

# **Lecture Notes in Artificial Intelligence**      **10357**

## Subseries of Lecture Notes in Computer Science

### LNAI Series Editors

Randy Goebel

*University of Alberta, Edmonton, Canada*

Yuzuru Tanaka

*Hokkaido University, Sapporo, Japan*

Wolfgang Wahlster

*DFKI and Saarland University, Saarbrücken, Germany*

### LNAI Founding Series Editor

Joerg Siekmann

*DFKI and Saarland University, Saarbrücken, Germany*

More information about this series at <http://www.springer.com/series/1244>

Petra Perner (Ed.)

# Advances in Data Mining

## Applications and Theoretical Aspects

17th Industrial Conference, ICDM 2017  
New York, NY, USA, July 12–13, 2017  
Proceedings



Springer

*Editor*  
Petra Perner  
Institute of Computer Vision and Applied  
Computer Sciences  
Leipzig, Sachsen  
Germany

ISSN 0302-9743                    ISSN 1611-3349 (electronic)  
Lecture Notes in Artificial Intelligence  
ISBN 978-3-319-62700-7            ISBN 978-3-319-62701-4 (eBook)  
DOI 10.1007/978-3-319-62701-4

Library of Congress Control Number: 2017945723

LNCS Sublibrary: SL7 – Artificial Intelligence

© Springer International Publishing AG 2017

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.

Printed on acid-free paper

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

## Preface

The 16th event of the Industrial Conference on Data Mining ICDM was held in New York ([www.data-mining-forum.de](http://www.data-mining-forum.de)) running under the umbrella of the World Congress on “The Frontiers in Intelligent Data and Signal Analysis, DSA 2017” ([www.worldcongressdsa.com](http://www.worldcongressdsa.com)).

After the peer-review process, we accepted 26 high-quality papers for oral presentation. The topics range from theoretical aspects of data mining to applications of data mining, such as in multimedia data, in marketing, in medicine, and in process control, industry, and society. Extended versions of selected papers will appear in the international journal *Transactions on Machine Learning and Data Mining* ([www.ibai-publishing.org/journal/mldm](http://www.ibai-publishing.org/journal/mldm)).

A tutorial on Data Mining, a tutorial on Case-Based Reasoning, a tutorial on Intelligent Image Interpretation and Computer Vision in Medicine, Biotechnology, Chemistry and Food Industry, and a tutorial on Standardization in Immunofluorescence were held before the conference.

We would like to thank all reviewers for their highly professional work and their effort in reviewing the papers.

We also thank the members of the Institute of Applied Computer Sciences, Leipzig, Germany ([www.ibai-institut.de](http://www.ibai-institut.de)), who handled the conference as secretariat. We appreciate the help and understanding of the editorial staff at Springer, and in particular Alfred Hofmann, who supported the publication of these proceedings in the LNAI series.

Last, but not least, we wish to thank all the speakers and participants who contributed to the success of the conference. We hope to see you in 2018 in New York at the next World Congress on “The Frontiers in Intelligent Data and Signal Analysis, DSA 2018” ([www.worldcongressdsa.com](http://www.worldcongressdsa.com)), which combines under its roof the following three events: International Conferences Machine Learning and Data Mining, MLDM, the Industrial Conference on Data Mining, ICDM, and the International Conference on Mass Data Analysis of Signals and Images in Medicine, Biotechnology, Chemistry and Food Industry, MDA.

July 2017

Petra Perner

# Organization

## Chair

Petra Perner IBaI Leipzig, Germany

## Program Committee

Ajith Abraham	Machine Intelligence Research Labs, USA
Brigitte Bartsch-Spörl	BSR Consulting GmbH, Germany
Orlando Belo	University of Minho, Portugal
Bernard Chen	University of Central Arkansas, USA
Jeroen de Bruin	Medical University of Vienna, Austria
Antonio Dourado	University of Coimbra, Portugal
Stefano Ferilli	University of Bari, Italy
Geert Gins	KU Leuven, Belgien
Warwick Graco	ATO, Australia
Aleksandra Gruca	Silesian University of Technology, Poland
Hartmut Ilgner	Council for Scientific and Industrial Research, South Africa
Pedro Issias	Universidade Aberta, Portugal
Piotr Jedrzejowicz	Gdynia Maritime University, Poland
Martti Juhola	University of Tampere, Finland
Janusz Kacprzyk	Polish Academy of Sciences, Poland
Mehmed Kantardzic	University of Louisville, USA
Eduardo F. Morales	INAOE, Ciencias Computacionales, Mexico
Armand Prieditris	Newstar Labs, USA
Rainer Schmidt	University of Rostock, Germany
Victor Sheng	University of Central Arkansas, USA
Kaoru Shimada	Section of Medical Statistics, Fukuoka Dental College, Japan
Gero Szepannek	Santander Consumer Bank, Germany

## Additional Reviewer

Juliane Perner Cancer Research UK Cambridge Institute

# Contents

Incorporating Positional Information into Deep Belief Networks for Sentiment Classification . . . . .	1
<i>Yong Jin, Harry Zhang, and Donglei Du</i>	
Tracking Multiple Social Media for Stock Market Event Prediction. . . . .	16
<i>Fang Jin, Wei Wang, Prithwish Chakraborty, Nathan Self, Feng Chen, and Naren Ramakrishnan</i>	
Ensemble Sales Forecasting Study in Semiconductor Industry. . . . .	31
<i>Qiuping Xu and Vikas Sharma</i>	
Towards an efficient method of modeling “Next Best Action” for Digital Buyer’s journey in B2B . . . . .	45
<i>Anit Bhandari, Kiran Rama, Nandini Seth, Nishant Nirajan, Parag Chitalia, and Stig Berg</i>	
Association Rule-based Classifier Using Artificial Missing Values . . . . .	57
<i>Kaoru Shimada, Takaaki Arahira, and Takashi Hanioka</i>	
Mining Location-based Service Data for Feature Construction in Retail Store Recommendation . . . . .	68
<i>Tsung-Yi Chen, Lyu-Cian Chen, and Yuh-Min Chen</i>	
Constraint-based Clustering Algorithm for Multi-Density Data and Arbitrary Shapes . . . . .	78
<i>Walid Atwa and Kan Li</i>	
Towards a Large Scale Practical Churn Model for Prepaid Mobile Markets . . . . .	93
<i>Amit Kumar Meher, Jobin Wilson, and R. Prashanth</i>	
Smart Stores: A scalable foot traffic collection and prediction system . . . . .	107
<i>Soheila Abrishami, Piyush Kumar, and Wickus Nienaber</i>	
Multivariate Time Series Representation and Similarity Search Using PCA . . . . .	122
<i>Aminata Kane and Nematollaah Shiri</i>	
Message Passing on Factor Graph: A Novel Approach for Orphan Drug Physician Targeting . . . . .	137
<i>Yunlong Wang and Yong Cai</i>	
Fast GPU-based Influence Maximization within Finite Deadlines via Node-level Parallelism . . . . .	151
<i>Koushik Pal, Zisis Poulos, Edward Kim, and Andreas Veneris</i>	

Visual Scenes Mining for Agent Awareness Module . . . . .	166
<i>Gang Ma, Zhentao Tang, Xi Yang, Zhongzhi Shi, and Kun Yang</i>	
Predicting Hospital Re-admissions from Nursing Care Data of Hospitalized Patients . . . . .	181
<i>Muhammad K. Lodhi, Rashid Ansari, Yingwei Yao, Gail M. Keenan, Diana Wilkie, and Ashfaq A. Khokhar</i>	
Activity Prediction in Process Management using the WoMan Framework . . . . .	194
<i>Stefano Ferilli, Domenico Redavid, and Sergio Angelastro</i>	
Hierarchical Text Classification of Autopsy Reports to Determine MoD and CoD through Term-Based and Concepts-Based Features . . . . .	209
<i>Ghulam Mujtaba, Liyana Shuib, Ram Gopal Raj, Mohammed Ali Al-Garadi, Retnagowri Rajandram, and Khairunisa Shaikh</i>	
Collaborative Filtering Fusing Label Features Based on SDAE . . . . .	223
<i>Huan Huo, Xiufeng Liu, Deyuan Zheng, Zonghan Wu, Shengwei Yu, and Liang Liu</i>	
Interestingness Classification of Association Rules for Master Data . . . . .	237
<i>Wei Han, Julio Borges, Peter Neumayer, Yong Ding, Till Riedel, and Michael Beigl</i>	
MapReduce and Spark-based Analytic Framework Using Social Media Data for Earlier Flu Outbreak Detection . . . . .	246
<i>Ali Al Essa and Miad Faezipour</i>	
An Integrated Approach using Data Mining and System Dynamics to Policy Design: Effects of Electric Vehicle Adoption on CO <sub>2</sub> Emissions in Singapore . . . . .	258
<i>Bohao Zhang and Francis E.H. Tay</i>	
Using the Results of Capstone Analysis to Predict a Weather Outcome . . . . .	269
<i>Anthony G. Nolan and Warwick J. Graco</i>	
Classification of Network Traffic Using Fuzzy Clustering for Network Security . . . . .	278
<i>Terrence P. Fries</i>	
Machine Learning and Pattern Recognition Techniques for Information Extraction to Improve Production Control and Design Decisions . . . . .	286
<i>Carlos A. Escobar and Ruben Morales-Menendez</i>	
Real-time Prediction of Styrene Production Volume based on Machine Learning Algorithms . . . . .	301
<i>Yikai Wu, Fang Hou, and Xiaopei Cheng</i>	

A graph-based ranking model for automatic keyphrases extraction from Arabic documents . . . . .	313
<i>Mohamed Salim El Bazzi, Driss Mammass, Taher Zaki,     and Abdelatif Ennaji</i>	
Mining Frequent Subgraph Pattern over a Collection of Attributed-Graphs and Construction of a Relation Hierarchy for Result Reporting . . . . .	323
<i>Petra Perner</i>	
<b>Author Index</b> . . . . .	345