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Maria De Marsico · Gabriella Sanniti di Baja
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Pattern Recognition Applications and Methods

6th International Conference, ICPRAM 2017
Porto, Portugal, February 24–26, 2017
Revised Selected Papers

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ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-93646-8 ISBN 978-3-319-93647-5 (eBook)
<https://doi.org/10.1007/978-3-319-93647-5>

Library of Congress Control Number: 2018947324

LNCS Sublibrary: SL6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

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Printed on acid-free paper

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

Preface

The 13 chapters of this book are the extended and revised versions of selected papers presented at the 6th International Conference on Pattern Recognition Applications and Methods (ICPRAM 2017), held in Porto, Portugal, February 24–26, 2016. Since its first edition, the purpose of the ICPRAM conference has been to establish and strengthen contacts among researchers active in different research fields related to pattern recognition in its wider connotation, both from theoretical and application perspectives. This book collects the best contributions along this line. In particular, they represent the most interesting and relevant part of all submissions (11%) received for ICPRAM 2017. The pre-selection process was carried out by the general chair and the program chairs of the event by taking into account a number of criteria such as classifications and comments provided by the ICPRAM 2017 Program Committee members, the session chairs' assessment of presentation quality, and the program chairs' global view of all papers included in the technical program. Then, the authors of the pre-selected papers were invited to submit a revised and extended version of their work; a new reviewing process was performed to check whether the submitted extended papers were characterized by a sufficient amount of innovative material, with respect to the discussion of the proposed approaches, the presentation of theoretical as well as operational details, and experiments.

We believe that this book can contribute to the understanding of relevant trends of current research on pattern recognition in the areas covered by the collected papers. As with the conference organization, we divided the papers into two main tracks: “Applications” and “Methods.” The five papers dealing with methods are presented first, not because they are more important but because they have a more general scope, and each of them may offer inspiration for different applications. Then the eight papers presenting a wide variety of applications follow.

The papers dealing with methods are introduced next.

In “Control Variates as a Variance Reduction Technique for Random Projections,” by Keegan Kang and Giles Hooker, control variates are used as a variance reduction technique in Monte Carlo integration, making use of positively correlated variables to bring about a reduction of variance for estimated data.

In “Graph Classification with Mapping Distance Graph Kernels,” by Tetsuya Kataoka, Eimi Shiotsuki, and Akihiro Inokuchi, two novel graph kernels are proposed, namely, a mapping distance kernel with stars (MDKS), and mapping distance kernel with vectors (MDKV), to classify labeled graphs more accurately than existing methods.

In “Domain Adaptation Transfer Learning by Kernel Representation Adaptation,” by Xiaoyi Chen and Régis Lengellé, a new SVM-based approach with a supplementary maximum mean discrepancy (MMD)-like constraint is proposed, as well as a kernel principal component analysis (KPCA)-based transfer learning method. Both methods

are compared with other transfer learning methods from the literature to show their efficiency on synthetic and real datasets.

In “Optimal Linear Imputation with a Convergence Guarantee,” by Yehezkel S. Resheff and Daphna Weinshall, a method for imputation of missing values is proposed, which is guaranteed to converge to a local minimum. The performance of the method is shown to be markedly superior in comparison with other methods.

The paper “Condensing Deep Fisher Vectors: To Choose or to Compress?” by Sarah Ahmed and Tayyaba Azim shows that feature compression is a better choice than feature selection for reducing data high-dimensional memory. In particular, this holds when dealing with large-scale retrieval of high dimensional Fisher vectors, when they are derived from deep or shallow stochastic models such as restricted Boltzmann machine.

The group of papers dealing with Applications follows.

The paper “Emotion Recognition Using Neighborhood Components Analysis and ECG/HRV-Based Features,” by Hany Ferdinando, Tapio Seppänen, and Esko Alasaarela, explores how much neighborhood component analysis (NCA) enhances emotion recognition using ECG-derived features. Results with the MAHNOB-HCI database were validated using subject-dependent and subject-independent scenarios with kNN as classifier for 3-class problem in valence and arousal.

In “A Conservative Hidden Non-Markovian Model Approach for 2D and 3D Online Movement Trajectory Verification,” by Tim Dittmar, Claudia Krull, and Graham Horton, an approach for stochastic modelling of movement trajectories is presented, where the models are based on conservative hidden non-Markovian models. A verification system is presented that creates trajectory models from several examples. Its performance is deduced from experiments on different data sets including signatures, doodles, pseudo-signatures, and hand gestures recorded with a Kinect.

The paper “Prediction of User Interest by Predicting Product Text Reviews,” by Esteban García-Cuesta, Daniel Gómez-Vergel, Luis Gracia-Expósito, José Manuel López-López, and María Vela-Pérez, deals with shopping websites providing social network services to collect the opinions of the users on items available for purchasing. A prediction is done based on the sets of words that users would use should they express their opinions and interests on items not yet reviewed. To this aim, careful attention is given to the internal consistency of the model by relying on well-known facts of linguistic analysis, collaborative filtering techniques, and matrix factorization methods.

In the paper “Blood Vessel Delineation in Endoscopic Images with Deep Learning Based Scene Classification,” by Mayank Golhar, Yuji Iwahori M. K. Bhuyan, Kenji Funahashi, and Kunio Kasugai, a novel blood vessel extraction methodology is proposed. First, a high-level classification of the input endoscopic images into four classes is carried out. Then, the classified images containing blood vessel information are processed with a Frangi vesselness filter. The results of the proposed blood vessel delineation algorithm were found to give better accuracy than the vanilla Frangi vesselness filter and the BCOSFIRE filter, increasing it by 8% and 5%, respectively.

In “Semi-Automated Testing of an Architectural Floor Plan Retrieval Framework: Quantitative and Qualitative Comparison of Semantic Pattern-Based Matching Approaches,” by Qamer Uddin Sabri, Johannes Bayer, Viktor Ayzenshtadt,

Syed Saqib Bukhari, Klaus-Dieter Althoff, and Andreas Dengel, case-based reasoning and (in)exact graph matching are utilized to construct an end-to-end system for floor plan retrieval, accessible by a refined version of a design-supporting Web interface. A floor plan is modeled as a graph, where each room is represented as a node and the relations between rooms are modeled as edges.

In “Characterization of a Virtual Glove for Hand Rehabilitation Based on Orthogonal LEAP Controllers,” by Giuseppe Placidi, Luigi Cinque, Matteo Polsinelli, and Matteo Spezialetti, a multi-sensor approach, namely, the virtual glove (VG), is presented. It is based on the simultaneous use of two orthogonal LEAP motion controllers. An engineered version of the VG is described, and its characterization is performed through spatial measurements.

The paper “Congestion Analysis Across Locations Based on Wi-Fi Signal Sensing,” by Atsushi Shimada, Kaito Oka, Masaki Igarashi, and Rin-ichiro Taniguchi, deals with congestion analysis focusing on perceptual congestion rather than on objective, quantitative congestion. The relationship between quantitative and perceptual congestion is also analyzed. To this aim, a system for estimating and visualizing congestion and collecting user reports about congestion is described.

In “Text Line Segmentation in Handwritten Documents Based on Connected Components Trajectory Generation,” by Insaf Setitra, Abdelkrim Meziane, Zineb Hadjadj, and Nawfel Bengherbia, a novel approach of text line segmentation based on tracking is presented. Each connected component is considered as a moving object along its respective line, and finds its best match given its history motion, i.e., the closest connected component that lies in its trajectory.

Finally, we would like to express our gratitude to all the authors for their contributions, and to the reviewers, who helped ensure the quality of this book. Our thanks are also due to the INSTICC staff who supported both the conference and the preparation of this book.

February 2017

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