droogenbroeck |
| 10:10 - 10:30 | **Multi-modal Background Model Initialization**<br>Domenico Bloisi, Alfonso Grillo, Andrea Pennisi, Luca Iocchi and Claudio Passaretti |
| 10:30 - 11:00 | **Morning Break** |
| 11:00 - 11:20 | **Background Modeling by Weightless Neural Networks**<br>Massimo De Gregorio and Maurizio Giordano |
| 11:20 - 11:40 | **BMTDL for Scene Modeling on the SBI Dataset**<br>Nicoletta Noceti, Alessandra Staglianò, Alessandro Verri and Francesca Odone |

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| 11:40 - 12:00 | **Comparison of Matrix Completion Algorithms for Background Initialization in Videos**<br>Andrews Sobral, Thierry Bouwmans and El-Hadi Zahzah |
| 12:00 - 12:20 | **Real-time Implementation of Background Modelling Algorithms in FPGA Devices**<br>Tomasz Kryjak and Marek Gorgon |
| 12:20 - 12:40 | **A Perfect Estimation of a Background Image Does Not Lead to a Perfect Background Subtraction: Analysis of the Upper Bound on the Performance**<br>Sébastien Piérard and Marc Van Droogenbroeck |
| 12:40 - 13:00 | **Nonlinear Background Filter to Improve Pedestrian Detection**<br>Yi Wang, Sébastien Piérard, Songzhi Su and Pierre-Marc Jodoin |
| 13:00 - 13:30 | **Panel Discussion** |

## QoEM 2015 - Workshop on Image And Video Processing For Quality of Multimedia Experience

### Organizers

Niculae Sebe, University of Trento, Italy
Ben Herbst, Stellenbosch University, South Africa
Dubravko Culibrk, University of Trento, Italy/University of Novi Sad, Serbia

### Schedule: half day, afternoon

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| 14:00 - 14:45 | **Invited Talk - Personal Aesthetics: understanding people by their aesthetical preferences**<br>Marco Cristani, University of Verona, Italy |
| 14:45 - 15:05 | **Full-Reference SSIM Metric for Video Quality Assessment with Saliency-based Features**<br>Eduardo Romani, Wyllian Bezerra Da Silva, Keiko Verônica Ono Fonseca, Dubravko Culibrk and Alexandre de Almeida Prado Pohl. |
| 15:05 - 15:25 | **Quality Assessment for Mobile Devices on Mobile Devices**<br>Milan Mirkovic, Dubravko Culibrk, Srdjan Sladojevic and Andras Anderla |
| 15:25 - 15:45 | **An Efficient SIMD Implementation of the H.265 Decoder for mobile architecture**<br>Massimo Bariani, Paolo Lambruschini, Marco Raggio and Luca Pezzoni. |
| 15:45 - 16:15 | **Afternoon Break** |
| 16:15 - 16:35 | **Kinematics Analysis Multimedia System for Rehabilitation**<br>Minxiang Ye, Cheng Yang, Vladimir Stankovic, Lina Stankovic and Andrew Kerr |

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| 16:35 - 16:55 | **Evaluation of Signal Processing Methods for Attention Assessment in Visual Content Interaction**<br>Georgia Elafoudi, Lina Stankovic, Vladimir Stankovic, Deepti Pappusetty and Hari Kalva |
| 16:55 - 17:15 | **Why You Trust in Visual Saliency**<br>Edoardo Ardizzone, Alessandro Bruno, Luca Greco and Marco La Cascia |
| 17:15 - 18:00 | **Panel Discussion** |

# Invited Talks

**Visual Cognition**

*Arnold Smeulders, University of Amsterdam, The Netherlands*

In computer vision research, considerable progress has been made on naming things in digital pictures automatically to the level that human cognition is in sight. Initially facilities like Google Search used the annotation added to the image. Recognising an instance of an arbitrary object class from the picture data essentially started in 2003 when Fergus and Zisserman recognised a picture to contain a "motor bicycle" or not. In hindsight, they made a few assumptions: 1. parts of one object are spatially close (where it is unnecessary to first delineate the object in the scene), 2. specific visual parts are recurring among all members of the concept class (such as a part of a wheel which will be visible on all pictures of a motor bicycle), and 3. the recognition of these class-specific parts can be learned from examples. Visual concept recognition by computation from the data given some visual examples has achieved remarkable progress in the last decade as we will soon be able to recognise from 50 – 1000 examples for each of the 20,000 different things we are living by. In the talk an overview of the standard recognition algorithm is given, including new extensions such as algorithms to localise the object next to recognising it, algorithms to recognise actions, and algorithms for the search of all images of 1 specific object of which just 1 image is available. We end with: is this algorithm also present in the brain and what is more in visual cognition?

**Blind optics**

*Michal Irani, Weizmann Institute of Science, Israel*

Small image patches tend to repeat “as is” at multiple scales of a natural image. This fractal-like behavior has been used (by us and by others) for various tasks, including image compression, super-resolution, and denoising. However, it turns out that this internal patch recurrence property is strong only in images taken under *ideal* imaging conditions, but significantly diminishes when the imaging conditions deviate from ideal ones. In the first part of my talk I will briefly review some methods for exploiting the cross-scale recurrence prior for image enhancement. In the second part of my talk I will show how we can exploit the *deviations* from ideal patch recurrences in order to recover important information about the unknown sensor, as well as unknown physical properties of the scene.

In particular, I will show how the deviations from ideal patch recurrence can be used for:

Recovering the unknown camera blur (giving rise to “Blind Deblurring”).

Recovering the unknown atmospheric scattering parameters from images taken under fog, haze, and bad weather conditions (giving rise to “Blind Dehazing”).

**Towards Visual Scene understanding – It's time to address it again**

*Bernt Schiele, Max Planck Institute for Informatics, Germany*

Inspired by the ability of humans to interpret and understand 3D scenes nearly effortlessly, the problem of 3D scene understanding has long been advocated as the "holy grail" of computer vision. In the early days this problem was addressed in a bottom-up fashion without enabling satisfactory or reliable results for scenes of realistic complexity. In recent years there has been considerable progress on many sub-problems of the overall 3D scene understanding problem. As the performance for these sub-tasks starts to achieve remarkable performance levels we argue that the problem to automatically infer and understand 3D scenes should be addressed again. This talk highlights recent progress on some essential components (such as object recognition and person detection), on our attempt towards 3D scene understanding, as well as on our work towards activity recognition and the ability to describe video content with natural language. These efforts are part of a longer-term agenda towards visual scene understanding. While visual scene understanding has long been advocated as the "holy grail" of computer vision, we believe it is time to address this challenge again, based on the progress in recent years.

**Action and attention in first-person vision**

*Kristen Grauman, University of Texas at Austin, USA*

A traditional third-person camera passively watches the world, typically from a stationary position. In contrast, a first-person (wearable) camera is inherently linked to the ongoing experiences of its wearer. It encounters the visual world in the context of the wearer's physical activity, behavior, and goals. This distinction has many intriguing implications for computer vision research, in topics ranging from fundamental visual recognition problems to high-level multimedia applications.

I will present our recent work in this space, driven by the notion that the camera wearer is an active participant in the visual observations received. First, I will show how to exploit egomotion when learning image representations. Cognitive science tells us that proper development of visual perception requires internalizing the link between "how I move" and "what I see"---yet today's best recognition methods are deprived of this link, learning solely from bags of images downloaded from the Web. We introduce a deep feature learning approach that embeds information not only from the video stream the observer sees, but also the motor actions he simultaneously makes. We demonstrate the impact for recognition, including a scenario where features learned from ego-video on an autonomous car substantially improve large-scale scene recognition. Next, I will present our work exploring video summarization from the first person perspective. Leveraging cues about ego-attention and interactions to infer a storyline, we automatically detect the highlights in long videos. Overall, whether considering action or attention, the first-person setting offers exciting new opportunities for large-scale visual learning.

**Deepid: Deep Learning for Face Recognition**

*Xiogang Wang, Chinese University of Hong Kong, Hong Kong*

In this talk, I will present our recent works on deep learning for face recognition. With a novel deep model and a moderate training set with 400,000 face images, 99.47% accuracy has been achieved on LFW, the most challenging and extensively studied face recognition dataset. Deep learning provides a powerful tool to separate intra-personal and inter-personal variations, whose distributions are complex and highly nonlinear, through hierarchical feature transforms. It is essential to learn effective face representations by using two supervisory signals simultaneously, i.e. the face identification and verification signals. Some people understand the success of deep learning as using a complex model with many parameters to fit a dataset. To clarify such misunderstanding, we further investigate face recognition process in deep nets, what information is encoded in neurons, and how robust they are to data corruptions. We discovered several interesting properties of deep nets, including sparseness, selectiveness and robustness. In Multi-View Perception, a hybrid deep model is proposed to simultaneously accomplish the tasks of face recognition, pose estimation, and face reconstruction. It employs deterministic and random neurons to encode identity and pose information respectively. Given a face image taken in an arbitrary view, it can untangle the identity and view features, and in the meanwhile the full spectrum of multi-view images of the same identity can be reconstructed. It is also capable to interpolate and predict images under viewpoints that are unobserved in the training data.

**The Battle against the long tail in Computer Vision**

*Samy Bengio, Google Inc., USA*

The long tail phenomena appears when a small number of objects/words/classes are very frequent and thus easy to model, while many many more are rare and thus hard to model. this has always been a problem in machine learning. We start by explaining why representation sharing in general, and embedding approaches in particular, can help to represent tail objects. Several embedding approaches are presented, in increasing levels of complexity, to show how to tackle the long tail problem, from rare classes to unseen classes in image classification (the so-called zero-shot setting). Finally, we present our latest results on image description, which can be seen as an ultimate rare class problem since each image is attributed to a novel, yet structured, class in the form of a meaningful descriptive sentence.

# Oral Sessions

coffee break 11:00 - 11:30 lunch 13:10 - 14:30 coffee break 15:45 - 16:15
GIRPR meeting 18:15 - 20:00
welcome cocktail 20:15

**INVITED TALK:** **09:00 - 09:50**

Visual Cognition

Arnold Smeulders
University of Amsterdam , The Netherlands

Chair: Nicu Sebe

**Oral session 1: Pattern Recognition & Machine Learning** **11:30 - 13:10**

Chair: Edwin Hancock

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|---|---|
| Transfer Learning through Greedy Subset Selection | Ilja Kuzborskij, Francesco Orabona, Barbara Caputo |
| MEG: Multi-Expert Gender recognition in a demographics-balanced dataset | Modesto Castrillon-Santana, Maria De Marsico, Michele Nappi, Daniel Riccio |
| An Edge-based Matching Kernel through Discrete-time Quantum Walks | Lu Bai, Zhihong Zhang, Peng Ren, Luca Rossi, Edwin Hancock |
| Implicit Boundary Learning for Connectomics | Tobias Maier, Thomas Vetter |
| A Parzen-based distance between probability measures as an alternative of summary statistics in Approximate Bayesian Computation | Carlos D. Zuluaga, Edgar A. Valencia, Mauricio A. Alvarez, Alvaro A. Orozco |

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| **INVITED TALK:** | **16:15 - 17:05** |
| Blind optics | Michal Irani<br>Weizmann Institute of Science, Israel |
| Chair: Gunilla Borgefors | |

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| **Oral session 2: Image Analysis 1** | **17:05 - 18:05** |
| Chair: Marco Gori | |
| Learning Balanced Trees for Large Scale Image Classification | Tien-Dung Mai, Thanh Duc Ngo, Duy-Dinh Le, Duc Anh Duong, Kiem Hoang, Shin'ichi Satoh |
| Analysis of compact features for RGB-D visual search | Alioscia Petrelli, Danilo Pau, Luigi Di Stefano |
| Hierarchical image segmentation relying on a likelihood ratio test | Silvio Jamil Guimaraes, Zenilton Kleber do Patrocinio Jr, Yukiko Kenmochi, Jean Cousty, Laurent Najman |

# Poster Sessions

## Poster Session 1: Pattern Recognition & Machine learning 09:50 - 11:20

| | | |
|---|---|---|
| 1 | Density based analysis in Tanimoto space for multi-model fitting | Luca Magri, Andrea Fusiello |
| 2 | Bag Of Graphs with Geometric Relationships among Trajectories for Better Human Action Recognition | Manel Sekma, Mahmoud Mejdoub, Chokri Benamar |
| 3 | Have a SNAK. Encoding spatial information with the Spatial Non-Alignment Kernel | Radu Tudor Ionescu, Marius Popescu |
| 4 | Convolved multi-output Gaussian processes for Semi-Supervised Learning | Hernan Dario Vargas Cardona, Mauricio A. Alvarez, Alvaro A. Orozco |
| 5 | Volcano-seismic events classification using document classification strategies | Manuele Bicego, John Makario Londoño-Bonilla, Paola Alexandra Castro-Cabrera, and Mauricio Orozco-Alzate |
| 6 | Unsupervised Feature Selection by Graph Optimization | Zhihong Zhang, Lu Bai, Yuanheng Liang, Edwin Hancock |
| 7 | Gait Recognition Robust to Speed Transition using Mutual Subspace Method | Yumi Iwashita, Hitoshi Sakano, Ryo Kurazume |
| 8 | Path-Based Dominant-Set Clustering | Eyasu Zemene, Marcello Pelillo |

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| 9 | Global and Local Gaussian Process for Multioutput and Treed Data | Jhouben J. Cuesta, Mauricio A. Alvarez, Alvaro A. Orozco |
| 10 | BRISK local descriptors for heavily occluded ball recognition | Pier Luigi Mazzeo, Paolo Spagnolo, Cosimo Distante |
| 11 | Neighborhood Selection for Dimensionality Reduction | Paola Campadelli, Elena Casiraghi, Claudio Ceruti |
| 12 | Crowdsearching Training Sets for Image Classification | Sami Abduljalil Abdulhak, Walter Riviera, Marco Cristani |
| 13 | The color of smiling: computational synaesthesia of facial expressions | Vittorio Cuculo, Raffaella Lanzarotti, Giuseppe Boccignone |
| 14 | Learning Texture Image Prior for Super Resolution using Convolutional Neural Network | Chulmoo Kang, Minui Hong, Suk I. Yoo |
| 15 | GRUNTS: Graph Representation for UNsupervised Temporal Segmentation | Francesco Battistone, Alfredo Petrosino, Gabriella Sanniti di Baja |
| 16 | A Strict Pyramidal Deep Neural Network for Action Recognition | Ihsan Ullah, Alfredo Petrosino |
| 17 | Nerve localization by machine learning framework with new feature selection algorithm | Oussama Hadjerci, Adel Hafiane, Pascal Makris, Donatello Conte, Pierre Vieyres, Aain Delbos |
| 18 | Human tracking using a top-down and knowledge based approach | Benoit Gaüzère, Pierluigi Ritrovato, Alessia Saggese, Mario Vento |

## Poster Session 2: Image Analysis 1 14:30 - 16:00

| | | |
|---|---|---|
| 1 | A Gravitational Model for Plant Classification Using Adaxial Epidermis Texture | André Ricardo Backes, Jarbas Joaci de Mesquita Sá Junior, Rosana Marta |
| 2 | Adaptive Background Modeling for Land and Water Composition Scenes | Jing Zhao, Shaoning Pang, Bruce Hartill, Abdol-Hossein Sarrafzadeh |
| 3 | Enhancing signal discontinuities with Shearlets: an application to corner detection | Miguel Alejandro Duval Poo, Francesca Odone, Ernesto De Vito |
| 4 | Improved Human Gait Recognition | Imad Rida, Ahmed Bouridane, Gian Luca Marcialis, Pierluigi Tuveri |
| 5 | Human Area Refinement of Human Detection | Rong Xu, Satoshi Ueno, Tatsuya Kobayashi, Naoya Makibuchi, Sei Naito |
| 6 | Skeletonization Algorithm using Discrete Contour Map | Hassan Id Ben Idder, Nabil Laachfoubi |
| 7 | Superpixel and entropy-based multi-atlas fusion framework for the segmentation of X-ray images | Dac Cong Tai Nguyen, Said Benameur, Max Mignotte, Frédéric Lavoie |
| 8 | Wavelet-like lifting-based transform for decomposing images in accordance with the inter-prediction principles of video coding | Marek Parfieniuk |

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| 9 | Bounded Non-Local Means for Fast and Effective Image Denoising | Federico Tombari, Luigi Di Stefano |
| 10 | i-Street: Detection, Identification, Augmentation of Street Plates in a Touristic Mobile Application | Stefano Messelodi, Carla Maria Modena, Lorenzo Porzi, Paul Chippendale |
| 11 | Distortion Adaptive Descriptors: Extending Gradient-Based Descriptors to Wide Angle Images | Antonino Furnari, Giovanni Maria Farinella, Arcangelo Ranieri Bruna, Sebastiano Battiato |
| 12 | Counting Turkish Coins with a Calibrated Camera | Burak Benligiray, Halil Ibrahim Cakir, Cihan Topal, Cuneyt Akinlar |
| 13 | Design and Implementation of a Dynamic Adaptive Video Streaming System with a Buffer Aware Rate Selection Algorithm | Venkata Phani Kumar M, Ravi K C, Sudipta Udipta Mahapatra |
| 14 | Leveraging mutual information in local descriptions: from Local Binary Patterns to the image | Tahir Q. Syed, Sadaf I. Behlim, Alishan K. Merchant, Alexis Thomas, Furgan M. Khan |
| 15 | Dominant LBP Considering Pattern Type for Facial Image Representation | Alaa Sagheer, Shimaa Saad |
| 16 | Improving high resolution satellite images retrieval using color component features | Houria Sebai, Assia Kourgli |
| 17 | The QCRI Recognition System for Handwritten Arabic | Felix Stahlberg, Stephan Vogel |

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| 18 | Optimized Parallel Model of Covariance Based Person Detection | Nesrine Abid, Kais Loukil, Walid Ayedi, Ahmed Chiheb Ammari, Mohamed Abid |
| 19 | Face recognition from robust SIFT matching | Massimiliano Di Mella, Francesco Isgrò |
| 20 | Optimized Intra Mode Decision for High Efficiency Video Coding | Anis BenHajyoussef, Tahar Ezzedine |
| 21 | Towards Learning free Naive Bayes Nearest Neighbor-based Domain Adaptation | Faraz Saeedan, Barbara Caputo |

# Oral Sessions

coffee break 11:00 - 11:30 lunch 13:10 - 14:30 coffee break 15:45 - 16:15
social dinner 20:00

**INVITED TALK:** **09:00 - 09:50**

Towards Visual Scene understanding:
It's time to address it again

Bernt Schiele
Max Planck Institute for Informatics, Germany

Chair: Andrea Fusiello

| **Oral session 3: Image Analysis 2**<br>Chair: Stefano Messelodi | **11:30 -13:10** |
|---|---|
| Large Scale Specific Object Recognition by using GIFTS Image Feature | Hiroki Nakano, Yumi Mori, Chiaki Morita, Shingo Nagai |
| On Tensor Product Spatiochromatic Features in Natural Images Statistics | Edoardo Provenzi, Julie Delon, Yann Gousseau, Baptiste Mazin |
| Real-time foreground segmentation with Kinect sensor | Luigi Cinque, Alessandro Danani, Piercarlo Dondi, Luca Lombardi |
| Hierarchical Image Representation Using Deep Network | Emrah Ergul, Sarp Erturk, Nafiz Arica |
| Fast Image Classification with Reduced Multiclass Support Vector Machines | Marco Melis, Luca Piras, Battista Biggio, Giorgio Giacinto, Giorgio Fumera, Fabio Roli |

**INVITED TALK:** **16:15 - 17:05**

Action and attention in first-person vision

Kristen Grauman
University of Texas at Austin, USA

Chair: Silvana Dellepiane

| **Oral session 4: Shape Analysis & 3D Computer Vision** Chair: Alfredo Petrosino | **17:05 - 18:45** |
|---|---|
| Fuzzy "Along" Spatial Relation in 3D. Application to Anatomical Structures in Maxillofacial CBCT | Timothée Evain, Xavier Ripoche, Jamal Atif, Isabelle Block |
| Fast and Precise Geodesic Distances On Manifold Surfaces | Rosario Aiello, Francesco Banterle, Nico Pietroni, Luigi Malomo, Paolo Cignoni, Roberto Scopigno |
| Comparing persistence diagrams through complex vectors | Barbara Di Fabio, Massimo Ferri |
| Pop-up Modelling of Hazy Scenes | Lingyun Zhao, Miles Hansard, Andrea Cavallaro |
| 3D Geometric Analysis of Tubular Objects based on Surface Normal Accumulation | Bertrand Kerautret, Adrien Krähenbühl, Isabelle Debled-Rennesson, Jacques-Olivier Lachaud |

# Poster Sessions

## Poster Session 3: Image Analysis 2 09:50 - 11:20

| | | |
|---|---|---|
| 1 | A gravitational model for grayscale texture classification applied to the pap-smear database | Jarbas Joaci de Mesquita Sá Junior, André R. Backes |
| 2 | Combining ARF and OR-PCA for Robust Background Subtraction of Noisy Videos | Sajid Javed, Thierry Bouwmans, Soon Ki Jung |
| 3 | Image clarification method based on structure-texture decomposition with texture refinement | Masato Toda, Kenta Senzaki, Masato Tsukada |
| 4 | Detecting and tracking the tips of fluorescently labeled mitochondria in U2OS cells | Eero Lihavainen, Jarno Mäkelä, Johannes N. Spelbrink, Andre S. Ribeiro |
| 5 | Recognition of the human fatigue based on the ICAAM algorithm | Konrad Rodzik, Dariusz Sawicki |
| 6 | Rich QR code for multimedia management applications | Iuliia Tkachenko, William Puech, Olivier Strauss, Christophe Destruel, Jean-Marc Gaudin, Christian Guichard |
| 7 | Panel Tracking for the Extraction and the Classification of Speech Balloons | Hadi S. Jomaa, Lina Ghaibeh, Mariette Awad |

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| 8 | Combining Hardwaremetry and Biometry for Human Authentication via Smartphones | Chiara Galdi, Michele Nappi, Jean-Luc Dugelay |
| 9 | Multi-scale opening-a new morphological operator | Subhadip Basu, Eric Hoffman, Punam K. Saha |
| 10 | Level-by-level Adaptive Disparity Compensated Prediction in Wavelet Domain for Stereo Image Coding | Shigao Li, Liming Jia |
| 11 | Logo Recognition Using CNN Features | Simone Bianco, Marco Buzzelli, Davide Mazzini, Raimondo Schettini |
| 12 | Person re-identification using robust brightness transfer functions based on multiple detections | Amran Bhuiyan, Behzad Mirmahboub, Alessandro Perina, Vittorio Murino |
| 13 | Analysis of HOG suitability for Facial Traits description in FER problems | Marco Del Coco, Pierluigi Carcagnì, Giuseppe Palestra, Marco Leo, Cosimo Distante |
| 14 | Difference-based Local Gradient Patterns for Image Representation | Alaa Sagheer, Shimaa Saad |
| 15 | Non-Local Sigma Filter | Nikolay Ponomarenko, Vladimir Lukin, Jaakko Astola, Karen Egiazarian |
| 16 | A New Multi-resolution Affine Invariant Planar Contour Descriptor | Taha Faidi, Faten Chaieb, Faouzi Ghorbel |

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| 17 | Image Manipulation on Facebook for Forensics Evidence | Marco Moltisanti, Antonino Paratore, Sebastiano Battiato, Luigi Saravo |
| 18 | Improved Performance in Facial Expression Recognition Using 32 Geometric Features | Giuseppe Palestra, Adriana Pettinicchio, Marco Del Coco, P. Carcagnì, Marco Leo, Cosimo Distante |
| 19 | A Selection Module for Large-Scale Face Recognition Systems | Giuliano Grossi, Raffaella Lanzarotti, Jianyi Lin |
| 20 | A classification-selection approach for self updating of face verification systems under stringent storage and computational requirements | Pierluigi Tuveri, Valerio Mura, Gian Luca Marcialis, Fabio Roli |
| 21 | Super-Sparse Regression for Fast Age Estimation From Faces at Test Time | Ambra Demontis, Battista Biggio, Giorgio Fumera, Fabio Roli |
| 22 | Real-Time Age Estimation from Face Imagery using Fisher Vectors | Lorenzo Seidenari, Alessandro Rozza, Alberto Del Bimbo |
| 23 | Unsupervised Classification of Raw Full-Waveform Airborne Lidar Data by Self Organizing Maps | Eleonora Maset, Roberto Carniel, Fabio Crosilla |

**Poster session 4: Shape Analysis, 3D Computer Vision & Multimedia** **14.30 - 16:00**

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|---|---|---|
| 1 | Tongue in Cheek | George Nagy, Naomi Nagy |
| 2 | Where is the ground? Quality measures for the planar digital terrain model in Terrestrial Laser Scanning | Marcin Bator, Leszek J. Chmielewski, Arkadiusz Orłowski |
| 3 | Extending the sGLOH descriptor | Fabio Bellavia, Carlo Colombo |
| 4 | Fast Superpixel-based Hierarchical Approach to Image Segmentation | Francesco Verdoja, Marco Grangetto |
| 5 | Supertetras: a Superpixel Analog for Tetrahedral Mesh Oversegmentation | Giulia Picciau, Patricio Simari, Federico Iuricich, Leila De Floriani |
| 6 | Extraction of Successive Patterns in Document Images by a new Concept based on Force Histogram and Thick Discrete Lines | Isabelle Debled-Rennesson, Laurent Wendling |
| 7 | Hierarchical mesh segmentation editing through rotation operations | Federico Iuricich, Patricio Simari |
| 8 | Local feature extraction in log-polar images | Manuela Chessa, Fabio Solari |
| 9 | Scale-space Techniques for Fiducial Points Extraction from 3D Faces | Nikolas De Giorgis, Luigi Rocca, Enrico Puppo |
| 10 | Filtering Non-Significant Quench Points using Collision Impact in Grassfire Propagation | Dakai Jin, Cheng Chen, Punam K. Saha |

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| 11 | Robust and Efficient Camera Motion Synchronization via Matrix Decomposition | Federica Arrigoni, Beatrice Rossi, Andrea Fusiello |
| 12 | Novel View-Synthesis from Multiple Sources for Conversion to 3DS | Francesco Malapelle, Andrea Fusiello, Beatrice Rossi, Pasqualina Fragneto |
| 13 | Dynamic Optimal Path Selection for 3D Triangulation with Multiple Cameras | Mara Pistellato, Filippo Bergamasco, Andrea Albarelli, Andrea Torsello |
| 14 | Smartphone-based Obstacle Detection for the Visually Impaired | Alessandro Caldini, Marco Fanfani, Carlo Colombo |
| 15 | Efficient moving point handling for incremental 3D manifold reconstruction | Andrea Romanoni, Matteo Matteucci |
| 16 | Volumetric 3D Reconstruction and Parametric Shape Modeling from RGB-D Sequences | Y. Nakaguro, Waqar Shahid Qureshi, M.N. Dailey, Mongkol Ekpanyapong, P. Bunnun, K.Tungpimolrut |
| 17 | Movie Genre Classification by Exploiting MEG Brain Signals | Pouya Ghaemmaghami, Mojtaba Khomami Abadi, Seyed Mostafa Kia, Paolo Avesani, Nicu Sebe |
| 18 | Egocentric Video Personalization in Cultural Experiences Scenarios | Patrizia Varini, Giuseppe Serra, Rita Cucchiara |
| 19 | Advanced Content based Image Retrieval for Fashion | Tewodros Mulugeta Dagnew, Umberto Castellani |
| 20 | Audiovisual Liveness Detection | Aleksandr Melnikov, Rasim Akhunzyanov, Oleg Kudashev, Eugene Luckyanets |

# Oral Sessions

coffee break 11:00 - 11:30 lunch 13:10 - 14:30

**INVITED TALK:** **09:00 - 09:50**

Deepid: Deep Learning for Face Recognition

Xiogang Wang
Chinese University of Hong Kong, China

Chair: Raimondo Schettini

**Oral session 5: Biomedical Applications** **11:30 - 13.10**

Chair: Paola Campadelli

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|---|---|
| Efficient Resolution Enhancement Algorithm for Compressive Sensing Magnetic Resonance Image Reconstruction | Osama Omer, Mohamed A. Bassiouny, Ken'ichi Morooka |
| Towards accurate segmentation of fibroglandular tissue in breast MRI using fuzzy c-means and skin-folds removal | Mohammad Razavi, Lei Wang, Albert Gubern-Merida, Tatyana Ivanovska, Hendrik Laue, Nico Karssemeijer, Horst Hahn |
| Robust and Fast Vessel Segmentation via Gaussian Derivatives in Orientation Scores | Jiong Zhang, Erik Bekkers, Samaneh Abbasi, Behdad Dashtbozorg, Bart ter Haar Romeny |
| Information-based cost function for the Bayesian MRI segmentation framework | David Cárdenas-Peña, Alvaro A. Orozco, Germán Castellanos-Dominguez |

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| Learning by Sampling for White Blood Cells Segmentation | Cecilia Di Ruberto, Andrea Loddo, Lorenzo Putzu |

**INVITED TALK:** **14:30 -15:20**

The Battle against the long tail in Computer Vision

Samy Bengio
Google Inc., USA

Chair: Rita Cucchiara

**Oral session 6: Video Analysis & Multimedia** **15:20 - 16:45**

Chair: Mario Vento

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|---|---|
| Automated Recognition of Social Behavior in Rats: The Role of Feature Quality | Malte Lorbach, Ronald Poppe, Elsbeth van Dam, Lucas Noldus, Remco Veltkamp |
| Scale and Occlusion Invariant Tracking-by-Detection | Andrea Mazzeschi, Giuseppe Lisanti, Federico Pernici, Alberto Del Bimbo |
| Ensemble of Hankel Matrices for Face Emotion Recognition | Liliana Lo Presti, Marco La Cascia |
| Emotions in Abstract Art: Does Texture Matter? | Andreza Sartori, Berhan Şenyazar, Alkim Almila Akdag Salah, Albert Ali Salah, Nicu Sebe |

# Poster Sessions

**Poster session 5: Biomedical Applications & Video Analysis** **09:50 - 11:20**

| | | |
|---|---|---|
| 1 | Fully Automatic Brain Tumor Segmentation by using Competitive EM and Graph Cut | Valentina Pedoia, Sergio Balbi, Elisabetta Binaghi |
| 2 | An Automatic Method for Metabolic Evaluation of Gamma Knife Treatments | Alessandro Stefano, Salvatore Vitabile, Giorgio Russo, Massimo Ippolito, Franco Marletta, Corrado D'Arrigo, Davide D'Urso, Maria Gabriella Sabini, Orazio Gambino, Roberto Pirrone, Edoardo Ardizzone, Maria Carla Gilardi |
| 3 | Spinal canal and spinal marrow segmentation by means of the Hough Transform of special classes of curves | Annalisa Perasso, Cristina Campi, Anna Maria Massone, Mauro Beltrametti |
| 4 | A New Graph-Based Method for Automatic Segmentation | Laura Gemme, Silvana Dellepiane |
| 5 | Color Spaces in Data Fusion of Multi-Temporal Images | Roberta Ferretti, Silvana Dellepiane |
| 6 | TraGEN: A Tool for Generation of Synthetic Time-Lapse Image Sequences of Living Cells | Vladimir Ulman, Zoltán Orémuš, David Svoboda |

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| 7 | Automatic Image Analysis and Classification for Urinary Bacteria Infection Screening | Paolo Andreini, Simone Bonechi, Monica Bianchini, Alessandro Mecocci, Vincenzo Di Massa |
| 8 | LBP-TOP for volume lesion classification in breast DCE-MRI | Gabriele Piantadosi, Roberta Fusco, Antonella Petrillo, Mario Sansone, Carlo Sansone |
| 9 | Kernel Centered Alignment Supervised Metric for Multi-Atlas Segmentation | Mauricio Orbes-Arteaga, David Cárdenas-Peña, Mauricio A. Alvarez, Alvaro A. Orozco, Germán Castellanos-Dominguez |
| 10 | A New Approach to Detect Use of Alcohol Through Iris Videos Using Computer Vision | Hedenir Pinheiro, Ronaldo Costa, Eduardo Camilo, Anderson Soares, Rogerio Salvini, Gustavo Laureano, Fabrizzio Soares, Gang Hua |
| 11 | Selection of Temporal Features for Event Detection in Smart Security | Niki Martinel, Danilo Avola, Claudio Piciarelli, Christian Micheloni, Marco Vernier, Luigi Cinque, Gian Luca Foresti |
| 12 | Recognition of Human Movements with Pressure Floor Sensors | Martino Lombardi, Roberto Vezzani, Rita Cucchiara |
| 13 | Object Detection & Tracking from fixed and mobile platforms | Giovanni Garibotto, Francesco Buemi |

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| 14 | Foreground detection robust against cast shadows in outdoor daytime environment | Akari Sato, Masato Toda, Masato Tsukada |
| 15 | A Tool to Support the Creation of Datasets of Tampered Videos | Edoardo Ardizzone, Giuseppe Mazzola |
| 16 | Cognition helps vision: recognizing biological motion using invariant dynamic cues | Nicoletta Noceti, Alessandra Sciutti, Giulio Sandini |
| 17 | Egocentric Object Tracking: an Odometry-Based Solution | Stefano Alletto, Giuseppe Serra, Rita Cucchiara |
| 18 | En plein air visual agents | Marco Gori, Marco Lippi, Marco Maggini, Stefano Melacci, Marcello Pelillo |
| 19 | Modalities Combination for Italian Sign Language Extraction and Recognition | Bassem Seddik, Sami Gazzah, Najoua Essoukri Ben Amara |
| 20 | Abnormality Detection with Improved Histogram of Oriented Tracklets | Hossein Mousavi, Moin Nabi, Hamed Kiani Galoogahi, Alessandro Perina, Vittorio Murino |

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