## **Lecture Notes in Computer Science**

11010

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

#### **Editorial Board**

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zurich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology Madras, Chennai, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at http://www.springer.com/series/7409

Anup Basu · Stefano Berretti (Eds.)

# Smart Multimedia

First International Conference, ICSM 2018 Toulon, France, August 24–26, 2018 Revised Selected Papers



Editors Anup Basu University of Alberta Edmonton, AB, Canada

Stefano Berretti Dipartimento di Ingegneria Università degli Studi di Firenze Florence, Italy

ISSN 0302-9743 ISSN 1611-3349 (electronic) Lecture Notes in Computer Science ISBN 978-3-030-04374-2 ISBN 978-3-030-04375-9 (eBook) https://doi.org/10.1007/978-3-030-04375-9

Library of Congress Control Number: 2018962151

LNCS Sublibrary: SL3 - Information Systems and Applications, incl. Internet/Web, and HCI

#### © Springer Nature Switzerland AG 2018

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

### **Preface**

Welcome to the proceedings of the First International Conference on Smart Multimedia. The idea behind this conference originated from the need to bring together smart algorithm design and various multimedia technologies ranging from smart sensing to haptics. We organized this conference with only one track to facilitate exchanges between researchers from various communities (e.g., deep learning, signal processing, computer vision, robotics, and medical multimedia processing) who focus on different topics. We hope this will help initiate new interdisciplinary collaborations and accelerate projects that need expertise in multiple disciplines.

In the long term, we would like to go beyond collecting big data and using such data for learning, to understanding what smartness really means and how many animals in nature can learn and generalize from a limited number of examples.

In our first year of the conference, we received around 100 submissions; around 30% could be accepted in the regular tracks owing to limited space. In addition, two excellent tutorials covering the topics of "Haptics for Smart Multimedia" and "Domain Adaptation for Computer Vision" were included. Papers in the conference were organized into 11 sessions, and the Springer LNCS proceedings containing the papers are arranged following these sessions into 10 topics. The topics in the proceedings include: Social, Affective and Cognition Analysis; Person-centered Smart Multimedia; Haptic and Robots for Smart Multimedia; MR, 3D, Underwater Image Processing; When Smart Signal Processing Meets Smart Sensing; Visual Behavior Analysis; Video Analysis; Learning; and Low-level Vision. These areas cover a broad range of disciplines on the wider field of smart multimedia.

We thank several donors for our premier conference on Smart Multimedia whose gifts not only assisted in covering the cost of organizing the conference, but also made the variety of social events possible.

October 2018 Stefano Berretti
Anup Basu

### **Organization**

#### **General Chairs**

N. Thirion-Moreau SeaTech

A. Leleve INSA, Lyon, France

A. Basu University of Alberta, Canada

### **Program Chairs**

S. Berretti UFlorence, Italy M. Daoudi IMT Lille Douai

#### **Area Chairs**

S. Panchanathan Arizona University, USA
A. El-Saddik University of Ottawa, Canada
W. Pedrycz University of Alberta, Canada

M. Kankanhalli NUS, Singapore

J. Wu University of Windsor, Canada

### **Industrial Program Chairs**

Li Cheng A-Star, Singapore
Tao Wang SAS, USA
H. Azari Microsoft, USA
G.-M. Su Dolby, USA

F. Zhai Huawei, Hong Kong, SAR China

#### **Finance Chair**

Lihang Ying Together Inc.

### **Special Sessions Chair**

S. Nahavandi Deakin University, Australia

### **Special Sessions Assistant**

S. Soltaninejad University of Alberta, Canada

### **Registration Chair**

Yo-Ping Huang Taipei University, Taiwan

### **Publicity Co-chairs**

P. Atrey University of Albany, USA Jun Zhou Griffith University, Australia

### **Submissions Chair**

S. Mukherjee University of Alberta, Canada

#### Web Chair

X. Sun University of Alberta, Canada

#### Advisor

P. Bonfils University of Toulon, France

### **Program Committee**

### **ICSM 2018 Program Committee**

Ajmal Mian University of Western Australia
Alan Wee-Chung Liew Griffith University, Australia

Alexander Schwing University of Illinois at Urbana-Champaign, USA

Allan Jepson University of Toronto, Canada
Andrea Prati University of Parma, Italy
Ashirbani Saha Duke University, USA
Audrey Minghelli University of Toulon, France
Bin Wang Griffith University, Australia
Chengcai Leng University of Alberta, Canada

Cheston Tan Yin Chet Institute for Infocomm Research, Singapore

Chidansh Bhatt FxPal, USA

Chunhua Shen University of Adelaide, Australia Claudio Ferrari University of Florence, Italy

Claudio Tortorici Khalifa University of Science, Technology and

Research, UAE

Costantino Grana University of Modena and Reggio Emilia, Italy

Cyril Prissette University of Toulon, France

David Fofi University of Bourgogne Franche-Comté (UBFC),

France

Dibyendu Mukherjee Epson Canada Ltd.

Djamila Aouada University of Luxembourg, Luxembourg

Eric Moreau University of Toulon, France

Francisco Josè Silva Mata CENATAV, Cuba

François Denis Aix-Marseille Université, France Frédéric Bouchara University of Toulon, France

Georges Quenot Bâtiment IMAG

Géraldine Morin The National Institute of Electrical Engineering,

Electronics, Computer Science, Fluid Mechanics & Telecommunications and Networks, France

Giuseppe Lisanti University of Pavia, Italy Guoying Zhao University of Oulu, Finland

Hervé Rivano Inria, France

Hicham Ghennioui Université Sidi Mohamed Ben Abdellah, Morocco

Hongdong Li Australian National University, Australia Iacopo Masi University of Southern California, USA

Jean Martinet University of Lille, France

Jian Zhang University of Technology Sydney, Australia

Kamal Nasrollahi Aalborg University, Denmark Karim Abed-Meraim Université d'Orléans, France

Lei Wang University of Wollongong, Australia

Lidong Chen NUDT, China
Lionel Fillatre UNS CNRS, France

Mahdi Tavakoli University of Alberta, Canada

Manoranjan Mohanty
Manoranjan Paul
Marcus Brubaker

University of Auckland, New Zealand
Charles Sturt University, Australia
University of Toronto, Canada

Mark Pickering University of New South Wales, Australia
Minglun Gong Newfoundland and Labrador University, Canada

Minh Tu Pham INSA Lyon, France

Mukesh Saini Indian Institute of Technology, Ropar, India Naoufel Werghi Khalifa University of Science, Technology

and Research, UAE

Nathalie Mitton Inria, France Oscar Garcia-Panella Barcelona, Spain

Paweł Karczmarek The John Paul II Catholic University of Lublin, Poland

Pietro Pala University of Florence, Italy Pietro Zanuttigh University of Padua, Italy

Remco Veltkamp Utrecht University

Roger Zimmermann National University of Singapore
Ruixing Yu Northwestern Polytechnical University

Sabrina Senatore UNISA

Sabu M. Thampi Indian Institute of Information Technology

and Management - Kerala (IIITM-K), India

Shuiwang Ji Washington State University, USA

Shuren Tan Vision Splend

Thanh Nguyen University of Alberta, Canada Thomas B. Moeslund Aalborg University, Denmark

#### X Organization

Vincent Charvillat The National Institute of Electrical Engineering,

Electronics, Computer Science, Fluid Mechanics & Telecommunications and Networks, France

Vincenzo Loia **UNISA** 

Xenophon Zabulis ICS-Forth, Greece

Zenon A. Sosnowski Politechnika Białostocka, Poland Zhisheng Yan Georgia State University, USA Zhiwu Li Xidian University, China

University of Sydney, Australia Zhiyong Wang

Zhuhui Xiong NUDT, China

### **Contents**

Social, Affective and Cognition Analysis	
Tactile Facial Action Units Toward Enriching Social Interactions for Individuals Who Are Blind	3
·	
Affectional Ontology and Multimedia Dataset for Sentiment Analysis Rana Abaalkhail, Fatimah Alzamzami, Samah Aloufi, Rajwa Alharthi, and Abdulmotaleb El Saddik	15
Predicting Student Seating Distribution Based on Social Affinity Zhao Pei, Miaomiao Pan, Kang Liao, Miao Ma, and Chengcai Leng	29
Spatio-Temporal Eye Gaze Data Analysis to Better Understand	
Team Cognition	39
Person-Centered Smart Multimedia: Serving People with Disabilities to the General Population	
Person-Centric Multimedia: How Research Inspirations from Designing Solutions for Individual Users Benefits the Broader Population Sethuraman Panchanathan, Ramin Tadayon, Hemanth Venkateswara, and Troy McDaniel	51
Deep Reinforcement Learning Methods for Navigational Aids Bijan Fakhri, Aaron Keech, Joel Schlosser, Ethan Brooks, Hemanth Venkateswara, Sethuraman Panchanathan, and Zsolt Kira	66
Haptic and Robots for Smart Multimedia Applications	
A Pneumatic Haptic Probe Replica for Tele-Robotized Ultrasonography Ibrahim Abdallah, Fabrice Gatwaza, Nicolas Morette, Arnaud Lelevé, Cyril Novales, Laurence Nouaille, Xavier Brun, and Pierre Vieyres	<b>7</b> 9
Haptic Vision: Augmenting Non-visual Travel and Accessing Environmental Information at a Distance	90
Bryan Duarte, Troy McDaniel, Ramin Tadayon, Samjhana Devkota, Gracie Strasser, CeCe Ramey, and Sethuraman Panchanathan	

Robotic Catheter for Endovascular Surgery Using 3D Magnetic Guidance Amir Pournajib and Anup Basu	102
Haptic Training in a Virtual Environment to Train Cognitive Functions of Medical Students: Work in Progress	110
MR, 3D, Underwater Image Processing	
Towards Maritime Videosurveillance Using 4K Videos	123
A Heterogeneous Image Fusion Algorithm Based on LLC Coding Bing Zhu, Weixin Gao, Xiaomeng Wu, and Ruixing Yu	134
Towards the Identification of Parkinson's Disease Using only T1 MR Images	145
Atlas-Free Method of Periventricular Hemorrhage Detection from Preterm Infants' T1 MR Images	157
When Smart Signal Processing Meets Smart Sensing	
When Smart Signal Processing Meets Smart Imaging	171
A Regularized Nonnegative Third Order Tensor decomposition Using a Primal-Dual Projected Gradient Algorithm: Application to 3D Fluorescence Spectroscopy	183
Karima El Qate, Mohammed El Rhabi, Abdelilah Hakim, Eric Moreau, and Nadàge Thirion-Moreau	102
Adaptive Dithering Using Curved Markov-Gaussian Noise in the Quantized Domain for Mapping SDR to HDR Image	193
Visual Behavior Analysis: Methods and Applications	
A Flexible Method for Time-of-Flight Camera Calibration Using Random Forest	207

Contents	AIII
A Survey on Vision-Based Hand Gesture Recognition	219
Video Analysis	
Research on Path Planning Method of an Unmanned Vehicle in Urban Road Environments	235
Detecting Attention in Pivotal Response Treatment Video Probes	248
Person Authentication by Air-Writing Using 3D Sensor and Time Order	
Stroke Context	260
Synthetic Vision Assisted Real-Time Runway Detection for Infrared	
Aerial Images	274
Learning	
Detection-Based Online Multi-target Tracking via Adaptive Subspace Learning	285
A Deep Learning Approach to Predict Crowd Behavior Based on Emotion	296
Object Tracking in Hyperspectral Videos with Convolutional Features and Kernelized Correlation Filter	308
Learning 3DMM Deformation Coefficients for Rendering Realistic  Expression Images	320
Semi-supervised Adversarial Image-to-Image Translation	334
A Step Beyond Generative Multi-adversarial Networks	345

Adversarial Training for Dual-Stage Image Denoising Enhanced with Feature Matching	357
IVUS-Net: An Intravascular Ultrasound Segmentation Network Ji Yang, Lin Tong, Mehdi Faraji, and Anup Basu	367
Low-Level Vision	
A Simplified Active Calibration Algorithm for Focal Length Estimation Mehdi Faraji and Anup Basu	381
Automatic Computation of Fundamental Matrix Based on Voting XinSheng Li and Xuedong Yuan	391
Adapting Texture Compression to Perceptual Quality Metric for Textured 3D Models	397
A Novel Data Clustering Method Based on Smooth Non-negative Matrix Factorization	406
Miscellaneous	
Subjective Quality of Spatially Asymmetric Omnidirectional Stereoscopic Video for Streaming Adaptation	417
A Model-Based Approach for Arrhythmia Detection and Classification	429
EREL Selection Using Morphological Relation	437
EREL-Net: A Remedy for Industrial Bottle Defect Detection	448
Author Index	457