

Founding Editors

Gerhard Goos

Karlsruhe Institute of Technology, Karlsruhe, Germany

Juris Hartmanis

Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino

Purdue University, West Lafayette, IN, USA

Wen Gao

Peking University, Beijing, China

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Gerhard Woeginger 

RWTH Aachen, Aachen, Germany

Moti Yung

Columbia University, New York, NY, USA

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

Hujun Yin · David Camacho ·
Peter Tino · Antonio J. Tallón-Ballesteros ·
Ronaldo Menezes · Richard Allmendinger (Eds.)

Intelligent Data Engineering and Automated Learning – IDEAL 2019

20th International Conference
Manchester, UK, November 14–16, 2019
Proceedings, Part I

Editors

Hujun Yin 
University of Manchester
Manchester, UK

Peter Tino 
University of Birmingham
Birmingham, UK

Ronaldo Menezes
University of Exeter
Exeter, UK

David Camacho 
Technical University of Madrid
Madrid, Spain

Antonio J. Tallón-Ballesteros 
University of Huelva
Huelva, Spain

Richard Allmendinger 
University of Manchester
Manchester, UK

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-030-33606-6 ISBN 978-3-030-33607-3 (eBook)
<https://doi.org/10.1007/978-3-030-33607-3>

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

© Springer Nature Switzerland AG 2019

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, expressed 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

This year saw the 20th edition of the International Conference on Intelligent Data Engineering and Automated Learning (IDEAL 2019), held for the second time in Manchester, UK – the birthplace of one of the world’s first electronic computers as well as artificial intelligence (AI) marked by Alan Turing’s seminal and pioneering work. The IDEAL conference has been serving its unwavering role in data analytics and machine learning for the last 20 years. It strives to provide an *ideal* platform for the scientific communities and researchers from near and far to exchange latest findings, disseminate cutting-edge results, and to forge alliances on tackling many real-world challenging problems. The core themes of the IDEAL 2019 include big data challenges, machine learning, data mining, information retrieval and management, bio-/neuro-informatics, bio-inspired models (including neural networks, evolutionary computation, and swarm intelligence), agents and hybrid intelligent systems, real-world applications of intelligent techniques, and AI.

In total, 149 submissions were received and subsequently underwent rigorous peer reviews by the Program Committee members and experts. Only the papers judged to be of the highest quality and novelty were accepted and included in the proceedings. These volumes contain 94 papers (58 for the main track and 36 for special sessions) accepted and presented at IDEAL 2019, held during November 14–16, 2019, at the University of Manchester, Manchester, UK. These papers provided a timely snapshot of the latest topics and advances in data analytics and machine learning, from methodologies, frameworks, and algorithms to applications. IDEAL 2019 enjoyed outstanding keynotes from leaders in the field, Thomas Bäck of Leiden University and Damien Coyle of University of Ulster, and an inspiring tutorial from Peter Tino of University of Birmingham.

IDEAL 2019 was hosted by the University Manchester and was co-sponsored by the Alan Turing Institute and Manchester City Council. It was also technically co-sponsored by the IEEE Computational Intelligence Society UK and Ireland Chapter.

We would like to thank our sponsors for their financial and technical support. We would also like to thank all the people who devoted so much time and effort to the successful running of the conference, in particular the members of the Program Committee and reviewers, organizers of the special sessions, as well as the authors who contributed to the conference. We are also very grateful to the hard work by the local Organizing Committee at the University of Manchester, in particular, Yao Peng and

Jingwen Su for checking through all the camera-ready files. Continued support, sponsorship, and collaboration from Springer LNCS are also greatly appreciated.

September 2019

Hujun Yin
David Camacho
Peter Tino
Antonio J. Tallón-Ballesteros
Ronaldo Menezes
Richard Allmendinger

Organization

General Chairs

Hujun Yin	University of Manchester, UK
David Camacho	Universidad Politecnica de Madrid, Spain
Peter Tino	University of Birmingham, UK

Programme Co-chairs

Hujun Yin	University of Manchester, UK
David Camacho	Universidad Politecnica de Madrid, Spain
Antonio J. Tallón-Ballesteros	University of Huelva, Spain
Peter Tino	University of Birmingham, UK
Ronaldo Menezes	University of Exeter, UK
Richard Allmendinger	University of Manchester, UK

International Advisory Committee

Lei Xu	Chinese University of Hong Kong, Hong Kong, China, and Shanghai Jiaotong University, China
Yaser Abu-Mostafa	CALTECH, USA
Shun-ichi Amari	RIKEN, Japan
Michael Dempster	University of Cambridge, UK
Francisco Herrera	Autonomous University of Madrid, Spain
Nick Jennings	University of Southampton, UK
Soo-Young Lee	KAIST, South Korea
Erkki Oja	Helsinki University of Technology, Finland
Latit M. Patnaik	Indian Institute of Science, India
Burkhard Rost	Columbia University, USA
Xin Yao	Southern University of Science and Technology, China, and University of Birmingham, UK

Steering Committee

Hujun Yin (Chair)	University of Manchester, UK
Laiwan Chan (Chair)	Chinese University of Hong Kong, Hong Kong, China
Guilherme Barreto	Federal University of Ceará, Brazil
Yiu-ming Cheung	Hong Kong Baptist University, Hong Kong, China
Emilio Corchado	University of Salamanca, Spain
Jose A. Costa	Federal University of Rio Grande do Norte, Brazil
Marc van Hulle	KU Leuven, Belgium

Samuel Kaski	Aalto University, Finland
John Keane	University of Manchester, UK
Jimmy Lee	Chinese University of Hong Kong, Hong Kong, China
Malik Magdon-Ismail	Rensselaer Polytechnic Institute, USA
Peter Tino	University of Birmingham, UK
Zheng Rong Yang	University of Exeter, UK
Ning Zhong	Maebashi Institute of Technology, Japan

Publicity Co-chairs/Liaisons

Jose A. Costa	Federal University of Rio Grande do Norte, Brazil
Bin Li	University of Science and Technology of China, China
Yimin Wen	Guilin University of Electronic Technology, China

Local Organizing Committee

Hujun Yin	Richard Allmendinger
Richard Hankins	Yao Peng
Ananya Gupta	Jingwen Su
Mengyu Liu	

Program Committee

Ajith Abraham	Josep Carmona
Jesus Alcala-Fdez	Mercedes Carnero
Richard Aler	Carlos Carrascosa
Davide Anguita	Andre de Carvalho
Anastassia Angelopoulou	Joao Carvalho
Ángel Arcos-Vargas	Pedro Castillo
Romis Attux	Luis Cavique
Martin Atzmueller	Darryl Charles
Dariusz Barbucha	Richard Chbeir
Mahmoud Barhamgi	Songcan Chen
Bruno Baruque	Xiaohong Chen
Carmelo Bastos Filho	Sung-Bae Cho
Lordes Borrajo	Stelvio Cimato
Zoran Bosnic	Manuel Jesus Cobo Martin
Vicent Botti	Leandro Coelho
Edyta Brzykczyn	Carlos Coello Coello
Fernando Buarque	Roberto Confalonieri
Andrea Burattin	Rafael Corchuelo
Robert Burduk	Francesco Corona
Aleksander Byrski	Nuno Correia
Heloisa Camargo	Luis Correia

Paulo Cortez
Jose Alfredo F. Costa
Carlos Cotta
Raúl Cruz-Barbosa
Alfredo Cuzzocrea
Bogusław Cyganek
Ireneusz Czarnowski
Ernesto Damiani
Amit Kumar Das
Bernard De Baets
Javier Del Ser
Boris Delibašić
Fernando Díaz
Juan Manuel Dodero
Jose Dorronsoro
Dinu Dragan
Gérard Dreyfus
Jochen Einbeck
Florentino Fdez-Riverola
Joaquim Filipe
Juan J. Flores
Simon James Fong
Pawel Forczmanski
Giancarlo Fortino
Felipe M. G. França
Dariusz Frejlichowski
Hamido Fujita
Marcus Gallagher
Yang Gao
Salvador Garcia
Pablo García Sánchez
Luis Javier Garcia Villalba
María José Ginzo Villamayor
Fernando Gomide
Antonio Gonzalez-Pardo
Anna Gorawska
Marcin Gorawski
Juan Manuel Górriz
Manuel Graña
Maciej Grzenda
Jerzy Grzymala-Busse
Pedro Antonio Gutierrez
Barbara Hammer
Julia Handl
Richard Hankins
Ioannis Hatzilygeroudis

Álvaro Herrero
J. Michael Herrmann
Ignacio Hidalgo
James Hogan
Jaakko Hollmén
Wei-Chiang Samuelson Hong
Vahid Jalali
Dariusz Jankowski
Piotr Jedrzejowicz
Vicente Julian
Rushed Kanawati
Mario Koeppen
Mirosław Kordos
Marcin Korzeń
Dariusz Krol
Pawel Ksieniewics
Raul Lara-Cabrera
Bin Li
Lei Liu
Wenjian Luo
José F. Martínez-Trinidad
Giancarlo Mauri
Cristian Mihaescu
Boris Mirkin
José M. Molina
João Mp Cardoso
Grzegorz J. Nalepa
Valery Naranjo
Susana Nascimento
Tim Nattkemper
Antonio Neme
Rui Neves Madeira
Ngoc-Thanh Nguyen
Paulo Novais
Fernando Nuñez
Ivan Olier-Caparroso
Eva Onaindia
Sandra Ortega-Martorell
Vasile Palade
Jose Palma
Juan Pavón
Yao Peng
Carlos Pereira
Barbara Pes
Marco Platzner
Paulo Quaresma

Cristian Ramírez-Atencia
 Ajalmar Rêgo Da Rocha Neto
 Izabela Rejer
 Victor Rodriguez Fernandez
 Matilde Santos
 Pedro Santos
 Jose Santos
 Rafal Scherer
 Ivan Silva
 Leandro A. Silva
 Dragan Simic
 Anabela Simões
 Marcin Szpyrka
 Jesús Sánchez-Oro
 Ying Tan
 Qing Tian
 Renato Tinós
 Stefania Tomasiello

Pawel Trajdos
 Carlos M. Travieso-González
 Bogdan Trawinski
 Milan Tuba
 Turki Turki
 Eiji Uchino
 Carlos Usabiaga Ibáñez
 José Valente de Oliveira
 Alfredo Vellido
 Juan G. Victores
 José R. Villar
 Lipo Wang
 Tzai-Der Wang
 Dongqing Wei
 Raymond Kwok-Kay Wong
 Michal Wozniak
 Xin-She Yang
 Huiyu Zhou

Additional Reviewers

Sabri Allani
 Ray Baishkhi
 Samik Banerjee
 Avishek Bhattacharjee
 Nurul E'zzati Binti Md Isa
 Daniele Bortoluzzi
 Anna Burduk
 Jose Luis Calvo Rolle
 Walmir Caminnhas
 Meng Cao
 Hugo Carneiro
 Giovanna Castellano
 Hubert Cecotti
 Carl Chalmers
 Lei Chen
 Zonghai Chen
 Antonio Maria Chiarelli
 Bernat Coma-Puig
 Gabriela Czanner
 Mauro Da Lio
 Sukhendu Das
 Klaus Dietmayer
 Paul Fergus
 Róża Goścień
 Ugur Halici

Hongmei He
 Eloy Irigoyen
 Suman Jana
 Ian Jarman
 Jörg Keller
 Bartosz Krawczyk
 Weikai Li
 Mengyu Liu
 Nicolás Marichal
 Wojciech Mazurczyk
 Philippa Grace McCabe
 Eneko Osaba
 Kexin Pei
 Mark Pieroni
 Alice Plebe
 Girijesh Prasad
 Sergey Prokudin
 Yu Qiao
 Juan Rada-Vilela
 Dheeraj Rathee
 Haider Raza
 Yousef Rezaei Tabar
 Patrick Riley
 Gastone Pietro Rosati Papini
 Salma Sassi

Ivo Siekmann
 Mônica Ferreira Da Silva
 Kacper Sumera
 Yuchi Tian
 Mariusz Topolski

Marley Vellasco
 Yu Yu
 Rita Zgheib
 Shang-Ming Zhou

Special Session on Fuzzy Systems and Intelligent Data Analysis

Organizers

Susana Nascimento	NOVA University, Portugal
Antonio	University of Huelva, Spain
J. Tallón-Ballesteros	
José Valente de Oliveira	University of Algarve, Portugal
Boris Mirkin	National Research University Moscow, Russian

Special Session on Machine Learning towards Smarter Multimodal Systems

Organizers

Nuno Correia	NOVA University of Lisboa, Portugal
Rui Neves Madeira	NOVA University of Lisboa, Polytechnic Institute of Setúbal, Portugal
Susana Nascimento	NOVA University, Portugal

Special Session on Data Selection in Machine Learning

Organizers

Antonio	University of Huelva, Spain
J. Tallón-Ballesteros	
Raymond Kwok-Kay Wong	University of New South Wales, Australia
Ireneusz Czarnowski	University of Novi Sad, Serbia
Simon James Fong	University of Macau, Macau, China

Special Session on Machine Learning in Healthcare

Organizers

Ivan Olier	Liverpool John Moores University, UK
Sandra Ortega-Martorell	Liverpool John Moores University, UK
Paulo Lisboa	Liverpool John Moores University, UK
Alfredo Vellido	Universitat Politècnica de Catalunya, Spain

Special Session on Machine Learning in Automatic Control

Organizers

Matilde Santos	University Complutense of Madrid, Spain
Juan G. Victores	University Carlos III of Madrid, Spain

Special Session on Finance and Data Mining

Organizers

Fernando Núñez Hernández	University of Seville, Spain
Antonio	University of Huelva, Spain
J. Tallón-Ballesteros	
Paulo Vasconcelos	University of Porto, Portugal
Ángel Arcos-Vargas	University of Seville, Spain

Special Session on Knowledge Discovery from Data

Organizers

Barbara Pes	University of Cagliari, Italy
Antonio	University of Huelva, Spain
J. Tallón-Ballesteros	
Julia Handl	University of Manchester, UK

Special Session on Machine Learning Algorithms for Hard Problems

Organizers

Pawel Ksieniewicz	Wroclaw University of Science and Technology, Poland
Robert Burduk	Wroclaw University of Science and Technology, Poland

Contents – Part I

Orchids Classification Using Spatial Transformer Network with Adaptive Scaling	1
<i>Watcharin Sarachai, Jakramate Bootkrajang, Jeerayut Chaijaruwanich, and Samerkae Somhom</i>	
Scalable Dictionary Classifiers for Time Series Classification	11
<i>Matthew Middlehurst, William Vickers, and Anthony Bagnall</i>	
Optimization of the Numeric and Categorical Attribute Weights in KAMILA Mixed Data Clustering Algorithm	20
<i>Nádia Junqueira Martarelli and Marcelo Seido Nagano</i>	
Meaningful Data Sampling for a Faithful Local Explanation Method	28
<i>Peyman Rasouli and Ingrid Chieh Yu</i>	
Classifying Prostate Histological Images Using Deep Gaussian Processes on a New Optical Density Granulometry-Based Descriptor	39
<i>Miguel López-Pérez, Adrián Colomer, María A. Sales, Rafael Molina, and Valery Naranjo</i>	
Adaptive Orthogonal Characteristics of Bio-inspired Neural Networks	47
<i>Naohiro Ishii, Toshinori Deguchi, Masashi Kawaguchi, Hiroshi Sasaki, and Tokuro Matsuo</i>	
Using Deep Learning for Ordinal Classification of Mobile Marketing User Conversion	60
<i>Luís Miguel Matos, Paulo Cortez, Rui Castro Mendes, and Antoine Moreau</i>	
Modeling Data Driven Interactions on Property Graph	68
<i>Worapol Alex Pongpech</i>	
Adaptive Dimensionality Adjustment for Online “Principal Component Analysis”	76
<i>Nico Migenda, Ralf Möller, and Wolfram Schenck</i>	
Relevance Metric for Counterfactuals Selection in Decision Trees	85
<i>Rubén R. Fernández, Isaac Martín de Diego, Víctor Aceña, Javier M. Moguerza, and Alberto Fernández-Isabel</i>	
Weighted Nearest Centroid Neighbourhood	94
<i>Víctor Aceña, Javier M. Moguerza, Isaac Martín de Diego, and Rubén R. Fernández</i>	

The Prevalence of Errors in Machine Learning Experiments	102
<i>Martin Shepperd, Yuchen Guo, Ning Li, Mahir Arzoky, Andrea Capiluppi, Steve Counsell, Giuseppe Destefanis, Stephen Swift, Allan Tucker, and Leila Yousefi</i>	
A Hybrid Model for Fraud Detection on Purchase Orders	110
<i>William Ferreira Moreno Oliverio, Allan Barcelos Silva, Sandro José Rigo, and Rodolpho Lopes Bezerra da Costa</i>	
Users Intention Based on Twitter Features Using Text Analytics	121
<i>Qadri Mishael, Aladdin Ayeshe, and Iryna Yevseyeva</i>	
Mixing Hetero- and Homogeneous Models in Weighted Ensembles	129
<i>James Large and Anthony Bagnall</i>	
A Hybrid Approach to Time Series Classification with Shapelets	137
<i>David Guijo-Rubio, Pedro A. Gutiérrez, Romain Tavenard, and Anthony Bagnall</i>	
An Ensemble Algorithm Based on Deep Learning for Tuberculosis Classification	145
<i>Alfonso Hernández, Ángel Panizo, and David Camacho</i>	
A Data-Driven Approach to Automatic Extraction of Professional Figure Profiles from Résumés	155
<i>Alessandro Bondielli and Francesco Marcelloni</i>	
Retrieving and Processing Information from Clinical Algorithm via Formal Concept Analysis	166
<i>Aleksandra Vatian, Anna Tatarinova, Svyatoslav Osipov, Nikolai Egorov, Vitalii Boitsov, Elena Ryngach, Tatiana Treshkur, Anatoly Shalyto, and Natalia Gusarova</i>	
Comparative Analysis of Approaches to Building Medical Dialog Systems in Russian	175
<i>Aleksandra Vatian, Natalia Dobrenko, Nikolai Andreev, Aleksandr Nemerovskii, Anastasia Nevochhikova, and Natalia Gusarova</i>	
Tracking Position and Status of Electric Control Switches Based on YOLO Detector	184
<i>Xingang Mou, Jian Cui, Hujun Yin, and Xiao Zhou</i>	
A Self-generating Prototype Method Based on Information Entropy Used for Condensing Data in Classification Tasks	195
<i>Alberto Manastarla and Leandro A. Silva</i>	

Transfer Knowledge Between Sub-regions for Traffic Prediction Using Deep Learning Method.	208
<i>Yi Ren and Kunqing Xie</i>	
Global Q-Learning Approach for Power Allocation in Femtocell Networks.	220
<i>Abdalmajeed M. Alenezi and Khairi Hamdi</i>	
Deep Learning and Sensor Fusion Methods for Studying Gait Changes Under Cognitive Load in Males and Females	229
<i>Abdullah S. Alharthi and Krikor B. Ozanyan</i>	
Towards a Robotic Personal Trainer for the Elderly.	238
<i>J. A. Rincon, A. Costa, P. Novais, V. Julian, and C. Carrascosa</i>	
Image Quality Constrained GAN for Super-Resolution.	247
<i>Jingwen Su, Yao Peng, and Hujun Yin</i>	
Use Case Prediction Using Product Reviews Text Classification	257
<i>Tinashe Wamambo, Cristina Luca, and Arooj Fatima</i>	
Convolutional Neural Network for Core Sections Identification in Scientific Research Publications	265
<i>Bello Aliyu Muhammad, Rahat Iqbal, Anne James, and Dianabasi Nkantah</i>	
Knowledge Inference Through Analysis of Human Activities	274
<i>Leandro O. Freitas, Pedro R. Henriques, and Paulo Novais</i>	
Representation Learning of Knowledge Graphs with Multi-scale Capsule Network	282
<i>Jingwei Cheng, Zhi Yang, Jinming Dang, Chunguang Pan, and Fu Zhang</i>	
CNNPSP: Pseudouridine Sites Prediction Based on Deep Learning	291
<i>Yongxian Fan, Yongzhen Li, Huihua Yang, and Xiaoyong Pan</i>	
A Multimodal Approach to Image Sentiment Analysis.	302
<i>António Gaspar and Luís A. Alexandre</i>	
Joining Items Clustering and Users Clustering for Evidential Collaborative Filtering	310
<i>Raoua Abdelkhalek, Imen Boukhris, and Zied Elouedi</i>	
Conditioned Generative Model via Latent Semantic Controlling for Learning Deep Representation of Data	319
<i>Jin-Young Kim and Sung-Bae Cho</i>	

Toward a Framework for Seasonal Time Series Forecasting Using Clustering	328
<i>Colin Leverger, Simon Malinowski, Thomas Guyet, Vincent Lemaire, Alexis Bondu, and Alexandre Termier</i>	
An Evidential Imprecise Answer Aggregation Approach Based on Worker Clustering	341
<i>Lina Abassi and Imen Boukhris</i>	
Combining Machine Learning and Classical Optimization Techniques in Vehicle to Vehicle Communication Network.	350
<i>Mutasem Hamdan and Khairi Hamdi</i>	
Adversarial Edit Attacks for Tree Data	359
<i>Benjamin Paaßen</i>	
Non-stationary Noise Cancellation Using Deep Autoencoder Based on Adversarial Learning.	367
<i>Kyung-Hyun Lim, Jin-Young Kim, and Sung-Bae Cho</i>	
A Deep Learning-Based Surface Defect Inspection System for Smartphone Glass	375
<i>Gwang-Myong Go, Seok-Jun Bu, and Sung-Bae Cho</i>	
Superlinear Speedup of Parallel Population-Based Metaheuristics: A Microservices and Container Virtualization Approach.	386
<i>Hatem Khalloof, Phil Ostheimer, Wilfried Jakob, Shadi Shahoud, Clemens Duepmeier, and Veit Hagenmeyer</i>	
Active Dataset Generation for Meta-learning System Quality Improvement. . .	394
<i>Alexey Zabashta and Andrey Filchenkov</i>	
Do You Really Follow Them? Automatic Detection of Credulous Twitter Users	402
<i>Alessandro Balestrucci, Rocco De Nicola, Marinella Petrocchi, and Catia Trubiani</i>	
User Localization Based on Call Detail Record.	411
<i>Buddhi Ayesha, Bhagya Jeewanthi, Charith Chitraranjan, Amal Shehan Perera, and Amal S. Kumarage</i>	
Automatic Ground Truth Dataset Creation for Fake News Detection in Social Media	424
<i>Danae Pla Karidi, Harry Nakos, and Yannis Stavrakas</i>	

Artificial Flora Optimization Algorithm for Task Scheduling in Cloud Computing Environment.	437
<i>Nebojsa Bacanin, Eva Tuba, Timea Bezdan, Ivana Strumberger, and Milan Tuba</i>	
A Significantly Faster Elastic-Ensemble for Time-Series Classification.	446
<i>George Oastler and Jason Lines</i>	
ALIME: Autoencoder Based Approach for Local Interpretability.	454
<i>Sharath M. Shankaranarayana and Davor Runje</i>	
Detection of Abnormal Load Consumption in the Power Grid Using Clustering and Statistical Analysis.	464
<i>Matúš Cuper, Marek Lóderer, and Viera Rozinajová</i>	
Deep Convolutional Neural Networks Based on Image Data Augmentation for Visual Object Recognition.	476
<i>Khaoula Jayech</i>	
An Efficient Scheme for Prototyping k NN in the Context of Real-Time Human Activity Recognition	486
<i>Paulo J. S. Ferreira, Ricardo M. C. Magalhães, Kemilly Dearo Garcia, João M. P. Cardoso, and João Mendes-Moreira</i>	
A Novel Recommendation System for Next Feature in Software.	494
<i>Victor R. Prata, Ronaldo S. Moreira, Luan S. Cordeiro, Átilla N. Maia, Alan R. Martins, Davi A. Leão, C. H. L. Cavalcante, Amauri H. Souza Júnior, and Ajalmar R. Rocha Neto</i>	
Meta-learning Based Evolutionary Clustering Algorithm	502
<i>Dmitry Tomp, Sergey Muravyov, Andrey Filchenkov, and Vladimir Parfenov</i>	
Fast Tree-Based Classification via Homogeneous Clustering.	514
<i>George Pardis, Konstantinos I. Diamantaras, Stefanos Ougiaroglou, and Georgios Evangelidis</i>	
Ordinal Equivalence Classes for Parallel Coordinates.	525
<i>Alexey Myachin and Boris Mirkin</i>	
New Internal Clustering Evaluation Index Based on Line Segments.	534
<i>Juan Carlos Rojas Thomas and Matilde Santos Peñas</i>	
Threat Identification in Humanitarian Demining Using Machine Learning and Spectroscopic Metal Detection.	542
<i>Wouter van Verre, Toykan Özdeğer, Ananya Gupta, Frank J. W. Podd, and Anthony J. Peyton</i>	
Author Index	551

Contents – Part II

Special Session on Fuzzy Systems and Intelligent Data Analysis

Computational Generalization in Taxonomies Applied to: (1) Analyze Tendencies of Research and (2) Extend User Audiences.	3
<i>Dmitry Frolov, Susana Nascimento, Trevor Fenner, Zina Taran, and Boris Mirkin</i>	
Unsupervised Initialization of Archetypal Analysis and Proportional Membership Fuzzy Clustering.	12
<i>Susana Nascimento and Nuno Madaleno</i>	

Special Session on Machine Learning Towards Smarter Multimodal Systems

Multimodal Web Based Video Annotator with Real-Time Human Pose Estimation	23
<i>Rui Rodrigues, Rui Neves Madeira, Nuno Correia, Carla Fernandes, and Sara Ribeiro</i>	
New Interfaces for Classifying Performance Gestures in Music.	31
<i>Chris Rhodes, Richard Allmendinger, and Ricardo Climent</i>	

Special Session on Data Selection in Machine Learning

Classifying Ransomware Using Machine Learning Algorithms	45
<i>Samuel Egunjobi, Simon Parkinson, and Andrew Crampton</i>	
Artificial Neural Networks in Mathematical Mini-Games for Automatic Students' Learning Styles Identification: A First Approach.	53
<i>Richard Torres-Molina, Jorge Banda-Almeida, and Lorena Guachi-Guachi</i>	
The Use of Unified Activity Records to Predict Requests Made by Applications for External Services	61
<i>Maciej Grzenda, Robert Kunicki, and Jaroslaw Legierski</i>	
Fuzzy Clustering Approach to Data Selection for Computer Usage in Headache Disorders.	70
<i>Svetlana Simić, Ljiljana Radmilo, Dragan Simić, Svetislav D. Simić, and Antonio J. Tallón-Ballesteros</i>	

Multitemporal Aerial Image Registration Using Semantic Features	78
<i>Ananya Gupta, Yao Peng, Simon Watson, and Hujun Yin</i>	

Special Session on Machine Learning in Healthcare

Brain Tumor Classification Using Principal Component Analysis and Kernel Support Vector Machine	89
<i>Richard Torres-Molina, Carlos Bustamante-Orellana, Andrés Riofrío-Valdivieso, Francisco Quinga-Socasi, Robinson Guachi, and Lorena Guachi-Guachi</i>	

Modelling Survival by Machine Learning Methods in Liver Transplantation: Application to the UNOS Dataset	97
<i>David Guijo-Rubio, Pedro J. Villalón-Vaquero, Pedro A. Gutiérrez, Maria Dolores Ayllón, Javier Briceño, and César Hervás-Martínez</i>	

Design and Development of an Automatic Blood Detection System for Capsule Endoscopy Images	105
<i>Pedro Pons, Reinier Noorda, Andrea Nevárez, Adrián Colomer, Vicente Pons Beltrán, and Valery Naranjo</i>	

Comparative Analysis for Computer-Based Decision Support: Case Study of Knee Osteoarthritis	114
<i>Philippa Grace McCabe, Ivan Olier, Sandra Ortega-Martorell, Ian Jarman, Vasilios Baltzopoulos, and Paulo Lisboa</i>	

A Clustering-Based Patient Grouper for Burn Care	123
<i>Chindimma Noelyn Onah, Richard Allmendinger, Julia Handl, Paraskevas Yiapanis, and Ken W. Dunn</i>	

A Comparative Assessment of Feed-Forward and Convolutional Neural Networks for the Classification of Prostate Lesions	132
<i>Sabrina Marnell, Patrick Riley, Ivan Olier, Marc Rea, and Sandra Ortega-Martorell</i>	

Special Session on Machine Learning in Automatic Control

A Method Based on Filter Bank Common Spatial Pattern for Multiclass Motor Imagery BCI.	141
<i>Ziqing Xia, Likun Xia, and Ming Ma</i>	

Safe Deep Neural Network-Driven Autonomous Vehicles Using Software Safety Cages	150
<i>Sampo Kuutti, Richard Bowden, Harita Joshi, Robert de Temple, and Saber Fallah</i>	

Wave and Viscous Resistance Estimation by NN	161
<i>D. Marón and M. Santos</i>	
Neural Controller of UAVs with Inertia Variations	169
<i>J. Enrique Sierra-Garcia, Matilde Santos, and Juan G. Victores</i>	
Special Session on Finance and Data Mining	
A Metric Framework for Quantifying Data Concentration	181
<i>Peter Mitic</i>	
Adaptive Machine Learning-Based Stock Prediction Using Financial Time Series Technical Indicators	191
<i>Ahmed K. Taha, Mohamed H. Kholief, and Walid AbdelMoez</i>	
Special Session on Knowledge Discovery from Data	
Exploiting Online Newspaper Articles Metadata for Profiling City Areas	203
<i>Livio Cascone, Pietro Ducange, and Francesco Marcelloni</i>	
Modelling the Social Interactions in Ant Colony Optimization	216
<i>Nishant Gurrapadi, Lydia Taw, Mariana Macedo, Marcos Oliveira, Diego Pinheiro, Carmelo Bastos-Filho, and Ronaldo Menezes</i>	
An Innovative Deep-Learning Algorithm for Supporting the Approximate Classification of Workloads in Big Data Environments	225
<i>Alfredo Cuzzocrea, Enzo Mumolo, Carson K. Leung, and Giorgio Mario Grasso</i>	
Control-Flow Business Process Summarization via Activity Contraction.	238
<i>Valeria Fionda and Gianluigi Greco</i>	
Classifying Flies Based on Reconstructed Audio Signals	249
<i>Michael Flynn and Anthony Bagnall</i>	
Studying the Evolution of the ‘Circular Economy’ Concept Using Topic Modelling	259
<i>Sampriti Mahanty, Frank Boons, Julia Handl, and Riza Batista-Navarro</i>	
Mining Frequent Distributions in Time Series.	271
<i>José Carlos Coutinho, João Mendes Moreira, and Cláudio Rebelo de Sá</i>	
Time Series Display for Knowledge Discovery on Selective Laser Melting Machines.	280
<i>Ramón Moreno, Juan Carlos Pereira, Alex López, Asif Mohammed, and Prasha Pahlevannejad</i>	

Special Session on Machine Learning Algorithms for Hard Problems

Using Prior Knowledge to Facilitate Computational Reading of Arabic Calligraphy	293
<i>Seetah ALSalamah, Riza Batista-Navarro, and Ross D. King</i>	
SMOTE Algorithm Variations in Balancing Data Streams	305
<i>Bogdan Gulowaty and Paweł Ksieniewicz</i>	
Multi-class Text Complexity Evaluation via Deep Neural Networks	313
<i>Alfredo Cuzzocrea, Giosué Lo Bosco, Giovanni Pilato, and Daniele Schicchi</i>	
Imbalance Reduction Techniques Applied to ECG Classification Problem . . .	323
<i>Jędrzej Kozal and Paweł Ksieniewicz</i>	
Machine Learning Methods for Fake News Classification.	332
<i>Paweł Ksieniewicz, Michał Choraś, Rafał Kozik, and Michał Woźniak</i>	
A Genetic-Based Ensemble Learning Applied to Imbalanced Data Classification	340
<i>Jakub Klikowski, Paweł Ksieniewicz, and Michał Woźniak</i>	
The Feasibility of Deep Learning Use for Adversarial Model Extraction in the Cybersecurity Domain	353
<i>Michał Choraś, Marek Pawlicki, and Rafał Kozik</i>	
Author Index	361