ADVANCES IN KNOWLEDGE-BASED AND INTELLIGENT INFORMATION AND ENGINEERING SYSTEMS

Frontiers in Artificial Intelligence and Applications

Volume 243
Published in the subseries

Knowledge-Based Intelligent Engineering Systems
Editors: L.C. Jain and R.J. Howlett

Recently published in KBIES:

Vol. 240. M. Virvou, K. Matsuura, G. Tsihrintzis and A. Sako (Eds.), Knowledge-Based Software Engineering – Proceedings of the Tenth Joint Conference on Knowledge-Based Software Engineering
Vol. 234. B. Apolloni, S. Bassis, A. Esposito and C.F. Morabito (Eds.), Neural Nets WIRN11 – Proceedings of the 21st Italian Workshop on Neural Nets
Vol. 226. B. Apolloni, S. Bassis, A. Esposito and C.F. Morabito (Eds.), Neural Nets WIRN10 – Proceedings of the 20th Italian Workshop on Neural Nets
Vol. 214. I.-O. Stathopoulou and G.A. Tsihrintzis, Visual Affect Recognition
Vol. 211. J.I. da Silva Filho, G. Lambert-Torres and J.M. Abe, Uncertainty Treatment Using Paraconsistent Logic – Introducing Paraconsistent Artificial Neural Networks
Vol. 204. B. Apolloni, S. Bassis and C.F. Morabito (Eds.), Neural Nets WIRN09 – Proceedings of the 19th Italian Workshop on Neural Nets, Vietri sul Mare, Salerno, Italy, May 28–30 2009
Vol. 203. M. Džbor, Design Problems, Frames and Innovative Solutions
Vol. 196. F. Masulli, A. Micheli and A. Sperduti (Eds.), Computational Intelligence and Bioengineering – Essays in Memory of Antonina Starita
Vol. 193. B. Apolloni, S. Bassis and M. Marinaro (Eds.), New Directions in Neural Networks – 18th Italian Workshop on Neural Networks: WIRN 2008
Vol. 186. G. Lambert-Torres et al. (Eds.), Advances in Technological Applications of Logical and Intelligent Systems – Selected Papers from the Sixth Congress on Logic Applied to Technology

Recently published in FAIA:

Vol. 242. L. De Raedt, C. Bessiere, D. Dubois, P. Doherty, P. Frasconi, F. Heintz and P. Lucas (Eds.), ECAI 2012 – 20th European Conference on Artificial Intelligence
Vol. 241. K. Kersting and M.Toussaint (Eds.), STAIRS 2012 – Proceedings of the Sixth Starting AI Researchers' Symposium
Vol. 239. M. Donnelly and G. Guizzardi (Eds.), Formal Ontology in Information Systems – Proceedings of the Seventh International Conference (FOIS 2012)
Vol. 238. A. Respício and F. Burstein (Eds.), Fusing Decision Support Systems into the Fabric of the Context
Vol. 237. J. Henno, Y. Kiyoki, T. Tokuda, H. Jaakkola and N. Yoshida (Eds.), Information Modelling and Knowledge Bases XXIII

ISSN 0922-6389 (print)
ISSN 1879-8314 (online)

Advances in Knowledge-Based and Intelligent Information and Engineering Systems

Edited by

Manuel Graña
Computational Intelligence Group,
University of the Basque Country, UPV/EHU, Spain

Carlos Toro
Vicomtech-IK4, Spain

Jorge Posada
Vicomtech-IK4, Spain

Robert J. Howlett
Bournemouth University, United Kingdom

and

Lakhmi C. Jain
University South Australia, Australia

IOS Press

Amsterdam • Berlin • Tokyo • Washington, DC

ISBN 978-1-61499-104-5 (print)
ISBN 978-1-61499-105-2 (online)
Library of Congress Control Number: 2012945596

Publisher
IOS Press BV
Nieuwe Hemweg 6B
1013 BG Amsterdam
Netherlands
fax: +31 20 687 0019
e-mail: order@iospress.nl

Distributor in the USA and Canada
IOS Press, Inc.
4502 Rachael Manor Drive
Fairfax, VA 22032
USA
fax: +1 703 323 3668
e-mail: iosbooks@iospress.com

Advances in Knowledge-Based and Intelligent Information and Engineering Systems
M. Graña et al. (Eds.)
IOS Press, 2012

Preface

Information processing has become a pervasive phenomenon in our civilization. Massive access to information resources and their use as intelligent systems in everyday applications is advantaged by the most recent research in information technologies. While the majority of information processing is becoming intelligent in a very broad sense, major research in Semantics, Artificial Intelligence and Knowledge Engineering supports the domain specific applications that are becoming more and more present in our everyday living. Intelligent Systems are present in a wide range of situations that include facets of simple everyday actions and sometimes not so simple aspects such as transport systems and even the medical domain. Digital news, socialization of relations, and enhancements derived from the handling of expert decisions are but a few examples of everyday applications.

Ontologies play a major role in the development of knowledge engineering in various domains, from semantic web down to the design of specific decision support systems. They are used for the specification of natural language semantics, information modeling and retrieval in querying systems, geographical information systems, medical information systems, the list is growing continuously. Ontologies allow easy modeling of heterogeneous information, flexible reasoning for the derivation of consequents or the search of query answers, specification of a priori knowledge, increasing accumulation of new facts and relations, i.e. reflexive ontologies. Therefore, they are becoming key components of adaptable information processing systems. Classical problems such as ontology matching or instantiation, has new and more complex formulations and solutions, involving a mixture of underlying technologies, from traditional logic up to fuzzy logic. Research on ontologies and their applications is a highly active front of current computational intelligence science.

Much of modern machine learning has become a branch of statistics and probabilistic system modeling. The Bayesian paradigm is becoming dominant, because it allows the formulation of elegant chains of reasoning to deal with uncertainty. Linear approaches to feature extraction and enrichments for discriminant systems have also a surprising revival from the hand of kernel theory and Bayesian sparse modeling. In the background, the establishment of a sound methodology to assess the value of the systems is a continuous endeavor that is also strongly anchored in statistics, approaches based on nature-inspired computing, such as artificial neural networks, have a broad application and are subject of active research.

A very specific new branch of developments is that of Lattice Computing, gathering works under a simple heading “use lattice operators as the underlying algebra for computational designs”. A traditional area of research that falls in this category is Mathematical Morphology as applied to image processing, where image operators are designed on the basis of maximum and minimum operations, a long track of successful applications support the idea that this approach could be fruitful in the framework of intelligent system design. The fruits have been innovative associative memories, image feature extraction and classification algorithms, which include lattice based techniques to manipulate heterogeneous information sources.

For more than 15 years, KES International and its annual organized events, have served as a platform for sharing the latest developments in Intelligent Systems. Organized by the Computational Intelligence Group of the University of the Basque Country and the computer graphics leading institute Vicomtech-IK4, the 16th Annual KES conference, was held in the beautiful city of San Sebastian in the north of Spain. (http://kes2012.kesinternational.org/index.php) Extracted from the conference, this book presents the best contributions received and presented by leading experts all over the world who joined us to share their latest achievements in this domain. The quality of these contributions clearly show that knowledge engineering is more than a trendy topic, but a continuous living and evolving set of technologies aimed to improve the design and understanding of systems and their relations with humans.

As editors of these selected readings, we are proud to present these articles that travel from theoretical and basic research conceptualizations to real world applications. We must thank the large number of people that have contributed to the success of this endeavor by managing the reception of papers and monitoring their review: Bruno Apolloni, Floriana Esposito, Ngoc Thanh Nguyen, Anne Hakansson, Tuan D. Pham, Ron Hartung, Andreas Nuernberger, Honghai Liu, Kazuhiko Tsuda , Nobuo Suzuki, Masakazu Takahashi, Hirokazu Taki, Masato Soga, Antonio Fernández-Caballero , Rafael Martínez-Tomás, Naoto Mukai, Taketoshi Ushiama , Toyohide Watanabe, Tomoko Kojiri, Piotr Jêdrzejowicz, Ireneusz Czarnowski, Alfredo Cuzzocrea, Kazumi Nakamatsu, Jair Minoro Abe, Gloria Bueno, Grégory Maclair, Cesar Sanín, Edward Szczerbicki, Cecilia Zanni-Merk , Richard Duro, Takahira Yamaguchi, Katsutoshi Yada, Gregory Zacharewic, Akinoro Abe, Yukio Ohsawa, Jeffrey W. Tweedale, Otoniel Mario López Granado, Adriana Dapena Janeiro, Nicolás Guil Mata, Yuji Iwahori, Yoshinori Adachi, Nobuhiro Inuzuka, Jun Munemori, Takaya Yuizono, Antonio Moreno, Hajer Baazaoui, Aida Valls, Nesrine Ben Mustapha, Arkadiusz Kawa, Pawel Pawlewski, Norio Baba, Hisao Shiizuka, Junzo Watada, Katsutoshi Yada and Takahira Yamaguchi.

We want to express our gratitude to the International Programme Committee which is the academic backbone supporting this conference series:

Dr. Ahmad Taher Azar	IGI Global, USA
Prof. Isabelle Bichindaritz	University of Washington Tacoma, USA
Dr Mihai Boicu	George Mason University, USA
Dr Gloria Bordogna	National Research Council of Italy , Italy
Dr. Zaki Brahmi	RIADI Laboratory, Manouba University, Tunisia.
Prof. Michele Ceccarelli	University of Sannio, Italy
Dr. Igor Chikalov	King Abdullah University of Science and Technology, Saudi Arabia
Prof. Alfredo Cuzzocrea	University of Calabria, Italy
Prof. Colette Faucher	LSIS-Polytech'Marseille, France
Prof. Alexandra Grancharova	Bulgarian Academy of Sciences, Bulgaria
Prof. Manuel Graña	University of the Basque Country, Spain
Prof. Ioannis Hatzilygeroudis	University of Patras, Greece
Prof. Robert J.Howlett	Bournemouth University, UK
Dr.Shraddha Ingale	Pune University, India
Dr Ivan Jordanov	University of Portsmouth, UK
Prof. Vladimir Jotsov	State University for Library Studies and Information Technologies, Bulgaria

Dr. Luis Kabongo	Vicomtech Research Centre, Spain
Prof. Petia Koprinkova-Hristova	Bulgarian Academy of Sciences, Bulgaria
Dr. Carlos Lamsfus	CIC Tourgune, Spain
Prof. Chengjun Liu	New Jersey Institute of Technology,USA
Prof. Ignac Lovrek	University of Zagreb, Croatia
Dr. Minhua Ma	Glasgow School of Art, Scotland, UK
Dr. Noel M. Martin	Defence Science and Technology Organisation and University of South Australia
Dr. Kenji Matsuura	The Univ. of Tokushima, Japan
Prof. Emilia Mendes	Zayed University, Dubai, UAE
Prof. Mikhail Moshkov	King Abdullah University of Science and Technology, Saudi Arabia
Prof. Hirofumi Nagashino	The University of Tokushima, Japan
Prof. Ioannis K. Nikolos	Technical University of Crete, Chania, Greece.
Dr. Carlos Ocampo-Martinez	Polytechnic University of Catalunia, Spain
Prof. Cezary Orlowski	Gdansk University of Technology, Poland
Dr. Jorge Posada	Vicomtech Research Centre, Spain
Prof. Jim Prentzas	Democritus University of Thrace, Greece
Prof. Marcello Sanguineti	University of Genova, Italy
Dr. Cesar Sanin	University of Newcastle, Australia
Prof. Ricardo Sotaquirá	Universidad de la Sabána, Columbia
Prof. Edward Szczerbicki	University of Newcastle, Australia
Prof. Eulalia Szmidt	Polish Academy of Sciences, Poland
Dr. Steve Thatcher	University of South Australia, Australia
Prof. Peter Tino	The University of Birmingham, UK
Dr. Carlos Toro	Vicomtech Research Centre, Spain
Dr. Jeffrey W. Tweedale	Defence Science and Technology Organisation and University of South Australia
Prof. Eiji Uchino	Yamaguchi University, Japan
Prof. Juan D. Velasquez Silva	University of Chile, Chile
Dr. Gregory Zacharewicz	Université de Bordeaux 1, France
Dr. Cecilia Zanni-Merk	INSA-Strasbourg, France
Prof. Guangquan Zhang	University of Technology Sydney, Australia
Dr. Beata M Zielosko	King Abdullah University of Science and Technology, Saudi Arabia

Finally we acknowledge the support of the Basque Government, Vicomtech-IK4 and the University of the Basque Country helping to the success of this meeting.

Manuel Graña
Jorge Posada
Carlos Toro
Robert J. Howlett
Lakhmi C. Jain