

Proceedings of the International Neural Networks Society

Volume 2

Series Editors

Plamen Angelov, School of Computing and Communications,
University of Lancaster, Lancaster, UK

Robert Kozma, Optimization and Networks Department, University of Memphis,
Memphis, TN, USA

The “Proceedings of the International Neural Networks Society INNS” publishes research contributions on fundamental principles and applications related to neural networks and modeling behavioral and brain processes. Topics of interest include new developments, state-of-art theories, methods and practical applications, covering all aspects of neural networks and neuromorphic technologies for (artificially; replace with anthropomorphic) intelligent (designs; replace with systems). This series covers high quality books that contribute to the full range of neural networks research, from computational neuroscience, cognitive science, behavioral and brain modeling, (add machine) learning algorithms, mathematical theories, to technological applications of systems that significantly use neural network concepts and techniques.

The series publishes monographs, contributed volumes, lecture notes, edited volumes, and conference proceedings in neural networks spanning theoretical, experimental, computational, and engineering aspects. Submissions of highly innovative cutting-edge contributions are encouraged, which extend our understanding at the forefront of science going beyond mainstream approaches. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution, which enable both wide and rapid dissemination of research output in this rapidly developing research field.

More information about this series at <http://www.springer.com/series/16268>

Lazaros Iliadis · Plamen Parvanov Angelov ·
Chrisina Jayne · Elias Pimenidis
Editors

Proceedings of the 21st EANN (Engineering Applications of Neural Networks) 2020 Conference

Proceedings of the EANN 2020

Editors

Lazaros Iliadis
School of Engineering,
Department of Civil Engineering
Democritus University of Thrace
Xanthi, Greece

Chrisina Jayne
School of Computing
and Digital Technologies
Teesside University
Middlesbrough, UK

Plamen Parvanov Angelov
Lancaster University
Lancaster, UK

Elias Pimenidis
University of the West of England
Bristol, UK

ISSN 2661-8141

ISSN 2661-815X (electronic)

Proceedings of the International Neural Networks Society

ISBN 978-3-030-48790-4

ISBN 978-3-030-48791-1 (eBook)

<https://doi.org/10.1007/978-3-030-48791-1>

© The Editor(s) (if applicable) and The Author(s), under exclusive license
to Springer Nature Switzerland AG 2020

This work is subject to copyright. All rights are solely and exclusively licensed 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

EANN 2020 Preface

Artificial neural networks (ANN) are a typical case of machine learning, which mimics the physical learning process of the human brain. More than 60 years have passed from the introduction of the first perceptron. Since then, numerous types of ANN architectures have been developed. Among them are recurrent ANN, whose nodes' connections are forming a directed graph along a temporal sequence. More recently, generative adversarial neural networks are trying to fuse “imagination” to artificial intelligence (AI) and convolutional neural networks (CNN) are significantly contributing to the enhancement of pattern recognition, machine translation, anomaly detection, and machine vision. Neural networks have a significant contribution in natural language, and they are widely employed for text classification by search engines in the web. In this domain, CNN are successfully applied by the word2vec method, in recommendation systems—sentiment analysis for movies, customer reviews, and so on. Also, they are used in text-to-speech conversion and semantic parsing plus question answering systems.

The engineering applications of neural networks conference aim to bring together scientists from all AI domains and to give them the chance to exchange ideas and to announce their achievements. Since the first conference in 1995, EANN has provided a great discussion forum on engineering applications of all artificial intelligence technologies, focusing on artificial neural networks. More specifically, EANN promotes the use of modeling techniques from all subdomains of AI in diverse application areas, where significant benefits can be derived. The conference is also reporting advances in theoretical AI aspects. Thus, both innovative applications and methods are particularly appreciated. EANN is a mature and well-established international scientific conference held in Europe. Its history is long and very successful, following and spreading the evolution of intelligent systems.

The 21st EANN 2020 was collocated with the 16th EANN 2020 conference.

The first EANN event was organized in Otaniemi, Finland, in 1995. Since then, it has a continuous and dynamic presence as a major global, but mainly European scientific event. More specifically, it has been organized in Finland, UK (England), Sweden, Gibraltar, Poland, Italy, Spain, France, Bulgaria, UK (Scotland), UK

(Bristol), and Greece. It has been technically supported by the International Neural Networks Society (INNS) and more specifically by the EANN Special Interest Group.

This proceedings volume belongs to International Neural Networks (INNS) Springer Series, and it contains the papers that were accepted to be presented orally at the 21st EANN 2020 conference. The diverse nature of papers presented demonstrates the vitality of artificial intelligence algorithms and approaches. It is not only related to neural networks, but it certainly provides a very wide forum for AI applications as well.

The event was held from June 5 to 7, 2020, and it was broadcasted live through web, to all conference participants. There was no potential for physical attendance due to the global problem with CONVI-19 virus.

Regardless of the extremely difficult pandemic conditions, the response of the international scientific community to the EANN 2020 call for papers was more than satisfactory, with 89 papers initially submitted. All papers were peer reviewed by at least two independent academic referees. When needed, a third referee was consulted to resolve any potential conflicts. A total of 47% of the submitted manuscripts (42 papers) have been accepted to be published as full papers (12 pages long) in the Springer proceedings. Due to the high quality of the submissions, the Program Committee has decided that it should accept additionally six more papers to be published as short ones (ten pages long).

Four Keynote speakers gave state-of-the-art lectures (after invitation) in the timely aspects applications of artificial intelligence.

Dr. Pierre Philippe Mathieu

European Space Agency (ESA) Head of the Philab (Φ Lab) Explore Office at the European Space Agency in ESRIN (Frascati, Italy).

Pierre-Philippe is passionate about innovation and our planet: its beauty, fragility and complex dynamics as part of an integrated Earth System. His current role at ESA is to help scientists, innovators and citizens to use high-tech (such as satellite data) to better monitor, understand and preserve our home planet, by making sustainable use of its limited natural resources.

PP's background is in Earth Sciences. He has a degree in engineering and M.Sc from the University of Liege (Belgium), a Ph.D. in climate science from the University of Louvain (Belgium), and a Management degree from the University of Reading Business School (Uk). Over the last 20 years, he has been working in environmental monitoring and modelling, across disciplines from remote sensing, modelling up to weather risk management.

Currently, PP is trying to connect the global picture we get from space with world challenges in daily life, fostering the use of our Earth Observation (EO) missions to support science, innovation and development in partnership with user communities, industry and businesses.

Professor Leontios Hadjileontiadis, Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Greece, and Coordinator of i-PROGNOSIS, gave a speech on the subject of “**Smartphone, Parkinson's and Depression: A new AI-based prognostic perspective**”.

Professor Hadjileontiadis has been awarded among other awards, as innovative researcher and champion faculty from Microsoft, USA (2012), the Silver Award in Teaching Delivery at the Reimagine Education Awards (2017–2018) and the Healthcare Research Award by the Dubai Healthcare City Authority Excellence Awards (2019). He is a senior member of IEEE.

Professor Nikola Kasabov, FIEEE, FRSNZ, Fellow INNS College of Fellows, DVF RAE, UK, Director, Knowledge Engineering and Discovery Research Institute, Auckland University of Technology, Auckland, New Zealand, Advisory/Visiting Professor SJTU and CASIA China, RGU, UK, gave a speech on the subject of **“Deep Learning, Knowledge Representation and Transfer with Brain-Inspired Spiking Neural Network Architectures”**.

Professor Kasabov has received a number of awards, among them: Doctor Honoris Causa from Obuda University, Budapest; INNS Ada Lovelace Meritorious Service Award; NN Best Paper Award for 2016; APNNA “Outstanding Achievements Award”; INNS Gabor Award for “Outstanding contributions to engineering applications of neural networks”; EU Marie Curie Fellowship; Bayer Science Innovation Award; APNNA Excellent Service Award; RSNZ Science and Technology Medal; 2015 AUT Medal; Honorable Member of the Bulgarian and the Greek Societies for Computer Science.

Professor Xiao-Jun Wu Department of Computer Science and Technology, Jiangnan University, China, gave a speech on the subject of **“Image Fusion Based on Deep Learning”**.

Professor Xiao-Jun Wu has won the most outstanding postgraduate award by Nanjing University of Science and Technology. He has won different national and international awards, for his research achievements. He was a visiting postdoctoral researcher in the Center for Vision, Speech, and Signal Processing (CVSSP), University of Surrey, UK, from 2003 to 2004.

Tutorials

Prof. John Macintyre

Dean of the Faculty of Applied Sciences, Pro Vice Chancellor at the University of Sunderland, UK. During the 1990s, he established the Center for Adaptive Systems—at the University, which became recognized by the UK government as a center of excellence for applied research in adaptive computing and artificial intelligence. The center undertook many projects working with and for external organizations in industry, science, and academia, and for three years ran the Smart Software for Decision Makers program on behalf of the Department of Trade and Industry.

Professor Macintyre will give a plenary talk on the following subject: **“AI Applications during the COVID-19 Pandemic - A Double Edged Sword?”**

Dr. Kostas Karpouzis

Associate Researcher, Institute of Communication and Computer Systems (ICCS) of the National Technical University of Athens, Greece. Tutorial Subject: **“AI/ML for games for AI/ML”**.

Digital games have recently emerged as a very powerful research instrument for a number of reasons: They involve a wide variety of computing disciplines, from databases and networking to hardware and devices, and they are very attractive to users regardless of age or cultural background, making them popular and easy to evaluate with actual players. In the fields of artificial intelligence and machine learning, games are used in a twofold manner: to collect information about the players' individual characteristics (player modeling), expressivity (affective computing), and playing style (adaptivity) and also to develop AI-based player bots to assist and face the human players and as a test bed for contemporary AI algorithms.

This tutorial discusses both approaches that relate AI/ML to games: Starting from a theoretical review of user/player modeling concepts, it discusses how we can collect data from the users during gameplay and use them to adapt the player experience or model the players themselves. Following that, it presents AI/ML algorithms used to train computer-based players and how these can be used in contexts outside gaming. Finally, it introduces player modeling in contexts related to serious gaming, such as health and education.

Intended audience: researchers in the fields of machine learning and human–computer interaction, game developers and designers, health and education practitioners.

The accepted papers of the 21st EANN conference are related to the following thematic topics:

- Classification Machine Learning
- Convolutional Neural Networks in Robotics/Machine Vision
- Deep Learning Applications in Engineering
- Deep Learning LSTM in Environmental Cases
- Deep Learning in Engineering
- Deep Learning/Image Processing
- Deep Learning and Medical Systems
- Fuzzy Logic Modeling
- Unsupervised Machine Learning/Clustering
- Fuzzy Modeling
- Machine Learning and Neuro/Biological Modeling
- Meta-Learning/Nonlinear Modeling
- Algorithmic Foundations of Neural Networks
- Neural Networks in Engineering
- Optimization and Machine Learning
- Hybrid Machine Learning Systems

The authors of submitted papers came from 18 different countries from all over the globe, namely Bulgaria, Czech Republic, Germany, Greece, France, Hong Kong, Hungary, India, Italy, Japan, Norway, Poland, Romania, Russia, Spain, Turkey, UK, and Vietnam.

Organization

General Co-chairs

Chrisina Jayne
Vera Kurkova
Plamen Angelov

Teesside University, UK
Czech Academy of Sciences, Czech Republic
Lancaster University, Fellow of the IEEE, of the
IET and of the HEA, Vice President of the
International Neural Networks Society (INNS)
for Conference and Governor of the Systems,
Man and Cybernetics Society of the IEEE
University of Sunderland, UK

John Macintyre

Program Co-chairs

Lazaros Iliadis
Ilias Maglogiannis
Elias Pimenidis

School of Engineering, Democritus University
of Thrace, Greece
University of Piraeus, Greece
University of the West of England, UK

Honorary Co-chairs

Nikola Kasabov
Marios Polycarpou

Auckland University of Technology,
New Zealand
University of Cyprus, Cyprus

Liaison Chair

Ioannis Kompatsiaris

IPTIL Research Institute, Thessaloniki, Greece

Advisory Co-chairs

Andreas Stafylopatis
Vincenzo Piuri

Technical University of Athens, Greece
University of Milan, Italy, IEEE Fellow (2001),
IEEE Society/Council Active
Memberships/Services: CIS, ComSoc, CS,
CSS, EMBS, IMS, PES, PHOS, RAS, SMCS,
SPS, BIOMC, SYSC, WIE

Petia Koprinkova

Bulgarian Academy of Sciences, Bulgaria

Workshops Co-chairs

Spyros Sioutas
Christos Makris
Phivos Mylonas
Katia Kermanidis

University of Patras, Greece
University of Patras, Greece
Ionio University, Greece
Ionio University, Greece

Publication and Publicity Co-chairs

Antonis Papaleonidas
Konstantinos Demertzis
George Tsekouras

Democritus University of Thrace, Greece
Democritus University of Thrace, Greece
University of the Aegean, Greece

Special Sessions

Tutorials on Emerging AI Research (Projects and Applications)

Panagiotis Papapetrou
Vangelis Karkaletsis

Stockholm University, Sweden
National Center for Scientific Research, NSCR
“Demokritos”, Greece

Steering Committee

Chrisina Jayne

Dean of the School of Computing and Digital
Technologies Teesside University, UK

Lazaros Iliadis

School of Engineering, Department of Civil
Engineering, Head of the Sector of
Mathematics, Programming and GC,
Democritus University of Thrace, Greece

Elias Pimenidis

Program Leader Computer Science, Department
FET-Computer Science and Creative
Technologies, University of the West
of England, Bristol, UK

Program Committee

Michel Aldanondo	Toulouse University—IMT Mines Albi, France
Georgios Alexandridis	University of the Aegean, Greece
Serafin Alonso Castro	University of Leon, Spain
Ioannis Anagnostopoulos	University of Thessaly, Greece
Costin Badica	University of Craiova, Romania
Giacomo Boracchi	Politecnico di Milano, Italy
Ivo Bukovsky	Czech Technical University in Prague, Czech Republic
George Caridakis	University of the Aegean, Greece
Francisco Carvalho	Polytechnic Institute of Tomar, Portugal
Ioannis Chamodrakas	National and Kapodistrian University of Athens, Greece
Adriana Coroiu	Babeş-Bolyai University, Romania
Kostantinos Delibasis	University Of Thessaly, Greece
Konstantinos Demertzis	Democritus University of Thrace, Greece
Sergey Dolenko	Lomonosov Moscow State University, Russia
Georgios Drakopoulos	Ionian University, Greece
Mauro Gaggero	National Research Council of Italy
Ignazio Gallo	University of Insubria, Italy
Angelo Genovese	Università degli Studi di Milano, Italy
Spiros Georgakopoulos	University of Thessaly, Greece
Eleonora Giunchiglia	Oxford University, UK
Foteini Grivokostopoulou	University of Patras, Greece
Peter Hajek	University of Pardubice Czech Republic
Giannis Haralabopoulos	University of Nottingham, UK
Ioannis Hatzilygeroudis	University of Patras, Greece
Nantia Iakovidou	King's College London, UK
Lazaros Iliadis	Democritus University of Thrace, Greece
Zhu Jin	University of Cambridge, UK
Jacek Kabziński	Lodz University of Technology, Poland
Andreas Kanavos	University of Patras, Greece
Stelios Kapetanakis	The University of Brighton, UK
Petros Kefalas	University of Sheffield International Faculty CITY College, Greece
Katia Kermanidis	Ionio University, Greece
Niki Kiriakidou	University of Patras, Greece
Giannis Kokkinos	University of Makedonia, Greece
Petia Koprinkova-Hristova	Bulgarian Academy of Sciences
Athanasios Koutras	Technical Educational Institute of Western Greece
Paul Krause	University of Surrey, UK
Florin Leon	Technical University of Iasi, Romania
Aristidis Likas	University of Ioannina, Greece

Ioannis Livieris	University of Patras, Greece
Doina Logofătu	Frankfurt University of Applied Sciences, Frankfurt am Main, Germany
Ilias Maglogiannis	University of Piraeus, Greece
Goerge Magoulas	Birkbeck College, University of London, UK
Christos Makris	University of Patras, Greece
Mario Malcangi	University of Milan, Italy
Francesco Marceloni	University of Pisa, Italy
Giovanna Maria Dimitri	University of Cambridge, UK, and University of Siena, Italy
Nikolaos Mitianoudis	Democritus University of Thrace, Greece
Antonio Moran	University of Leon, Spain
Konstantinos Moutselos	University of Piraeus, Greece
Phivos Mylonas	Ionio University, Greece
Stefanos Nikiforos	Ionio University, Greece
Stavros Ntalampiras	University of Milan, Italy
Mihaela Oprea	University Petroleum-Gas of Ploiesti Romania
Ioannis P. Chochliouros	Hellenic Telecommunications Organization, Greece
Basil Papadopoulos	Democritus University of Thrace
Vaios Papaioannou	University of Patras, Greece
Antonis Papaleonidas	Democritus University of Thrace, Greece
Daniel Pérez López	University of Leon, Spain
Isidoros Perikos	University of Patras, Greece
Elias Pimenidis	University of the West of England, Bristol, UK
Panagiotis Pintelas	University of Patras, Greece
Nikolaos Polatidis	University of Brighton, UK
Bernardete Ribeiro	University of Coimbra, Portugal
Leonardo Rundo	University of Cambridge, UK
Alexander Ryjov	Lomonosov Moscow State University, Russia
Simone Scardapane	Sapienza University (Rome), Italy
Evangelos Spyrou	National Center for Scientific Research—Demokritos, Greece
Antonio Staiano	University of Naples Parthenope, Italy
Andrea Tangherloni	University of Cambridge, UK
Azevedo Tiago	University of Cambridge, UK
Francesco Trovò	Polytecnico di Milano, Italy
Nicolas Tsapatsoulis	Cyprus University of Technology
Petra Vidnerová	The Czech Academy of Sciences, Czech Republic
Paulo Vitor de Campos Souza	CEFET-MG, Brazil
Gerasimos Vonitsanos	University of Patras, Greece

Abstracts of Invited Talks

The Rise of Artificial Intelligence for Earth Observation (AI4EO)

Pierre Philippe Mathieu

European Space Agency (ESA) Head of the Philab (Φ Lab) Explore Office at the European Space Agency in ESRIN (Frascati, Italy)

`Pierre.Phillippe.Mathieu@esa.int`

Abstract. The world of Earth Observation (EO) is rapidly changing as a result of exponential advances in sensor and digital technologies. The speed of change has no historical precedent. Recent decades have witnessed extraordinary developments in ICT, including the Internet, cloud computing and storage, which have all led to radically new ways to collect, distribute and analyse data about our planet. This digital revolution is also accompanied by a sensing revolution that provides an unprecedented amount of data on the state of our planet and its changes.

Europe leads this sensing revolution in space through the Copernicus initiative and the corresponding development of a family of Sentinel missions. This has enabled the global monitoring of our planet across the whole electromagnetic spectrum on an operational and sustained basis. In addition, a new trend, referred to as “New Space”, is now rapidly emerging through the increasing commoditization and commercialization of space.

These new global data sets from space lead to a far more comprehensive picture of our planet. This picture is now even more refined via data from billions of smart and inter-connected sensors referred to as the Internet of Things. Such streams of dynamic data on our planet offer new possibilities for scientists to advance our understanding of how the ocean, atmosphere, land and cryosphere operate and interact as part on an integrated Earth System. It also represents new opportunities for entrepreneurs to turn big data into new types of information services.

However, the emergence of big data creates new opportunities but also new challenges for scientists, business, data and software providers to make sense of the vast and diverse amount of data by capitalizing on powerful techniques such as Artificial Intelligence (AI). Until recently AI was mainly a restricted field occupied by experts and scientists, but today it is routinely used in everyday life without us even noticing it, in applications ranging from recommendation engines, language services, face recognition and autonomous vehicles.

The application of AI to EO data is just at its infancy, remaining mainly concentrated on computer vision applications with Very High-Resolution satellite imagery, while there are certainly many areas of Earth Science and big data mining / fusion,

which could increasingly benefit from AI, leading to entire new types of value chain, scientific knowledge and innovative EO services.

This talk will present some of the ESA research / application activities and partnerships in the AI4EO field, inviting you to stimulate new ideas and collaboration to make the most of the big data and AI revolutions.

Smartphone, Parkinson's, and Depression: A New AI-Based Prognostic Perspective

Leontios Hadjileontiadis^{1,2}

¹ Department of Electrical and Computer Engineering, Khalifa University of Science and Technology, Technology and Research, Abu Dhabi, United Arab Emirates

² Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece
leontios@auth.gr

Abstract. Machine learning (ML) is a branch of artificial intelligence (AI) based on the idea that systems can learn from data, identify patterns, and make decisions with minimal human intervention. While many ML algorithms have been around for a long time, the ability to automatically apply complex mathematical calculations to big data—over and over, faster and faster, deeper and deeper—is a recent development, leading to the realization of the so-called deep learning (DL). The latter has an intuitive capability that is similar to biological brains. It is able to handle the inherent unpredictability and fuzziness of the natural world. In this keynote, the main aspects of ML and DL will be presented, and the focus will be placed in the way they are used to shed light upon the human behavioral modeling. In this vein, AI-based approaches will be presented for identifying fine motor skills deterioration due to early Parkinson's and depression symptoms reflected in the keystroke dynamics, while interacting with a smartphone. These approaches provide a new and unobtrusive way for gathering and analyzing dense sampled big data, contributing to further understanding disease symptoms at a very early stage, guiding personalized and targeted interventions that sustain the patient's quality of life.

Deep Learning, Knowledge Representation, and Transfer with Brain-Inspired Spiking Neural Network Architectures

Nikola Kasabov

Auckland University of Technology, Knowledge Engineering
and Discovery Research Institute, Auckland, New Zealand
nkasabov@aut.ac.nz

Abstract. The talk argues and demonstrates that the third generation of artificial neural networks, the spiking neural networks (SNN), can be used to design brain-inspired architectures that are not only capable of deep learning of temporal or spatiotemporal data, but also enabling the extraction of deep knowledge representation from the learned data. Similarly to how the brain learns time space data, these SNN models do not need to be restricted in number of layers, neurons in each layer, etc. When a SNN model is designed to follow a brain template, knowledge transfer between humans and machines in both directions becomes possible through the creation of brain-inspired brain–computer interfaces (BCI). The presented approach is illustrated on an exemplar SNN architecture NeuCube (free software and open source available from www.kedri.aut.ac.nz/neucube) and case studies of brain and environmental data modeling and knowledge representation using incremental and transfer learning algorithms. These include predictive modeling of EEG and fMRI data measuring cognitive processes and response to treatment, AD prediction, BCI for neuro-rehabilitation, human–human and human-VR communication, hyper-scanning, and other.

Image Fusion Based on Deep Learning

Xiao-Jun Wu

Department of Computer Science and Technology, School of IoT Engineering,
Jiangnan University, China
wu_xiaojun@jiangnan.edu.cn

Abstract. Deep learning (DL) has found very successful applications in numerous different domains with impressive results. Image fusion (IMF) algorithms based on DL and their applications will be presented thoroughly in this keynote lecture. Initially, a brief introductory overview of both concepts will be given. Then, IMF employing DL will be presented in terms of pixel, feature, and decision level, respectively. Furthermore, a DL-inspired approach called MDLatLRR which is a general approach to image decomposition will be introduced for IMF. A comprehensive analysis of DL models will be offered, and their typical applications will be discussed, including Image Quality Enhancement, Facial Landmark Detection, Object Tracking, Multi-Modal Image Fusion, Video Style Transformation, and Deep Fake of Facial Images, respectively.

Contents

Classification/Machine Learning

A Compact Sequence Encoding Scheme for Online Human Activity Recognition in HRI Applications 3
Georgios Tsatiris, Kostas Karpouzis, and Stefanos Kollias

Classification of Coseismic Landslides Using Fuzzy and Machine Learning Techniques 15
Anastasios Panagiotis Psathas, Antonios Papaleonidas, George Papathanassiou, Sotiris Valkaniotis, and Lazaros Iliadis

Evaluating the Transferability of Personalised Exercise Recognition Models 32
Anjana Wijekoon and Nirmalie Wiratunga

Convolutional Neural Networks in Robotics/Computer Vision

Deep Learning-Based Computer Vision Application with Multiple Built-In Data Science-Oriented Capabilities 47
Sorin Liviu Jurj, Flavius Opritoiu, and Mircea Vladutiu

Visual Movement Prediction for Stable Grasp Point Detection 70
Constanze Schwan and Wolfram Schenck

Machine Learning in Engineering and Environment

Accomplished Reliability Level for Seismic Structural Damage Prediction Using Artificial Neural Networks 85
Magdalini Tyrtaiou, Antonios Papaleonidas, Anaxagoras Elenas, and Lazaros Iliadis

Efficient Implementation of a Self-sufficient Solar-Powered Real-Time Deep Learning-Based System 99
Sorin Liviu Jurj, Raul Rotar, Flavius Opritoiu, and Mircea Vladutiu

Leveraging Radar Features to Improve Point Clouds Segmentation with Neural Networks	119
Alessandro Cennamo, Florian Kaestner, and Anton Kummert	
LSTM Neural Network for Fine-Granularity Estimation on Baseline Load of Fast Demand Response	132
Shun Matsukawa, Keita Suzuki, Chuzo Ninagawa, Junji Morikawa, and Seiji Kondo	
Predicting Permeability Based on Core Analysis	143
Harry Kontopoulou, Hatem Ahriz, Eyad Elyan, and Richard Arnold	
Probabilistic Estimation of Evaporated Water in Cooling Towers Using a Generative Adversarial Network	155
Serafin Alonso, Antonio Morán, Daniel Pérez, Miguel A. Prada, Juan J. Fuertes, and Manuel Domínguez	
Reconstructing Environmental Variables with Missing Field Data via End-to-End Machine Learning	167
Matteo Sangiorgio, Stefano Barindelli, Valerio Guglieri, Giovanna Venuti, and Giorgio Guariso	
Semantic Segmentation Based on Convolution Neural Network for Steel Strip Position Estimation	179
Aline de Faria Lemos and Bálaaz Vince Nagy	
Towards a Digital Twin with Generative Adversarial Network Modelling of Machining Vibration	190
Evgeny Zotov, Ashutosh Tiwari, and Visakan Kadirkamanathan	
λ-DNNs and Their Implementation in Aerodynamic and Conjugate Heat Transfer Optimization	202
Marina Kontou, Dimitrios Kapsoulis, Ioannis Baklagis, and Kyriakos Giannakoglou	
Symbols in Engineering Drawings (SiED): An Imbalanced Dataset Benchmarked by Convolutional Neural Networks	215
Eyad Elyan, Carlos Francisco Moreno-García, and Pamela Johnston	
Deep Learning/Image Processing-Classification	
A Novel Spatial-Spectral Framework for the Classification of Hyperspectral Satellite Imagery	227
Shriya T. P. Gupta and Sanjay K. Sahay	
Detection of Shocking Images as One-Class Classification Using Convolutional and Siamese Neural Networks	240
Pavel Gulyaev and Andrey Filchenkov	

Factors Affecting Accuracy of Convolutional Neural Network Using VGG-16	251
Jyoti Rawat, Doina Logofătu, and Sruthi Chiramel	
Image Recoloring of Art Paintings for the Color Blind Guided by Semantic Segmentation	261
Stamatis Chatzistamatis, Anastasios Rigos, and George E. Tsekouras	
Large-Scale Geospatial Data Analysis: Geographic Object-Based Scene Classification in Remote Sensing Images by GIS and Deep Residual Learning	274
Konstantinos Demertzis, Lazaros Iliadis, and Elias Pimenidis	
Semantic Segmentation of Vineyard Images Using Convolutional Neural Networks	292
Theofanis Kalampokas, Konstantinos Tziridis, Alexandros Nikolaou, Eleni Vrochidou, George A. Papakostas, Theodore Pachidis, and Vassilis G. Kaburlasos	
Towards a Reliable Face Recognition System	304
Adamu Ali-Gombe, Eyad Elyan, and Johan Zwiegelaar	
Machine Learning in Medical Systems and Applications	
Automated Screening of Patients for Dietician Referral	319
Kamran Soomro and Elias Pimenidis	
Drug2vec: A Drug Embedding Method with Drug-Drug Interaction as the Context	326
Pengfei Liu, Xubin Zheng, Man-Hon Wong, and Kwong-Sak Leung	
Feature Selection with Artificial Bee Colony Algorithms for Classifying Parkinson's Diseases	338
Rafet Durgut, Yusuf Yargı Baydilli, and Mehmet Emin Aydin	
Medical Knowledge-Based Deep Learning Framework for Disease Prediction on Unstructured Radiology Free-Text Reports Under Low Data Condition	352
Shashank Shetty, V. S. Ananthanarayana, and Ajit Mahale	
Multidataset Incremental Training for Optic Disc Segmentation	365
Javier Civit-Masot, Antonis Billis, MJ Dominguez-Morales, Saturnino Vicente-Diaz, and Anton Civit	
On Image Prefiltering for Skin Lesion Characterization Utilizing Deep Transfer Learning	377
K. Delibasis, S. V. Georgakopoulos, S. K. Tasoulis, I. Maglogiannis, and V. P. Plagianakos	

Identification of Eyelid Basal Cell Carcinoma Using Artificial Neural Networks	389
Evangelos Georgios Chatzopoulos, George Anastassopoulos, Efsthios Detorakis, and Adam Adamopoulos	
Fuzzy Logic Modeling	
Application of Algorithmic Fuzzy Implications on Climatic Data	399
Stefanos Makariadis, Georgios Souliotis, and Basil K. Papadopoulos	
Fuzzy Logic Application to Searchable Cryptography	410
Hassan B. Kazemian and Yang Ma	
Personal Car Driver Black Box: A Wearable System for Data Log and Prediction Based on EVOS Paradigms	423
Mario Malcangi	
Learning/Clustering	
Instance Weighted Clustering: Local Outlier Factor and K-Means	435
Paul Moggridge, Na Helian, Yi Sun, Mariana Lilley, and Vito Veneziano	
Detecting Pattern Efficiently with Don't Cares	447
Hayam Alamro and Costas Iliopoulos	
Eye Movement Data Analysis	460
Olga Georgieva, Nadejda Bocheva, Bilyana Genova, and Miroslava Stefanova	
Machine Learning for Neuro/Biological Modeling	
Computational Complexity of Kabsch and Quaternion Based Algorithms for Molecular Superimposition in Computational Chemistry	473
Rafael Dolezal, Katerina Fronckova, Ayca Kirimtat, and Ondrej Krejcar	
Electronic Equivalent of Consciousness with Elementary Mental Process Model	487
Leonard Bernau, Filip Paulu, and Jan Voves	
Metalearning-Non Linear Engineering Modelling	
A Metalearning Study for Robust Nonlinear Regression	499
Jan Kalina and Petra Vidnerová	
An ASP-Based Approach for Phase Balancing in Power Electrical Systems	511
Theofanis Aravanis, Andreas Petratos, and Georgia Douklia	

Neural Networks Algorithmic Foundations

A New Lyapunov Analysis of Robust Stability of Neural Networks with Discrete Time Delays 523
Sabri Arik

Generalized Entropy Loss Function in Neural Network: Variable’s Importance and Sensitivity Analysis 535
Krzysztof Gajowniczek and Tomasz Żąbkowski

Robust Multilayer Perceptrons: Robust Loss Functions and Their Derivatives 546
Jan Kalina and Petra Vidnerová

Stability Analysis of Neutral-Type Hopfield Neural Networks with Multiple Delays 558
Özlem Faydasıcok

Reduction of Variables and Generation of Functions Through Nearest Neighbor Relations in Threshold Networks 569
Naohiro Ishii, Kazunori Iwata, Kazuya Odagiri, Toyoshiro Nakashima, and Tokuro Matsuo

Optimization/Machine Learning

A Comparative Study on Bayesian Optimization 581
Lam Gia Thuan and Doina Logofatu

A Genetic Programming Method for Scale-Invariant Texture Classification 593
Haythem Ghazouani, Walid Barhoumi, and Yosra Antit

A Monetary Policy Strategy Based on Genetic Algorithms and Neural Networks 605
Talitha F. Speranza, Ricardo Tanscheit, and Marley M. B. R. Vellasco

Author Index 617