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# Image Analysis and Processing – ICIAP 2019

20th International Conference  
Trento, Italy, September 9–13, 2019  
Proceedings, Part II


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# Preface

The International Conference on Image Analysis and Processing (ICIAP) is an established scientific meeting organized biennially and promoted by the Italian Association for Computer Vision, Pattern Recognition and Machine Learning (CVPL; ex-GIRPR) of the International Association for Pattern Recognition (IAPR). The conference traditionally covers topics related to computer vision, pattern recognition, and image processing, addressing both theoretical and applicative aspects.

The 20th International Conference on Image Analysis and Processing (ICIAP 2019), held in Trento, Italy, September 9–13, 2019 (<https://event.unitn.it/iciap2019>), was organized jointly by University of Trento and Fondazione Bruno Kessler.

The conference was located in the city center, at the Faculty of Law of University of Trento, nearby Piazza Duomo, namely the historical, main square of the city. ICIAP 2019 was endorsed by the International Association for Pattern Recognition (IAPR). This year the conference was co-located with the 13th International Conference on Distributed Smart Cameras (ICDSC 2019) (<https://event.unitn.it/icdsc2019/>), and a joint keynote speech and oral session was organized.

ICIAP is traditionally a venue to discuss image processing and analysis, computer vision, pattern recognition and machine learning, from both theoretical and applicative perspectives, promoting connections and synergies among senior scholars and students, universities, research institutes, and companies. ICIAP 2019 followed this trend, and the program was subdivided into nine main topics, covering a broad range of scientific areas, which were managed by two area chairs per each topic. They were: Video Analysis and Understanding, Pattern Recognition and Machine Learning, Deep Learning, Multiview Geometry and 3D Computer Vision, Image Analysis, Detection and Recognition, Multimedia, Biomedical and Assistive Technology, Digital Forensics, and Image Processing for Cultural Heritage.

ICIAP 2019 received 207 paper submissions from all over the world, including Algeria, Austria, Belgium, Brazil, Bulgaria, Canada, China, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, India, Israel, Italy, Japan, Korea, Morocco, Mexico, Pakistan, Poland, Romania, Russia, Saudi Arabia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, the United Kingdom, and the USA. To select papers from these submissions, 21 expert researchers were invited to act as areas chairs, together with the international Program Committee and an expert team of reviewers. A rigorous peer-review selection process was carried out where each paper received at least two reviews. This ultimately led to the selection of 117 high quality manuscripts, presented during the conference in the form of 18 orals, 18 spotlights, and 81 posters, with an overall acceptance rate of about 56%. Among oral papers selected at ICIAP 2019, four were selected as Brave New Ideas Paper, i.e. papers exploring highly innovative ideas, visionary applications, and theoretical paradigm shifts in the area of computer vision, pattern recognition, machine learning, multimedia analysis, and

image processing. The ICIAP 2019 proceedings are published as volumes of the *Lecture Notes in Computer Science* (LNCS) series by Springer.

The program included four invited talks by experts in computer vision, pattern recognition, and robotics: Davide Scaramuzza, University of Zurich and ETH Zurich (Switzerland), Tal Ayellet, Technion Israel of Technology (Israel), Emanuele Rodolà, Sapienza University of Rome (Italy), and Alessandra Sciutti, Italian Institute of Technology (Italy), who addressed very interesting and recent research approaches and paradigms such as deep learning, 3D modeling and reconstruction, visual robot navigation, semantic scene understanding, human-robot interaction, visual cognition, computer graphics, and image enhancement. ICIAP 2019 also included several tutorials on topics of great relevance for the community: Vision, Language and Action: from Captioning to Embodied AI, Lorenzo Baraldi and Marcella Cornia (University of Modena Reggio Emilia); Transferring Knowledge Across Domains: an Introduction to Deep Domain Adaptation, Massimiliano Mancini (Sapienza University of Rome, FBK and Italian Institute of Technology) and Pietro Morerio (Italian Institute of Technology); High-Dynamic-Range Imaging: Improvements and Limits, Alessandro Rizzi (University of Milano); Anomaly Detection in Images, Giacomo Boracchi (Politecnico Milano) and Diego Carrera (ST Microelectronics); Fingerprint Presentation Attacks Detection: Lessons Learned and a Roadmap to the Future, Gian Luca Marcialis (University of Cagliari); and Probabilistic and Deep Learning for Regression in Computer Vision, Stephane Lathuilière (University of Trento) and Xavier Alameda-Pineda (Inria Grenoble). ICIAP 2019 also hosted the presentation of the results of the Challenge DAFNE (Digital Anastylis of Frescoes challeNgE), an international competition in the artistic heritage sector designed to provide virtual solutions that ultimately add to the fresco restorer's toolkit.

ICIAP 2019 also hosted five satellite events: four workshops and one industrial session. The workshops were: BioFor Workshop on Recent Advances in Digital Security: Biometrics and Forensics, organized by Daniel Riccio, Francesco Marra, Diego Gragnaniello (University of Naples Federico II, Italy) and Chang-Tsun Li (Deakin University, Australia); the First International Workshop on eHealth in the Big Data and Deep Learning Era, organized by Tanmoy Chakraborty (Institute of Information Technology Delhi, India), Stefano Marrone (University of Naples "Federico II", Italy) and Giancarlo Sperl (CINI - ITEM National Lab, Naples, Italy); Deep Understanding of Shopper Behaviours and Interactions in Intelligent Retail Environment, organized by Emanuele Frontoni (Università Politecnica delle Marche), Sebastiano Battiato (University of Catania, Italy), Cosimo Distanto (ISASI CNR, Italy), Marina Paolanti (Università Politecnica delle Marche, Italy), Luigi Di Stefano (University of Bologna, Italy), Giovanni Marina Farinella (University di Catania, Italy), Annette Wolfrath (GfK Verein, Germany) and Primo Zingaretti (Università Politecnica delle Marche, Italy) and the International Workshop on Pattern Recognition for Cultural Heritage (PatReCH 2019), organized by Francesco Fontanella, Mario Molinaro (University of Cassino and Southern Lazio, Italy) and Filippo Stanco (University of Catania, Italy). The Industrial Session was organized with the purpose of bringing together researchers and practitioners in industrial engineering and computer science interested in industrial machine vision. The session was organized by Luigi di Stefano, Vittorio Murino, Paolo Rota, and Francesco Setti. In the industrial session we hosted

several companies as well as start-ups to show their activities while assessing them with respect to the cutting-edge research in the respective areas. The papers from the workshop and the industrial session were all collected in *New Trends in Image Analysis and Processing – ICIAP 2019*. We thank all the workshop and industrial session organizers and tutorial speakers who made possible such an interesting pre-conference program.

Several awards were conferred during ICIAP 2019. Two student support grants were provided by the International Association for Pattern Recognition (IAPR). The Eduardo Caianiello Award was attributed to the best paper authored or co-authored by at least one young researcher (PhD student, Post Doc, or similar). A Best Paper Award was also assigned after a careful selection made by an ad hoc appointed committee. The award was dedicated to Prof. Alfredo Petrosino, an eminent scientist and one of the most active members of the Italian Chapter of the IAPR, who passed away this year. During the conference an important moment was dedicated to commemorate the memory of Prof. Petrosino who will be greatly missed.

The organization and the success of ICIAP 2019 was made possible thanks to the cooperation of many people. First of all, special thanks should be given to all the reviewers and the area chairs, who made a big effort for the selection of the papers. Second, we also would like to thank the industrial, special session, publicity, publication, and Asia and US liaison chairs, who, operating in their respective fields, made this event a successful forum of science. Special thanks go to the workshop and tutorial chairs, as well as all workshop organizers and tutorial lecturers for making the conference program richer with notable satellite events. The communication services department of UNITN that supported all the communication, the registration process, and the financial aspects of the conference, among many other issues, should be acknowledged for all the work done. Last but not least, we are indebted to the local Organizing Committee (mainly colleagues from MHUG, University of Trento, and FBK-TeV) who covered almost every aspect of the conference when necessary and the day-to-day management issues of the ICIAP 2019 organization. Thanks very much indeed to all the aforementioned people, as without their support we would not have made it. We hope that ICIAP 2019 met its aim to serve as a basis and inspiration for future ICIAP editions.

August 2019

Elisa Ricci  
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