

**Editors & Conference Co-Chairs** 

Nick Bassiliades Antonis Bikakis Dimitrios Vrakas Ioannis Vlahavas George Vouros 9<sup>th</sup> Hellenic Conference on Artificial Intelligence

**SETN** 2016



The Association for Computing Machinery 2 Penn Plaza, Suite 701 New York, New York 10121-0701

#### **ACM COPYRIGHT NOTICE**

Copyright © 2016 by the Association for Computing Machinery, Inc. (ACM). Permission to make digital or hard copies of portions of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permission to republish from: Publications Dept., ACM, Inc. Fax +1 (212) 869-0481 or permissions@acm.org.

For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the percopy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, +1-978-750-8400, +1-978-750-4470 (fax).

#### **Notice to Past Authors of ACM-Published Articles**

ACM intends to create a complete electronic archive of all articles and/or other material previously published by ACM. If you have written a work that has been previously published by ACM in any journal or conference proceedings prior to 1978, or any SIG Newsletter at any time, and you do NOT want this work to appear in the ACM Digital Library, please inform permissions@acm.org, stating the title of the work, the author(s), and where and when published.

ISBN: 978-1-4503-3734-2

#### **ACM Order Department**

PO Box 11405 New York, NY 10286-1405

Phone: 1-800-342-6626 (USA and Canada) +1-212-626-0500 (all other countries)

Fax: +1-212-944-1318 E-mail: acmhelp@acm.org



#### **Foreword**

#### Dear Colleagues and Friends,

It is our great pleasure to welcome you to the 9<sup>th</sup> Hellenic Conference on Artificial Intelligence (SETN 2016) taking place on May 18<sup>th</sup> – 20<sup>th</sup> in Thessaloniki, Greece.

The Hellenic Conference on Artificial Intelligence is organized biannually by the Hellenic Artificial Intelligence Society (EETN). It has already been established as one of the most prominent forums for Greek and International AI scientists to present original and high-quality research on emergent topics of Artificial Intelligence. SETN 2016 highly encourages international participation. The official language of the conference is English.

SETN was first held in 1996 (University of Piraeus) and then in 2002 (Aristotle University of Thessaloniki). Since then it has occurred biannually: at the University of the Aegean (2004, 2008), the University of Crete (2006), the NCSR Demokritos (2010), the University of Central Greece (2012) and the University of Ioannina (2014). Over the years, SETN has become one of the premier events for the discussion and dissemination of research results in the field of AI, produced mainly by Greek scientists from institutes both in Greece and around the world. The two major goals of the conference are (a) to promote research in AI, one of the most exciting and active research areas in computer science and engineering and (b) to bring together scientists and engineers from academia and industry to discuss the challenging problems encountered and the solutions that could be adopted.

SETN 2016 received 68 submissions from 16 different countries in Europe, Asia, Africa and Oceania, and on several different topic areas such as Constraint Satisfaction Problems, Planning and Search, Agents, Machine Learning, Evolutionary Algorithms and Neural Networks, Pattern Recognition and Al applications. Each submission was carefully reviewed by at least three members of the Program Committee, as well as by the chairs of the PC. From the 68 submissions, 23 were accepted as full papers and 16 as short papers for presentation at the conference, in 8 sessions, and publication in the electronic proceedings and the ACM Digital Library.

The technical program of the conference also includes 2 distinguished keynote addresses from two prominent members of the AI community, Prof. Angelo Cangelosi from Plymouth University, and Johannes Fürnkranz from Technical University of Darmstadt, 1 nectar paper session, 2 workshops, 1 tutorial and a Robotic Demo session.

Constructive reviewer feedback is one of the keys to a high-quality conference year after year because it encourages each of us, as a researcher, to make our work more complete, or reach a little further. We would like to thank all the members of the SETN 2016 Program Committee for their hard work which made this 9<sup>th</sup> conference in SETN series possible. We acknowledge our distinguished invited speakers for their insightful keynotes. We also thank all the authors for choosing SETN as a forum to publish their research results. We would also like to express our sincere gratitude to the members of the SETN Organizing Committee for their valuable support and arrangements.

We would like to thank all our supporters and sponsors. We wish to thank EasyChair administrator, who helped us with the electronic submission and review system. Last but not least, we thank ACM for their support and cooperation.

We hope you enjoy the excellent academic and cultural atmosphere of the SETN 2016.

Nick Bassiliades, Antonis Bikakis, Dimitrios Vrakas, Ioannis Vlahavas and George Vouros SETN 2016 chairs



## **Conference Organization**

#### **General Chairs**

Ioannis Vlahavas, Aristotle University of Thessaloniki, Greece Dimitris Vrakas, Aristotle University of Thessaloniki, Greece

#### Co-Chair

George Vouros, University of Piraeus, Greece (EETN President)

#### **Program Chairs**

Nick Bassiliades, Aristotle University of Thessaloniki, Greece Antonis Bikakis, University College London (UCL), UK

#### **Workshop and Tutorials Chair**

Grigorios Tsoumakas, Aristotle University of Thessaloniki, Greece

#### **Steering Committee**

Aristidis Likas, University of Ioannina, Greece (SETN '14 Co-Chair) Konstantinos Blekas, University of Ioannina, Greece (SETN '14 Co-Chair) Dimitris Kalles, Hellenic Open University, Greece (SETN '14 Co-Chair) Ilias Maglogiannis, University of Piraeus, Greece (SETN '12 Co-Chair) Vassilis Plagianakos, University of Thessaly, Greece (SETN '12 Co-Chair)

#### **Local Organizing Committee**

Athanasios Tsadiras, Aristotle University of Thessaloniki, Greece Ilias Sakellariou, University of Macedonia, Greece Efstratios Kontopoulos, Centre for Research and Technology Hellas, Greece George Meditskos, Centre for Research and Technology Hellas, Greece

#### **Web Chair**

Fotis Kokkoras, Technological Educational Institute of Thessaly, Greece

#### **Program Committee**

Christos-Nikolaos Anagnostopoulos, University of the Aegean, Greece **Ion Androutsopoulos,** Athens University of Economics and Business, Greece **Grigoris Antoniou,** University of Huddersfield, UK Antonis Argyros, ICS-FORTH, Greece Alexander Artikis, NCSR "Demokritos", Greece Sotiris Batsakis, University of Huddersfield, UK Christos Berberidis, International Hellenic University, Greece Konstantinos Blekas, University of Ioannina, Greece Georgios Chalkiadakis, Technical University of Crete, Greece Vasileios Chasanis, University of Ioannina, Greece Sotirios Chatzis, Cyprus University of Technology, Cyprus Theo Damoulas, Cornell University, USA Christos Dimitrakakis, Chalmers University of Technology, Sweden Yannis Dimopoulos, University of Cyprus, Greece Georgios Dounias, University of the Aegean, Greece Giorgos Flouris, ICS-FORTH, Greece

Todor Ganchev, Technical University of Varna, Bulgaria

Antonios Gasteratos, Democritus University of Thrace, Greece

Basilis Gatos, NCSR "Demokritos", Greece

Manolis Gergatsoulis, Ionian University, Greece

Ioannis Hatzilygeroudis, University of Patras, Greece

Dimitris Iakovidis, Technological Educational Institute of Lamia, Greece

Antonis Kakas, University of Cyprus, Greece

Dimitris Kalles, Hellenic Open University, Greece

Achilles Kameas, Hellenic Open University, Greece

Kostas Karatzas, Aristotle University of Thessaloniki, Greece

Vangelis Karkaletsis, NCSR "Demokritos", Greece

Ioannis Katakis, University of Athens, Greece

Ergina Kavallieratou, University of the Aegean, Greece

Petros Kefalas, The University of Sheffield International Faculty, CITY College, Greece

Elpida Keravnou-Papailiou, University of Cyprus, Cyprus

Fotis Kokkoras, Technological Educational Institute of Thessaly, Greece

Stefanos Kollias, National Technical University of Athens, Greece

Yiannis Kompatsiaris, CERTH – ITI, Greece

Stasinos Konstantopoulos, NCSR "Demokritos", Greece

Efstratios Kontopoulos, CERTH – ITI, Greece

Constantine Kotropoulos, Aristotle University of Thessaloniki, Greece

Irene Kotsia, International Hellenic University, Greece

Costas Koutras, University of Peloponnese, Greece

Konstantinos Koutroumbas, National Observatory of Athens, Greece

Kalliopi Kravari, Aristotle University of Thessaloniki, Greece

Aristidis Likas, University of Ioannina, Greece

Spiros Likothanassis, University of Patras, Greece

Ilias Maglogiannis, University of Piraeus, Greece

George Magoulas, Birkbeck College, UK

Manolis Maragoudakis, University of the Aegean, Greece

Georgios Meditskos, CERTH – ITI, Greece

Loizos Michael, Open University of Cyprus, Cyprus

Rob Miller, University College London, UK

**Iosif Mporas,** University of Hertfordshire, UK

Phivos Mylonas, National Technical University of Athens, Greece

Christophoros Nikou, University of Ioannina, Greece

Georgios Paliouras, NCSR "Demokritos", Greece

Christos Papatheodorou, Ionian University, Greece

Konstantinos Parsopoulos, University of Ioannina, Greece

Ioannis Partalas, Viseo R&D, France

Theodore Patkos, ICS-FORTH, Greece

Pavlos Peppas, Sydney University of Technology, Australia

Giorgos Petasis, NCSR "Demokritos", Greece

Vassilis Plagianakos, University of Thessaly, Greece

Dimitris Plexousakis, ICS-FORTH, Greece

George Potamias, ICS-FORTH, Greece

Ioannis Pratikakis, Democritus University of Thrace, Greece

Ioannis Refanidis, University of Macedonia, Greece

Ilias Sakellariou, University of Macedonia, Greece

Michail Salampasis, Vienna University of Technology, Austria

Efstathios Stamatatos, University of the Aegean, Greece

Demosthenes Stamatis, Technological Educational Institute of Thessaloniki, Greece

Giorgos Stamou, National Technical University of Athens, Greece

Thanos Stavropoulos, Aristotle University of Thessaloniki, Greece

Petros Stefaneas, National Technical University of Athens, Greece

Kostas Stefanidis, ICS-FORTH, Greece

Kostas Stergiou, University of Western Macedonia, Greece

Giorgos Stoilos, National Technical University of Athens, Greece

Chrysostomos Stylios, Technological Educational Institute of Epirus, Greece

Andreas Symeonidis, Aristotle University of Thessaloniki, Greece

Anastasios Tefas, Aristotle University of Thessaloniki, Greece
Michalis Titsias, Athens University of Economics and Business, Greece
Christos Tjortjis, International Hellenic University, Greece
Panos Trahanias, ICS-FORTH, Greece
Athanasios Tsadiras, Aristotle University of Thessaloniki, Greece
Ioannis Tsamardinos, University of Crete, Greece
Grigorios Tsoumakas, Aristotle University of Thessaloniki, Greece
Yannis Tzitzikas, ICS-FORTH, Greece
Nikos Vassilas, Technological Educational Institute of Athens, Greece
Stavros Vassos, Sapienza University of Rome, IT
Dimitrios Vogiatzis, NCSR "Demokritos", Greece
Spyros Vosinakis, University of the Aegean, Greece
George Vouros, University of Piraeus, Greece



# **Table of Contents**

Constraint Satisfaction Problems	
Efficiently Reasoning about Qualitative Constraints through Variable Elimination Michael Sioutis, Zhiguo Long, Sanjiang Li Using Parallelization to Efficiently Exploit the Pruning Power of Strong Local Consistencies	Article 1 Article 2
Minas Dasygenis, Kostas Stergiou  Extending the Broken Triangle Property tractable class of binary CSPs  Wady Naanaa	Article 3
A constrained molecular graph generation with imposed and forbidden fragments Omrani Mohamed Amine, Wady Naanaa Constraint Programming MapReduce'd Nikolaos Pothitos, Panagiotis Stamatopoulos	Article 4 Article 5
Planning and Search	
Towards a validator for planning problems  Moses Symeonidis, Dimitris Giouroukis, Dimitris Vrakas  Grid Search for Operator and Parameter Control in Differential Evolution  Vasileios Tatsis, Konstantinos Parsopoulos  Piece of Pie Search: Confidently Exploiting Heuristics  Nikolaos Pothitos, Panagiotis Stamatopoulos  A Neo4j Implementation of Fuzzy Random Walkers  Georgios Drakopoulos, Andreas Kanavos, Athanasios Tsakalidis	Article 6 Article 7 Article 8 Article 9
Agents	
Modeling and Enactment of Business Agents Using Jason  Amelia Badica, Costin Badica, Florin Leon, Ionut Buligiu  Autonomous navigation of an over-actuated marine platform using reinforcement learning  Konstantinos Tziortziotis, Nikolaos Tziortziotis, Kostas Vlachos, Konstantinos Blekas	Article 10 Article 11
Energy Management in Solar Microgrid via Reinforcement Learning  Panagiotis Kofinas, George Vouros, Anastasios Dounis  EVLib: A Library for the Management of the Electric Vehicles in the Smart Grid  Sotiris Karapostolakis. Emmanouil Rigas. Nick Bassiliades. Sarvapali Ramchurn	Article 12 Article 13

## **Machine Learning**

Short-Term Load Forecasting using a Cluster of Neural Networks for the Greek	Article 15
Energy Market	
Apostolos Adamakos, Michalis Titsias	
Improving Text Stream Clustering using Term Burstiness and Co-burstiness	Article 16
Argyris Kalogeratos, Panagiotis Zagorisios, Aristidis Likas	
Content Representation and Similarity of Movies based on Topic Extraction from	Article 17
Subtitles	
Konstantinos Bougiatiotis, Theodoros Giannakopoulos	
Detecting hyperplane clusters with adaptive possibilistic clustering	Article 18
Konstantinos Koutroumbas, Spyridoula Xenaki, Athanasios Rontogiannis	
Spectral Clustering using Optimized Bag-of-Features	Article 19
Nikolaos Passalis, Anastasios Tefas	
Classifier-assisted optimization frameworks	Article 20
Yoel Tenne	
A Bag of Words approach for recognition of Greek folk dances	Article 21
Eftychia Fotiadou, Ioannis Kapsouras, Nikos Nikolaidis, Anastasios Tefas	
<b>Ensemble Feature Selection using Rank Aggregation Methods for Population</b>	Article 22
Genomic Data	
Ioannis Kavakiotis, Alexandros Triantafyllidis, Grigorios Tsoumakas, Ioannis Vlahavas	
Segmento: An R-based Visualization-rich System for Customer Segmentation and	Article 23
Targeting	
Anestis Fachantidis, Athanasios Tsiaras, Grigorios Tsoumakas, Ioannis Vlahavas	
Clustering Software Metric Values Extracted from C# Code for Maintainability	Article 24
Assessment	
Shumail Arshad, Christos Tjortjis	

## **Neural Networks and Evolutionary Algorithms**

Hybrid Evolutionary Algorithms in Resource Leveling Optimization: Application in	Article 25
a Large Real Construction Project of a 50000 DWT Ship	
Aggelos Gaitanidis, Vassilios Vassiliadis, Christos Kyriklidis, Georgios Dounias	
<b>Evolving Multi-Layer Neural Networks for Othello</b>	Article 26
Vassilis Makris, Dimitris Kalles	
Relevance Feedback in Deep Convolutional Neural Networks for Content Based	Article 27
Image Retrieval	
Maria Tzelepi, Anastasios Tefas	
Efficient MapReduce Kernel k-Means for Big Data Clustering	Article 28
Nikolaos Tsapanos, Anastasios Tefas, Nikolaos Nikolaidis, Ioannis Pitas	
Determination of a new formula for the electrical fast transient / burst waveform	Article 29
using genetic algorithm	
Markos Georgopoulos, Ioannis Gonos, Ioannis Stathopulos	

## **Pattern Recognition**

Real-time Bite Detection from Smartwatch Orientation Sensor Data	Article 30
Christos Maramis, Vasilis Kilintzis, Nicos Maglaveras	
A Real-Time Approach for Gesture Recognition using the Kinect Sensor	Article 31
Georgios Paraskevopoulos, Evaggelos Spyrou, Dimitrios Sgouropoulos	
Complex layout analysis based on contour classification and morphological	Article 32
operations	
Nikos Vasilopoulos, Ergina Kavallieratou	
Distance Measurement of Objects using Stereo Vision	Article 33
Mozammel Chowdhury, Junbin Gao, Rafiqul Islam	
Greek Sign Language Alphabet Recognition Using the Leap Motion Device	Article 34
Merkourios Simos, Nikolaos Nikolaidis	
Automatic Forest Wood Logging Identification based on Acoustic Monitoring	Article 35
Iosif Mporas, Michael Paraskevas	

## **AI Applications**

Artificial Intelligence meets Software Engineering in Computing Education	Article 36
Dimitris Kalles	
A Semantic Annotation Model for Arabic Legal Texts	Article 37
Ines Berrazega, Rim Faiz, Asma Bouhafs, Ghassan Mourad	
A Semantic Approach to Film Content Analysis and Retrieval	Article 38
Alexandros Chortaras, Stefanos Kollias, Kostas Rapantzikos, Giorgos Stamou	
ReSkill: Relative Skill-Level Calculation System	Article 39
Chairi Kiourt, George Pavlidis, Dimitris Kalles	



# **Supporters**



Aristotle University of Thessaloniki



Department of Informatics of the Aristotle University of Thessaloniki



Intelligent Systems research group at the Department of Informatics



# **Sponsors**

# **@ A.U.TH RESEARCH COMMITTEE**



