

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, 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/7407>

Alessandra Lintas · Stefano Rovetta
Paul F.M.J. Verschure · Alessandro E.P. Villa (Eds.)

Artificial Neural Networks and Machine Learning – ICANN 2017

26th International Conference on Artificial Neural Networks
Alghero, Italy, September 11–14, 2017
Proceedings, Part I

Editors

Alessandra Lintas
University of Lausanne
Lausanne
Switzerland

Stefano Rovetta
University of Genoa
Genoa
Italy

Paul F.M.J. Verschure
Universitat Pompeu Fabra
Barcelona
Spain

Alessandro E.P. Villa
University of Lausanne
Lausanne
Switzerland

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-68599-1 ISBN 978-3-319-68600-4 (eBook)
<https://doi.org/10.1007/978-3-319-68600-4>

Library of Congress Control Number: 2017955786

LNCS Sublibrary: SL1 – Theoretical Computer Science and General Issues

© 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

This volume is part of the two-volume proceedings of the 26th International Conference on Artificial Neural Networks (ICANN-2017), held during September 11–14, 2017 in Alghero, Italy. ICANN 2017 was organized with the support of the Department of Architecture of the University of Sassari, the Neuroheuristics Research Group of the University of Lausanne, and the European Neural Network Society (ENNS).

The ICANN conference is the flagship annual conference of the European Neural Network Society. The ICANN series of conferences was initiated in 1991 and soon became the major European gatherings of experts in the field of neural networks and related areas. The unique character of this conference is its transdisciplinarity, beyond the interdisciplinarity of machine learning, bringing together researchers from all horizons, i.e., mathematics, physics, information and computer sciences, engineering, as well as theoretical and experimental neurosciences. The conference is organized in partnership with ENNS with its governance fully committed to not-for-profit procedures that allow us to keep the congress fees low compared with international standards. This policy granted the participation of a significant number of undergraduate and master students, who accounted for 18% of the scientific delegates. The ICANN governance model consolidated the practice to include membership of ENNS, valid through December of the calendar year of the conference, for all ICANN participants who present a scientific communication. Last, but not least, two best paper awards are distributed, along with ten travel grants sponsored by ENNS.

Following the practice of the ICANN conference series since 2011, the ICANN 2017 conference was organized following a dual-track stream of oral talks lasting 20 minutes each, one track including seven sessions of mainly ANN and machine-learning-inspired presentations, and one track including seven sessions of mainly bio-inspired presentations. A tutorial on the capabilities of shallow and deep networks supported by ENNS President Vera Kurkova and a special session organized on the topic of neural networks and applications to environmental sciences were organized on the first day of the conference, before the opening of the main program. Poster sessions have always played a key role in successful ICANN conferences. This year, the time and space allocated to nine poster sessions was further expanded, and posters were left on display throughout the entire duration of the conference. The scientific program was completed by five keynote lectures from world-renowned scholars: Professor Moshe Abeles talking about temporal information in neural coding; Professor Marco Gori about the computational framework associated with the emergence of inference rules; Professor Elisabeth André about emotional intelligence in human–computer interaction; Professor David Ríos about adversarial machine learning; and Professor Michele Giugliano about information transmission in weakly coupled large-scale neural ensembles.

Out of approximately 270 papers submitted to ICANN 2017, the Program Committee selected 128 full and 63 short papers. It is interesting to note that about half of the accepted short papers were initially submitted as full papers. Although these papers did not get through the strict reviewing process for full papers, their authors prepared a short paper version for presentation at ICANN. Because of its reputation as a high-level conference, ICANN rarely receives papers of poor quality, and the fact that one third of the scientific delegates chose to submit short papers is certainly a proof of the vitality and attractiveness of the ICANN conference. The type of submission was not the ultimate criterion in assigning the submitters to an oral or a poster presentation. Short papers account for 19/79 oral presentations and 44/112 poster presentations.

The number of accepted papers necessitated publishing the proceedings in two volumes. The contributions (oral and posters) were grouped following the respective track: Volume I for Artificial Neural Networks and Biological Inspiration and Volume II for Formal Models and Their Applications. The proceedings of the short papers have been grouped, following the rules of the publisher, at the end of each volume. The presenting authors came from 33 countries all over the world: 87 from Europe, 74 from Asia, 26 from the Americas, three from Oceania and one from Africa. China (39) and Germany (33) were the most represented countries.

It is our pleasure to express our gratitude to everybody who contributed to the success of the conference and the publication of the proceedings. In particular, we thank the members of the Executive Committee of the ENNS and the president, Vera Kurkova, for entrusting us with the organization of the conference. We would like to express our sincere gratitude to the members of the Program Committee and all the reviewers, who did a tremendous job under time constraints during the review process. We thank all members of the local Organizing Committee and the local staff for the great effort and assistance in the organization of the conference, in particular, Antonello Monsù Scolaro (Department of Architecture in Alghero of the University of Sassari), Eugenio Lintas (Sassari), and Anna Mura (SPECs, Universitat Pompeu Fabra, Barcelona). We are greatly indebted to Dr. Paolo Masulli for his commitment as ENNS interim secretary and ICANN communication chair along all phases of the organization. We would also like to thank the publisher, Springer, for their cooperation during the publishing process that was under strict time limitations. Finally, we thank all authors who contributed to these volumes for sharing their ideas, their results, and their spirit with the community during the scientific and social programs of the conference. We are sure that the participants of ICANN 2017 maintained the enthusiasm of the founders of ENNS and initial organizers of the ICANN conferences and that they will continue to generate new ideas and innovative results in the field of neural networks and related areas.

August 2017

Alessandra Lintas
Stefano Rovetta
Paul F.M.J. Verschure
Alessandro E.P. Villa

Organization

General Chair

Alessandro E.P. Villa University of Lausanne, Switzerland

General Co-chair

Alessandra Lintas University of Lausanne, Switzerland

Local Co-chairs

Stefano Rovetta University of Genoa, Italy
Paul F.M.J. Verschure SPECS-Universitat Pompeu Fabra, Spain

Communication Chair

Paolo Masulli University of Lausanne, Switzerland

Local Organizing Committee

Paolo Enrico University of Sassari, Italy
Alessandra Lintas University of Lausanne, Switzerland
Eugenio Lintas Sassari
Antonello Monsù Scolaro University of Sassari, Italy
Anna Mura SPECS-Universitat Pompeu Fabra, Barcelona, Spain

Scientific and Reviewing Committee

Jérémie Cabessa Université Panthéon-Assas - Paris 2, France
Petia Koprinkova-Hristova Bulgarian Academy of Sciences, Sofia, Bulgaria
Věra Kůrková Czech Academy of Sciences, Prague, Czech Republic
Alessandra Lintas University of Lausanne, Switzerland
Paolo Masulli University of Lausanne, Switzerland
Francesco Masulli University of Genoa, Italy
Paul F.M.J. Verschure SPECS-Universitat Pompeu Fabra, Spain
Antonio Javier Pons Rivero Universitat Politècnica de Catalunya, Spain
Yifat Prut Hebrew University Jerusalem, Israel
Stefano Rovetta University of Genoa, Italy
Antonino Staiano University of Naples Parthenope, Italy
Igor V. Tetko Helmholtz Zentrum München, Germany
Alessandro E.P. Villa University of Lausanne, Switzerland

Program Committee

Lydia Fischer	Honda Research Institute Europe, Germany
Věra Kůrková	Czech Academy of Sciences, Prague, Czech Republic
Alessandra Lintas	University of Lausanne, Switzerland
Francesco Masulli	University of Genoa, Italy
Stefano Rovetta	University of Genoa, Italy
Antonino Staiano	University of Naples Parthenope, Italy
Alessandro E.P. Villa	University of Lausanne, Switzerland

Secretariat and Communication

Alessandra Lintas	University of Lausanne, Switzerland
Paolo Masulli	University of Lausanne, Switzerland

ENNS Travel Grant Committee

Cesare Alippi	Politecnico di Milano, Italy
Jérémie Cabessa	Université Panthéon-Assas - Paris 2, France
Barbara Hammer	University of Bielefeld, Germany
Petia Koprinkova-Hristova	Bulgarian Academy of Sciences, Sofia, Bulgaria
Věra Kůrková	Czech Academy of Sciences, Prague, Czech Republic
Paolo Masulli	University of Lausanne, Switzerland
Jaakko Peltonen	University of Tampere, Finland
Antonio Javier Pons Rivero	Universitat Politècnica de Catalunya, Spain
Yifat Prut	Hebrew University Jerusalem, Israel
Igor V. Tetko	Helmholtz Zentrum München, Germany
Paul F.M.J. Verschure	SPECS-Universitat Pompeu Fabra, Spain
Francisco Zamora-Martínez	University of Pamplona, Spain

Additional Reviewers

Tayfun Alpay	University of Hamburg, Knowledge Technology, WTM, Germany
Pablo Barros	University of Hamburg, Germany
Lluís Belanche	Universitat Politècnica de Catalunya, Spain
Michael Biehl	University of Groningen, The Netherlands
Giacomo Boracchi	Politecnico di Milano, Italy
Hans Albert Braun	University of Marburg, Germany
Li Bu	China
Guido Bugmann	Plymouth University, UK
Jérémie Cabessa	Université Panthéon-Assas, Paris 2, France
Francesco Camastra	University of Naples Parthenope, Italy
Angelo Cangelosi	Plymouth University, UK
Giovanna Castellano	University of Bari, Italy
Marta Castellano	Institute of Cognitive Sciences, Germany

Davide Chicco	University of Toronto, Canada
Angelo Ciaramella	University of Naples Parthenope, Italy
Jorg Conradt	TU München, Germany
David Coufal	Institute of Computer Science AS CR, Czech Republic
Jose Enrique De Tomas	University of Alicante, Spain
Marc Deffains	Hebrew University Jerusalem, Israel
Sergey Dolenko	D.V. Skobeltsyn Institute of Nuclear Physics, M.V. Lomonosov Moscow State University, Russia
Jose Dorronsoro	Universidad Autonoma de Madrid, Spain
Wlodzislaw Duch	Nicolaus Copernicus University, Poland
David Díaz-Vico	Universidad Autónoma de Madrid, Spain
Lambros Ekonomou	City University London, UK
Anna Maria Fanelli	University of Bari, Italy
Andreas Fischer	University of Fribourg, Switzerland
Lydia Fischer	Honda Research Institute Europe
Giorgio Gnecco	IMT Lucca, Italy
José Luis González-de-Suso	das-Nano, Spain
Claudius Gros	Goethe University of Frankfurt, Germany
Ankur Gupta	University of British Columbia, Canada
Tatiana V. Guy	Institute of Information Theory and Automation, Czech Republic
Frantisek Hakl	Institute of computer Science, Czech Republic
Barbara Hammer	Bielefeld University, Germany
Stefan Heinrich	Universität Hamburg, Germany
Katsuhiko Honda	Osaka Prefecture University, Japan
Brian Hyland	University of Otago, New Zealand
Lazaros Iliadis	Democritus University of Thrace, Greece
Maciej Jedynak	University Grenoble Alpes, Grenoble Institute of Neuroscience, France
Marika Kaden	HS Mittweida, Germany
Fotis Kanellos	National Technical University of Athens, Greece
Juha Karhunen	Aalto University, Finland
Matthias Kerzel	Universität Hamburg, Germany
Mario Koeppen	Kyushu Institute of Technology, Japan
Stefanos Kollias	National Technical University of Athens, Greece
Ján Koloda	das-Nano, Spain
Petia Koprinkova-Hristova	Bulgarian Academy of Sciences, Bulgaria
Irena Koprinska	University of Sydney, Australia
Vera Kurkova	Institute of Computer Science, Academy of Sciences of the Czech Republic, Czech Republic
Giancarlo La Camera	SUNY Stony Brook, USA
Alessandra Lintas	University of Lausanne, Switzerland
Ling Luo	University of Sydney, Australia
Iván López-Espejo	University of Granada, Spain
Sven Magg	Universität Hamburg, Germany
Miroslaw Malek	USI-Lugano, Switzerland

Petr Marsalek	Charles University in Prague, Czech Republic
Francesco Masulli	University of Genoa, Italy
Paolo Masulli	University of Lausanne, Switzerland
Joshua Mati	Hebrew University Jerusalem, Israel
Corrado Mencar	University of Bari A. Moro, Italy
George Mengov	Sofia University, Bulgaria
Valeri Mladenov	Technical University of Sofia, Bulgaria
Juan Manuel Moreno	Universitat Politècnica de Catalunya, Spain
Anna Mura	SPECS-UPF Barcelona, Spain
Roman Neruda	Institute of Computer Science, ASCR, Czech Republic
Nathan Netanyahu	Bar-Ilan University, Israel
Francesca Odone	University of Genoa, Italy
Luca Oneto	University of Genoa, Italy
Sebastian Otte	University of Tübingen, Germany
Joan Pastor Pellicer	Universitat Politècnica de València, Spain
Riccardo Pecori	eCampus, Italy
Jaakko Peltonen	Aalto University, Finland
Vincenzo Piuri	University of Milan, Italy
Mirko Polato	University of Padova, Italy
Antonio Javier Pons Rivero	Universitat Politècnica de Catalunya, Barcelona, Spain
Yifat Prut	Hebrew University Jerusalem, Israel
Federico Raue	University of Kaiserslautern, Germany
Francesco Regazzoni	Università della Svizzera Italiana, Switzerland
Marina Resta	University of Genoa, Italy
Jean Roaut	University of Québec Sherbrooke, Canada
Manuel Roveri	Politecnico di Milano, Italy
Stefano Rovetta	University of Genoa, Italy
Alessandro Rozza	Waynaut, Italy
Marcello Sanguineti	University of Genoa, Italy
Wolfram Schenck	Bielefeld University of Applied Sciences, Germany
Friedhelm Schwenker	University of Ulm, Germany
Jordi Soriano	Universitat de Barcelona, Spain
Alessandro Sperduti	University of Padova, Italy
Antonino Staiano	University of Naples Parthenope, Italy
Michael Stiber	University of Washington Bothell, USA
Aubin Tchaptchet	Philipps University of Marburg, Germany
Igor Tetko	HMGU, Germany
Yancho Todorov	Aalto University, Finland
Alberto Torres-Barrán	Universidad Autónoma de Madrid, Spain
Jochen Triesch	Frankfurt Institute for Advanced Studies, Germany
Francesco Trovo	Politecnico di Milano, Italy
Georgi Tsvetanov Tsenov	Technical University Sofia, Bulgaria
Antonio Vergari	University of Bari, Italy
Paul F.M.J. Verschure	SPECS-Universitat Pompeu Fabra, Spain
Petra Vidnerová	Czech Academy of Sciences, Czech Republic
Alexander Vidybida	Bogolyubov Institute for Theoretical Physics, Ukraine

Alessandro E.P. Villa	University of Lausanne, Switzerland
Thomas Villmann	UAS Mittweida, Germany
Roseli Wedemann	Universidade do Estado do Rio de Janeiro, Brazil
Thomas Wennekers	Plymouth University, UK
Heiko Wersing	Honda Research Institute Europe, Germany
Baptiste Wicht	University of Applied Sciences of Western Switzerland, Switzerland
Francisco Zamora-Martinez	das-Nano SL, Spain
Jianhua Zhang	East China University of Science and Technology, China
Dongbin Zhao	China

Contents – Part I

From Perception to Action

Semi-supervised Phoneme Recognition with Recurrent Ladder Networks <i>Marian Tietz, Tayfun Alpay, Johannes Twiefel, and Stefan Wermter</i>	3
Mixing Actual and Predicted Sensory States Based on Uncertainty Estimation for Flexible and Robust Robot Behavior <i>Shingo Murata, Wataru Masuda, Saki Tomioka, Tetsuya Ogata, and Shigeki Sugano</i>	11
Neurodynamical Model for the Coupling of Action Perception and Execution. <i>Mohammad Hovaidi-Ardestani, Vittorio Caggiano, and Martin Giese</i>	19
Neural End-to-End Self-learning of Visuomotor Skills by Environment Interaction <i>Matthias Kerzel and Stefan Wermter</i>	27
Learning of Labeling Room Space for Mobile Robots Based on Visual Motor Experience. <i>Tatsuro Yamada, Saki Ito, Hiroaki Arie, and Tetsuya Ogata</i>	35
Towards Grasping with Spiking Neural Networks for Anthropomorphic Robot Hands <i>J. Camilo Vasquez Tieck, Heiko Donat, Jacques Kaiser, Igor Peric, Stefan Ulbrich, Arne Roennau, Marius Zöllner, and Rüdiger Dillmann</i>	43
Obstacle Avoidance by Profit Sharing Using Self-Organizing Map-Based Probabilistic Associative Memory. <i>Daisuke Temma and Yuko Osana</i>	52
An Ultra-Compact Low-Powered Closed-Loop Device for Control of the Neuromuscular System. <i>Davide Polese, Luca Pazzini, Ignacio Delgado-Martínez, Luca Maiolo, Xavier Navarro, and Guglielmo Fortunato</i>	60
Comparing Action Sets: Mutual Information as a Measure of Control <i>Sascha Fler and Helge Ritter</i>	68
Sensorimotor Prediction with Neural Networks on Continuous Spaces <i>Michaël Garcia Ortiz</i>	76

Classifying Bio-Inspired Model of Point-Light Human Motion Using Echo State Networks	84
<i>Pattreeya Tanisaro, Constantin Lehman, Leon Sütfeld, Gordon Pipa, and Gunther Heidemann</i>	
A Prediction and Learning Based Approach to Network Selection in Dynamic Environments	92
<i>Xiaohong Li, Ru Cao, Jianye Hao, and Zhiyong Feng</i>	
Learning a Peripersonal Space Representation as a Visuo-Tactile Prediction Task.	101
<i>Zdenek Straka and Matej Hoffmann</i>	
Learning Distance-Behavioural Preferences Using a Single Sensor in a Spiking Neural Network	110
<i>Matt Ross, Nareg Berberian, André Cyr, Frédéric Thériault, and Sylvain Chartier</i>	
From Neurons to Networks	
Towards an Accurate Identification of Pyloric Neuron Activity with VSDi. . .	121
<i>Filipa dos Santos, Peter Andras, and K.P. Lam</i>	
Interactions in the Striatal Network with Different Oscillation Frequencies . . .	129
<i>Jovana J. Belić, Arvind Kumar, and Jeanette Hellgren Kotaleski</i>	
Robot Localization and Orientation Detection Based on Place Cells and Head-Direction Cells	137
<i>Xiaomao Zhou, Cornelius Weber, and Stefan Wermter</i>	
Algorithms for Obtaining Parsimonious Higher Order Neurons	146
<i>Can Eren Sezener and Erhan Oztup</i>	
Robust and Adaptable Motor Command Representation with Sparse Coding	155
<i>Nobuhiro Hinakawa and Katsunori Kitano</i>	
Translation-Invariant Neural Responses as Variational Messages in a Bayesian Network Model	163
<i>Takashi Sano and Yuuji Ichisugi</i>	
Implementation of Learning Mechanisms on a Cat-Scale Cerebellar Model and Its Simulation.	171
<i>Wataru Furusho and Tadashi Yamazaki</i>	

Neuromorphic Approach Sensitivity Cell Modeling and FPGA Implementation	179
<i>Hongjie Liu, Antonio Rios-Navarro, Diederik Paul Moeyes, Tobi Delbruck, and Alejandro Linares-Barranco</i>	

Brain Imaging

Event Related Potentials Reveal Fairness in Willingness-to-share	191
<i>Alessandra Lintas, Sarat Chandra Vysyaraju, Manon Jaquerod, and Alessandro E.P. Villa</i>	
Individual Identification by Resting-State EEG Using Common Dictionary Learning	199
<i>Takashi Nishimoto, Yoshiki Azuma, Hiroshi Morioka, and Shin Ishii</i>	
Performance Comparison of Machine Learning Algorithms for EEG-Signal-Based Emotion Recognition	208
<i>Peng Chen and Jianhua Zhang</i>	

Recurrent Neural Networks

A Neural Network Implementation of Frank-Wolfe Optimization	219
<i>Christian Bauckhage</i>	
Inferring Adaptive Goal-Directed Behavior Within Recurrent Neural Networks	227
<i>Sebastian Otte, Theresa Schmitt, Karl Friston, and Martin V. Butz</i>	
Information Bottleneck in Control Tasks with Recurrent Spiking Neural Networks	236
<i>Madhavun Candadai Vasu and Eduardo J. Izquierdo</i>	
Neural Computation with Spiking Neural Networks Composed of Synfire Rings	245
<i>J������ Cabessa, Ginette Horscholle-Bossavit, and Brigitte Quenet</i>	
Exploiting Recurrent Neural Networks in the Forecasting of Bees’ Level of Activity	254
<i>Pedro A.B. Gomes, Eduardo C. de Carvalho, Helder M. Arruda, Paulo de Souza, and Gustavo Pessin</i>	
Inherently Constraint-Aware Control of Many-Joint Robot Arms with Inverse Recurrent Models	262
<i>Sebastian Otte, Adrian Zwiener, and Martin V. Butz</i>	

Neuromorphic Hardware

Accelerating Training of Deep Neural Networks via Sparse Edge Processing	273
<i>Sourya Dey, Yinan Shao, Keith M. Chugg, and Peter A. Beerel</i>	
Unsupervised Learning Using Phase-Change Synapses and Complementary Patterns	281
<i>Severin Sidler, Angeliki Pantazi, Stanisław Woźniak, Yusuf Leblebici, and Evangelos Eleftheriou</i>	

Brain Topology and Dynamics

The Variational Coupled Gaussian Process Dynamical Model.	291
<i>Dmytro Velychko, Benjamin Knopp, and Dominik Endres</i>	
q -Maximum Entropy Distributions and Memory Neural Networks.	300
<i>Roseli S. Wedemann and Angel R. Plastino</i>	
Adaptively Learning Levels of Coordination from One’s, Other’s and Task Related Errors Through a Cerebellar Circuit: A Dual Cart-Pole Setup	309
<i>Martí Sánchez-Fibla, Giovanni Maffei, and Paul F.M.J. Verschure</i>	
Weighted Clique Analysis Reveals Hierarchical Neuronal Network Dynamics	317
<i>Paolo Masulli and Alessandro E.P. Villa</i>	
Why the Brain Might Operate Near the Edge of Criticality.	326
<i>Xerxes D. Arsiwalla and Paul Verschure</i>	
Interactive Control of Computational Power in a Model of the Basal Ganglia-Thalamocortical Circuit by a Supervised Attractor-Based Learning Procedure	334
<i>Jérémie Cabessa and Alessandro E.P. Villa</i>	

Synaptic Plasticity and Learning

Model Derived Spike Time Dependent Plasticity.	345
<i>Melissa Johnson and Sylvain Chartier</i>	
Online Representation Learning with Single and Multi-layer Hebbian Networks for Image Classification.	354
<i>Yanis Bahroun and Andrea Soltoggio</i>	
Building Efficient Deep Hebbian Networks for Image Classification Tasks. . .	364
<i>Yanis Bahroun, Eugénie Hunsicker, and Andrea Soltoggio</i>	

Automatic Recognition of Mild Cognitive Impairment from MRI Images Using Expedited Convolutional Neural Networks	373
<i>Shuqiang Wang, Yanyan Shen, Wei Chen, Tengfei Xiao, and Jinxing Hu</i>	
Interplay of STDP and Dendritic Plasticity in a Hippocampal CA1 Pyramidal Neuron Model	381
<i>Ausra Saudargiene, Rokas Jackevicius, and Bruce P. Graham</i>	
Enhancements on the Modified Stochastic Synaptic Model: The Functional Heterogeneity	389
<i>Karim Ellatihiy and Martin Bogdan</i>	
Multicompartment Simulations of NMDA Receptor Based Facilitation in an Insect Target Tracking Neuron	397
<i>Bo Bekkouche, Patrick A. Shoemaker, Joseph Fabian, Elisa Rigosi, Steven D. Wiederman, and David C. O’Carroll</i>	

Neural Networks Meet Natural and Environmental Sciences

On the Estimation of Pollen Density on Non-target Lepidoptera Food Plant Leaves in Bt-Maize Exposure Models: Open Problems and Possible Neural Network-Based Solutions.	407
<i>Francesco Camastra, Angelo Ciaramella, and Antonino Staiano</i>	

Short Papers

Neural Networks for Adaptive Vehicle Control.	417
<i>J. Kaste, J. Hoedt, K. Van Ende, and F. Kallmeyer</i>	
Brain–Computer Interface with Robot-Assisted Training for Neurorehabilitation.	418
<i>Roman Rosipal, Natália Porubcová, Peter Barančok, Barbora Cimrová, Michal Teplan, and Igor Farkaš</i>	
Unsupervised Learning of Factors of Variation in the Sensory Data of a Planar Agent	419
<i>Oksana Hagen and Michaël Garcia Ortiz</i>	
State Dependent Modulation of Perception Based on a Computational Model of Conditioning	421
<i>Jordi-Ysard Puigbò, Miguel Angel Gonzalez-Ballester, and Paul F.M.J. Verschure</i>	
Optimal Bases Representation for Embodied Supervised Learning.	422
<i>Ivan Herreros, Xerxes D. Arsiwalla, and Paul Verschure</i>	

The Effects of Neuronal Diversity on Network Synchronization	423
<i>Aubin Tchaptchet and Hans Albert Braun</i>	
Temporal Regions for Activity Recognition	424
<i>João Paulo Aires, Juarez Monteiro, Roger Granada, Felipe Meneguzzi, and Rodrigo C. Barros</i>	
Computational Capacity of a Cerebellum Model	425
<i>Robin De Gernier, Sergio Solinas, Christian Rössert, Jonathan Mapelli, Marc Haelterman, and Serge Massar</i>	
The Role of Inhibition in Selective Attention	427
<i>Sock Ching Low, Riccardo Zucca, and Paul F.M.J. Verschure</i>	
Stochasticity, Spike Timing, and a Layered Architecture for Finding Iterative Roots	429
<i>Adam Frick and Nicolangelo Iannella</i>	
Matching Mesoscopic Neural Models to Microscopic Neural Networks in Stationary and Non-stationary Regimes	431
<i>Lara Escuaín-Poole, Alberto Hernández-Alcaína, and Antonio J. Pons</i>	
Hyper Neuron - One Neuron with Infinite States.	432
<i>Shabab Bazrafkan, Joseph Lemley, and Peter Corcoran</i>	
Sparse Pattern Representation in a Realistic Recurrent Spiking Neural Network	434
<i>Jesús A. Garrido and Eduardo Ros</i>	
Gender Differences in Spontaneous Risky Decision-Making Behavior: A Hyperscanning Study Using Functional Near-Infrared Spectroscopy	436
<i>Mingming Zhang, Tao Liu, Matthew Pelowski, and Dongchuan Yu</i>	
An Implementation of a Spiking Neural Network Using Digital Spiking Silicon Neuron Model on a SIMD Processor	437
<i>Sansei Hori, Mireya Zapata, Jordi Madrenas, Takashi Morie, and Hakaru Tamukoh</i>	
Hardware Implementation of Deep Self-organizing Map Networks	439
<i>Yuichiro Tanaka and Hakaru Tamukoh</i>	
A Model of Synaptic Normalization and Heterosynaptic Plasticity Based on Competition for a Limited Supply of AMPA Receptors	442
<i>Jochen Triesch</i>	
Hebbian Learning Deduced from the Stationarity Principle Leads to Balanced Chaos in Fully Adapting Autonomously Active Networks	444
<i>Claudius Gros, Philip Trapp, and Rodrigo Echeveste</i>	

A Granule-Pyramidal Cell Model for Learning and Predicting Trajectories Online	446
<i>Mehdi Abdelwahed, Ithor Kuras, Artem Melnyk, and Pierre Andry</i>	
Single Neurons Can Memorize Precise Spike Trains Immediately: A Computational Approach	448
<i>Hubert Loeffler</i>	
Learning Stable Recurrent Excitation in Simulated Biological Neural Networks.	449
<i>Michael Teichmann and Fred H. Hamker</i>	
Speech Emotion Recognition: Recurrent Neural Networks Compared to SVM and Linear Regression.	451
<i>Leila Kerkeni, Youssef Serrestou, Mohamed Mbarki, Mohamed Ali Mahjoub, Kosai Raoof, and Catherine Cleder</i>	
Pelagic Species Identification by Using a PNN Neural Network and Echo-Sounder Data	454
<i>Ignazio Fontana, Giovanni Giacalone, Angelo Bonanno, Salvatore Mazzola, Gualtiero Basilone, Simona Genovese, Salvatore Aronica, Solon Pissis, Costas S. Iliopoulos, Ritu Kundu, Antonino Fiannaca, Alessio Langiu, Giosue' Lo Bosco, Massimo La Rosa, and Riccardo Rizzo</i>	
The Impact of Ozone on Crop Yields by Combining Multi-model Results Through a Neural Network Approach.	456
<i>A. Riccio, E. Solazzo, and S. Galmarini</i>	
Artificial Neural Networks for Fault Tolerance of an Air-Pressure Sensor Network	457
<i>Salvatore Aronica, Gualtiero Basilone, Angelo Bonanno, Ignazio Fontana, Simona Genovese, Giovanni Giacalone, Alessio Langiu, Giosué Lo Bosco, Salvatore Mazzola, and Riccardo Rizzo</i>	
Modelling the Impact of GM Plants and Insecticides on Arthropod Populations of Agricultural Interest	458
<i>Alberto Lanzoni, Edison Pasqualini, and Giovanni Burgio</i>	
Deep Neural Networks for Emergency Detection.	460
<i>Emanuele Cipolla, Riccardo Rizzo, and Filippo Vella</i>	
Author Index	463

Contents – Part II

Convolutional Neural Networks

Spiking Convolutional Deep Belief Networks	3
<i>Jacques Kaiser, David Zimmerer, J. Camilo Vasquez Tieck, Stefan Ulbrich, Arne Roennau, and Rüdiger Dillmann</i>	
Convolutional Neural Network for Pixel-Wise Skyline Detection	12
<i>Darian Frajberg, Piero Fraternali, and Rocio Nahime Torres</i>	
1D-FALCON: Accelerating Deep Convolutional Neural Network Inference by Co-optimization of Models and Underlying Arithmetic Implementation . . .	21
<i>Partha Maji and Robert Mullins</i>	
Shortcut Convolutional Neural Networks for Classification of Gender and Texture.	30
<i>Ting Zhang, Yujian Li, and Zhaoying Liu</i>	
Word Embedding Dropout and Variable-Length Convolution Window in Convolutional Neural Network for Sentiment Classification	40
<i>Shangdi Sun and Xiaodong Gu</i>	
Reducing Overfitting in Deep Convolutional Neural Networks Using Redundancy Regularizer	49
<i>Bingzhe Wu, Zhichao Liu, Zhihang Yuan, Guangyu Sun, and Charles Wu</i>	
An Improved Convolutional Neural Network for Sentence Classification Based on Term Frequency and Segmentation	56
<i>Qi Wang, Jungang Xu, Ben He, and Zhengcai Qin</i>	
Parallel Implementation of a Bug Report Assignment Recommender Using Deep Learning.	64
<i>Adrian-Cătălin Florea, John Anvik, and Răzvan Andonie</i>	
A Deep Learning Approach to Detect Distracted Drivers Using a Mobile Phone.	72
<i>Renato Torres, Orlando Ohashi, Eduardo Carvalho, and Gustavo Pessin</i>	
A Multi-level Weighted Representation for Person Re-identification	80
<i>Xianglai Meng, Biao Leng, and Guanglu Song</i>	

Games and Strategy

DeepAPT: Nation-State APT Attribution Using End-to-End Deep Neural Networks	91
<i>Ishai Rosenberg, Guillaume Sicard, and Eli (Omid) David</i>	

Estimation of the Change of Agents Behavior Strategy Using State-Action History	100
<i>Shihori Uchida, Sigeyuki Oba, and Shin Ishii</i>	

Boltzmann Machines and Phase Transitions

Generalising the Discriminative Restricted Boltzmann Machines	111
<i>Srikanth Cherla, Son N. Tran, Artur d'Avila Garcez, and Tillman Weyde</i>	

Extracting M of N Rules from Restricted Boltzmann Machines	120
<i>Simon Odense and Artur d'Avila Garcez</i>	

Generalized Entropy Cost Function in Neural Networks	128
<i>Krzysztof Gajowniczek, Leszek J. Chmielewski, Arkadiusz Orłowski, and Tomasz Żąbkowski</i>	

Learning from Noisy Label Distributions	137
<i>Yuya Yoshikawa</i>	

Phase Transition Structure of Variational Bayesian Nonnegative Matrix Factorization	146
<i>Masahiro Kohjima and Sumio Watanabe</i>	

Link Enrichment for Diffusion-Based Graph Node Kernels	155
<i>Dinh Tran-Van, Alessandro Sperduti, and Fabrizio Costa</i>	

Context Information Learning and Self-Assessment in Advanced Machine Learning Models

Classless Association Using Neural Networks	165
<i>Federico Raue, Sebastian Palacio, Andreas Dengel, and Marcus Liwicki</i>	

Shape from Shading by Model Inclusive Learning Method with Simultaneous Estimation of Parameters	174
<i>Yasuaki Kuroe and Hajimu Kawakami</i>	

Radius-Margin Ratio Optimization for Dot-Product Boolean Kernel Learning	183
<i>Ivano Lauriola, Mirko Polato, and Fabio Aiolli</i>	

Learning a Compositional Hierarchy of Disparity Descriptors for 3D Orientation Estimation in an Active Fixation Setting	192
<i>Katerina Kalou, Agostino Gibaldi, Andrea Canessa, and Silvio P. Sabatini</i>	
A Priori Reliability Prediction with Meta-Learning Based on Context Information	200
<i>Jennifer Kreger, Lydia Fischer, Stephan Hasler, Thomas H. Weisswange, and Ute Bauer-Wersing</i>	
Attention Aware Semi-supervised Framework for Sentiment Analysis	208
<i>Jingshuang Liu, Wenge Rong, Chuan Tian, Min Gao, and Zhang Xiong</i>	
Chinese Lexical Normalization Based on Information Extraction: An Experimental Study	216
<i>Tian Tian and WeiRan Xu</i>	
Analysing Event Transitions to Discover Student Roles and Predict Grades in MOOCs	224
<i>Ángel Pérez-Lemonche, Gonzalo Martínez-Muñoz, and Estrella Pulido-Cañabate</i>	
Applying Artificial Neural Networks on Two-Layer Semantic Trajectories for Predicting the Next Semantic Location	233
<i>Antonios Karatzoglou, Harun Sentürk, Adrian Jablonski, and Michael Beigl</i>	
Model-Aware Representation Learning for Categorical Data with Hierarchical Couplings	242
<i>Jianglong Song, Chengzhang Zhu, Wentao Zhao, Wenjie Liu, and Qiang Liu</i>	
Perceptron-Based Ensembles and Binary Decision Trees for Malware Detection	250
<i>Cristina Vatananu, Doina Cosovan, Dragoş Gavriluţ, and Henri Luchian</i>	
Multi-column Deep Neural Network for Offline Arabic Handwriting Recognition	260
<i>Rolla Almodfer, Shengwu Xiong, Mohammed Mudhsh, and Pengfei Duan</i>	
Using LSTMs to Model the Java Programming Language	268
<i>Brendon Boldt</i>	

Representation and Classification

Classification of Categorical Data in the Feature Space of Monotone DNFs	279
<i>Mirko Polato, Ivano Lauriola, and Fabio Aioli</i>	
DeepBrain: Functional Representation of Neural In-Situ Hybridization Images for Gene Ontology Classification Using Deep Convolutional Autoencoders	287
<i>Ido Cohen, Eli (Omid) David, Nathan S. Netanyahu, Noa Liscovitch, and Gal Chechik</i>	
Mental Workload Classification Based on Semi-Supervised Extreme Learning Machine.	297
<i>Jianrong Li and Jianhua Zhang</i>	
View-Weighted Multi-view K-means Clustering	305
<i>Hong Yu, Yahong Lian, Shu Li, and JiaXin Chen</i>	
Indefinite Support Vector Regression.	313
<i>Frank-Michael Schleif</i>	
Instance-Adaptive Attention Mechanism for Relation Classification	322
<i>Yao Lu, Chunyun Zhang, and Weiran Xu</i>	
ReForeSt: Random Forests in Apache Spark.	331
<i>Alessandro Lulli, Luca Oneto, and Davide Anguita</i>	
Semi-Supervised Multi-view Multi-label Classification Based on Nonnegative Matrix Factorization	340
<i>Guangxia Wang, Changqing Zhang, Pengfei Zhu, and Qinghua Hu</i>	
Masked Conditional Neural Networks for Audio Classification	349
<i>Fady Medhat, David Chesmore, and John Robinson</i>	
A Feature Selection Approach Based on Information Theory for Classification Tasks	359
<i>Jhoseph Jesus, Anne Canuto, and Daniel Araújo</i>	
Two-Level Neural Network for Multi-label Document Classification	368
<i>Ladislav Lenc and Pavel Král</i>	
Ontology Alignment with Weightless Neural Networks	376
<i>Thais Viana, Carla Delgado, João C.P. da Silva, and Priscila Lima</i>	
Marine Safety and Data Analytics: Vessel Crash Stop Maneuvering Performance Prediction	385
<i>Luca Oneto, Andrea Coraddu, Paolo Sanetti, Olena Karpenko, Francesca Cipollini, Toine Cleophas, and Davide Anguita</i>	

Combining Character-Level Representation for Relation Classification	394
<i>Dongyun Liang, Weiran Xu, and Yingge Zhao</i>	

On Combining Clusterwise Linear Regression and K-Means with Automatic Weighting of the Explanatory Variables	402
<i>Ricardo A.M. da Silva and Francisco de A.T. de Carvalho</i>	

PSO-RBFNN: A PSO-Based Clustering Approach for RBFNN Design to Classify Disease Data	411
<i>Ramalingaswamy Cheruku, Damodar Reddy Edla, Venkatanareshbabu Kuppili, and Ramesh Dharavath</i>	

Clustering

Modularity-Driven Kernel k -means for Community Detection	423
<i>Felix Sommer, François Fouss, and Marco Saerens</i>	

Measuring Clustering Model Complexity	434
<i>Stefano Rovetta, Francesco Masulli, and Alberto Cabri</i>	

GNMF Revisited: Joint Robust k -NN Graph and Reconstruction-Based Graph Regularization for Image Clustering	442
<i>Feng Gu, Wenju Zhang, Xiang Zhang, Chenxu Wang, Xuhui Huang, and Zhigang Luo</i>	

Two Staged Fuzzy SVM Algorithm and Beta-Elliptic Model for Online Arabic Handwriting Recognition	450
<i>Ramzi Zouari, Houcine Boubaker, and Monji Kherallah</i>	

Evaluating the Compression Efficiency of the Filters in Convolutional Neural Networks	459
<i>Kazuki Osawa and Rio Yokota</i>	

Dynamic Feature Selection Based on Clustering Algorithm and Individual Similarity	467
<i>Carine A. Dantas, Rômulo O. Nunes, Anne M.P. Canuto, and João C. Xavier-Júnior</i>	

Learning from Data Streams and Time Series

Dialogue-Based Neural Learning to Estimate the Sentiment of a Next Upcoming Utterance	477
<i>Chandrakant Bothe, Sven Magg, Cornelius Weber, and Stefan Wermter</i>	

Solar Power Forecasting Using Pattern Sequences	486
<i>Zheng Wang, Irena Koprinska, and Mashud Rana</i>	

A New Methodology to Exploit Predictive Power in (Open, High, Low, Close) Data.	495
<i>Andrew D. Mann and Denise Gorse</i>	
Recurrent Dynamical Projection for Time Series-Based Fraud Detection	503
<i>Eric A. Antonelo and Radu State</i>	
Transfer Information Energy: A Quantitative Causality Indicator Between Time Series.	512
<i>Angel Caçaron and Răzvan Andonie</i>	
Improving Our Understanding of the Behavior of Bees Through Anomaly Detection Techniques.	520
<i>Fernando Gama, Helder M. Arruda, Hanna V. Carvalho, Paulo de Souza, and Gustavo Pessin</i>	
Applying Bidirectional Long Short-Term Memories (BLSTM) to Performance Data in Air Traffic Management for System Identification . . .	528
<i>Stefan Reitmann and Karl Nachtigall</i>	

Image Processing and Medical Applications

A Novel Image Tag Completion Method Based on Convolutional Neural Transformation.	539
<i>Yanyan Geng, Guohui Zhang, Weizhi Li, Yi Gu, Ru-Ze Liang, Gaoyuan Liang, Jingbin Wang, Yanbin Wu, Nitin Patil, and Jing-Yan Wang</i>	
Reducing Unknown Unknowns with Guidance in Image Caption	547
<i>Mengjun Ni, Jing Yang, Xin Lin, and Liang He</i>	
A Novel Method for Ship Detection and Classification on Remote Sensing Images.	556
<i>Ying Liu, Hongyuan Cui, and Guoqing Li</i>	
Single Image Super-Resolution by Learned Double Sparsity Dictionaries Combining Bootstrapping Method	565
<i>Na Ai, Jinye Peng, Jun Wang, Lin Wang, and Jin Qi</i>	
Attention Focused Spatial Pyramid Pooling for Boxless Action Recognition in Still Images	574
<i>Weijiang Feng, Xiang Zhang, Xuhui Huang, and Zhigang Luo</i>	
The Impact of Dataset Complexity on Transfer Learning over Convolutional Neural Networks	582
<i>Miguel D. de S. Wanderley, Leonardo de A. e Bueno, Cleber Zanchettin, and Adriano L.I. Oliveira</i>	

Real-Time Face Detection Using Artificial Neural Networks.	590
<i>Pablo S. Aulestia, Jonathan S. Talahua, Víctor H. Andaluz, and Marco E. Benalcázar</i>	
On the Performance of Classic and Deep Neural Models in Image Recognition	600
<i>Ricardo García-Ródenas, Luis Jiménez Linares, and Julio Alberto López-Gómez</i>	
Winograd Algorithm for 3D Convolution Neural Networks	609
<i>Zelong Wang, Qiang Lan, Hongjun He, and Chunyuan Zhang</i>	
Core Sampling Framework for Pixel Classification	617
<i>Manohar Karki, Robert DiBiano, Saikat Basu, and Supratik Mukhopadhyay</i>	
Biomedical Data Augmentation Using Generative Adversarial Neural Networks.	626
<i>Francesco Calimeri, Aldo Marzullo, Claudio Stamile, and Giorgio Terracina</i>	
Detection of Diabetic Retinopathy Based on a Convolutional Neural Network Using Retinal Fundus Images	635
<i>Gabriel García, Jhair Gallardo, Antoni Mauricio, Jorge López, and Christian Del Carpio</i>	
A Comparison of Machine Learning Approaches for Classifying Multiple Sclerosis Courses Using MRSI and Brain Segmentations	643
<i>Adrian Ion-Mărgineanu, Gabriel Kocevar, Claudio Stamile, Diana M. Sima, Françoise Durand-Dubief, Sabine Van Huffel, and Dominique Sappey-Marinier</i>	
Advances in Machine Learning	
Parallel-Pathway Generator for Generative Adversarial Networks to Generate High-Resolution Natural Images	655
<i>Yuya Okadome, Wenpeng Wei, and Toshiko Aizono</i>	
Using Echo State Networks for Cryptography.	663
<i>Rajkumar Ramamurthy, Christian Bauckhage, Krisztian Buza, and Stefan Wrobel</i>	
Two Alternative Criteria for a Split-Merge MCMC on Dirichlet Process Mixture Models.	672
<i>Tikara Hosino</i>	

FP-MRBP: Fine-grained Parallel MapReduce Back Propagation Algorithm.	680
<i>Gang Ren, Qingsong Hua, Pan Deng, and Chao Yang</i>	
IQNN: Training Quantized Neural Networks with Iterative Optimizations . . .	688
<i>Shuchang Zhou, He Wen, Taihong Xiao, and Xinyu Zhou</i>	
Compressing Neural Networks by Applying Frequent Item-Set Mining	696
<i>Zi-Yi Dou, Shu-Jian Huang, and Yi-Fan Su</i>	
Applying the Heavy-Tailed Kernel to the Gaussian Process Regression for Modeling Point of Sale Data	705
<i>Rui Yang and Yukio Ohsawa</i>	
Chaotic Associative Memory with Adaptive Scaling Factor	713
<i>Tatsuuya Okada and Yuko Osana</i>	

Short Papers

EvoCNN: Evolving Deep Convolutional Neural Networks Using Backpropagation-Assisted Mutations	725
<i>Eli (Omid) David and Nathan S. Netanyahu</i>	
Stage Dependent Ensemble Deep Learning for Dots-and-Boxes Game	727
<i>Yipeng Zhang, Shuqin Li, Meng Ding, and Kun Meng</i>	
Conditional Time Series Forecasting with Convolutional Neural Networks . . .	729
<i>Anastasia Borovykh, Sander Bohte, and Cornelis W. Oosterlee</i>	
A Convolutional Neural Network Based Approach for Stock Forecasting . . .	731
<i>Haixing Yu, Lingyu Xu, and Gaowei Zhang</i>	
The All-Convolutional Neural Network with Recurrent Architecture for Object Recognition.	733
<i>Yiwei Gu and Xiaodong Gu</i>	
Body Measurement and Weight Estimation for Live Yaks Using Binocular Camera and Convolutional Neural Network	735
<i>Siqi Liu, Chun Yu, Yuan Xie, Zhiqiang Liu, Pin Tao, and Yuanchun Shi</i>	
A Modified Resilient Back-Propagation Algorithm in CNN for Optimized Learning of Visual Recognition Problems	737
<i>Sadaqat ur Rehman, Shanshan Tu, and Yongfeng Huang</i>	
Learning in Action Game by Profit Sharing Using Convolutional Neural Network	739
<i>Kaichi Murakami and Yuko Osana</i>	

Deep Learning for Adaptive Playing Strength in Computer Games	741
<i>Eli (Omid) David and Nathan S. Netanyahu</i>	
Benchmarking Reinforcement Learning Algorithms for the Operation of a Multi-carrier Energy System	743
<i>J. Bollenbacher and B. Rhein</i>	
Differentiable Oscillators in Recurrent Neural Networks for Gradient-Based Sequence Modeling	745
<i>Sebastian Otte and Martin V. Butz</i>	
Empirical Study of Effect of Dropout in Online Learning.	747
<i>Kazuyuki Hara</i>	
Context Dependent Input Weight Selection for Regression Extreme Learning Machines	749
<i>Yara Rizk and Mariette Awad</i>	
Solution of Multi-parameter Inverse Problem by Adaptive Methods: Efficiency of Dividing the Problem Space	751
<i>Alexander Efitorov, Tatiana Dolenko, Sergey Burikov, Kirill Laptinskiy, and Sergey Dolenko</i>	
Hopfield Auto-Associative Memory Network for Content-Based Text-Retrieval.	753
<i>Vandana M. Ladwani, Y. Vaishnavi, and V. Ramasubramanian</i>	
From Deep Multi-lingual Graph Representation Learning to History Understanding	756
<i>Sima Sharifirad, Stan Matwin, and Witold Dzwinel</i>	
Adaptive Construction of Hierarchical Neural Network Classifiers: New Modification of the Algorithm.	757
<i>Sergey Dolenko, Vsevolod Svetlov, and Igor Isaev</i>	
Automobile Insurance Claim Prediction Using Distributed Driving Behaviour Data on Smartphones	759
<i>Chalermpol Saiprasert, Pantaree Phumphuang, and Suttipong Thajchayapong</i>	
A Fault-Tolerant Indoor Localization System with Recurrent Neural Networks.	761
<i>Eduardo Carvalho, Bruno Ferreira, Geraldo P.R. Filho, Jó Ueyama, and Gustavo Pessin</i>	
SNN Model for Highly Energy and Area Efficient On-Chip Classification . . .	763
<i>Anmol Biswas, Aditya Shukla, Sidharth Prasad, and Udayan Ganguly</i>	

A Highly Efficient Performance and Robustness Evaluation Method for a SNN Based Recognition Algorithm	765
<i>Sidharth Prasad, Anmol Biswas, Aditya Shukla, and Udayan Ganguly</i>	
Metric Entropy and Rademacher Complexity of Margin Multi-category Classifiers.	767
<i>Khadija Musayeva, Fabien Lauer, and Yann Guermeur</i>	
A Fuzzy Clustering Approach to Non-stationary Data Streams Learning	768
<i>A. Abdullatif, F. Masulli, S. Rovetta, and A. Cabri</i>	
Data Stream Classification by Adaptive Semi-supervised Fuzzy Clustering. . .	770
<i>Giovanna Castellano and Anna Maria Fanelli</i>	
The Discovery of the Relationship on Stock Transaction Data	772
<i>Wanwan Jiang, Lingyu Xu, Gaowei Zhang, and Haixing Yu</i>	
Confirmation of the Effect of Simultaneous Time Series Prediction with Multiple Horizons at the Example of Electron Daily Fluence in Near-Earth Space	774
<i>Irina Myagkova and Sergey Dolenko</i>	
A Neural Attention Based Approach for Clickstream Mining	776
<i>Chandramohan T.N. and Balaraman Ravindran</i>	
Classification of Quantitative Light-Induced Fluorescence Images Using Convolutional Neural Network	778
<i>Sultan Imangaliyev, Monique H. van der Veen, Catherine M.C. Volgenant, Bruno G. Loos, Bart J.F. Keijser, Wim Crielaard, and Evgeni Levin</i>	
Deep Residual Hashing Network for Image Retrieval	780
<i>Edwin Jimenez-Lepe and Andres Mendez-Vazquez</i>	
Model Evaluation Improvements for Multiclass Classification in Diagnosis Prediction	782
<i>Adriana Mihaela Coroiu</i>	
MMT: A Multimodal Translator for Image Captioning.	784
<i>Chang Liu, Fuchun Sun, and Changhu Wang</i>	
A Multi-Channel and Multi-Scale Convolutional Neural Network for Hand Posture Recognition.	785
<i>Jiawen Feng, Limin Zhang, Xiangyang Deng, and Zhijun Yu</i>	
Semi-supervised Model for Feature Extraction and Classification of Fashion Images.	786
<i>Seema Wazarkar, Bettahally N. Keshavamurthy, and Shitala Prasad</i>	

Identification of Differential Flat Systems with Artificial Neural Networks . . .	788
<i>J. Hoedt, J. Kaste, K. Van Ende, and F. Kallmeyer</i>	
Adaptive Weighted Multiclass Linear Discriminant Analysis.	790
<i>Haifeng Zhao, Wei He, and Feiping Nie</i>	
Efficient Graph Construction Through Constrained Data Self-Representativeness	792
<i>L. Weng, F. Dornaika, and Z. Jin</i>	
Author Index	795