

Lecture Notes in Artificial Intelligence 2663

Edited by J. G. Carbonell and J. Siekmann

Subseries of Lecture Notes in Computer Science

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Tokyo

Ernestina Menasalvas Javier Segovia
Piotr S. Szczepaniak (Eds.)

Advances in Web Intelligence

First International Atlantic Web Intelligence Conference
AWIC 2003
Madrid, Spain, May 5-6, 2003
Proceedings



Springer

Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

Volume Editors

Ernestina Menasalvas
Javier Segovia
Universidad Politécnica de Madrid
Facultad de Informática
Campus de Montegancedo, Boadilla del Monte, 28660 Madrid, Spain
E-mail: {emenasalvas/fsegovia}@fi.upm.es

Piotr S. Szczepaniak
Technical University of Lodz
Institute of Computer Science
ul.Sterlinga 16/18, 90-217 Lodz, Poland
E-mail: office@ics.p.lodz.pl
Cataloging-in-Publication Data applied for

A catalog record for this book is available from the Library of Congress.

Bibliographic information published by Die Deutsche Bibliothek
Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie;
detailed bibliographic data is available in the Internet at <<http://dnb.ddb.de>>.

CR Subject Classification (1998): I.2, H.3, H.4, C.2, H.5, J.1, J.2

ISSN 0302-9743

ISBN 3-540-40124-5 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH

<http://www.springer.de>

© Springer-Verlag Berlin Heidelberg 2003
Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin GmbH
Printed on acid-free paper SPIN: 10930601 06/3142 5 4 3 2 1 0

Preface

We are pleased to present the proceedings of the 2003 Atlantic Web Intelligence Conference, AWIC 2003. The conference was located in Madrid, Spain during May 5–6, 2003, organized locally by the Technical University of Madrid.

AWIC 2003 aimed to be the first of a series of conferences on Web Intelligence, to be celebrated annually, alternatively in Europe and America, starting in Madrid. It was born as an activity of the recently created WIC-Poland Research Centre and the WIC-Spain Research Centre, both belonging to the Web Intelligence Consortium (WIC) (<http://wi-consortium.org>). AWIC 2003 was supported with grants from the Spanish Ministry for Science and Technology and the European Network of Excellence in Knowledge Discovery, KDNNet.

AWIC 2003 brought together scientists, engineers, computer users, and students to exchange and share their experiences, new ideas, and research results about all aspects (theory, applications, and tools) of artificial intelligence techniques applied to Web-based systems, and to discuss the practical challenges encountered and the solutions adopted. Almost 70 contributions were submitted. After a preliminary evaluation, 60 of these papers were accepted to the conference and were assigned at least two reviewers from the international program committee. Out of this 60, 33 were conditionally accepted, and 32 of them were finally accepted after the conditions set by the reviewers had been met, which resulted in an acceptance ratio of 45%.

AWIC 2003 had a general session with 9 papers, and the others were organized into special sessions on areas such as:

- Web security,
- Semantic Web,
- Web authoring and design,
- Web information retrieval,
- Agents for the web, and
- User behavior

During AWIC 2003 we were pleased to have some important invited speakers. Prof. Lotfi Zadeh, who does not need any introduction, was the honorary chair and gave a talk about the transition of search engines to question-answering systems. This book contains what could be considered an extended abstract of his actual lecture. Prof. Ning Zhong, President of WIC, who can be considered as one of the fathers of the term “Web Intelligence,” gave a talk about the past, present, and future of the area. Finally, Prof. Ryszard Tadeusiewicz spoke about the application of artificial intelligence techniques for information retrieval.

We thank all the authors for contributing to what in our minds was a more than interesting program in Web Intelligence. We also want to thank the remarkable effort made by Coro Perez, secretary of the conference, and the rest of the local committee. We hope to see all of them, and many others at AWIC 2004.

May 2003

E. Menasalvas
J. Segovia
P.S. Szczepaniak

AWIC 2003 Organization

Honorary Chair

Lotfi A. Zadeh (University of California, USA)

Conference Co-chairs

Javier Segovia (Universidad Politécnica de Madrid, Spain)

Piotr Szczepaniak (Technical University of Lodz, Poland)

Steering Committee

Ning Zhong (Maebashi Institute of Technology, Japan)

Enric Trillas (Universidad Politécnica de Madrid, Spain)

Jiming Liu (Hong Kong Baptist University)

Janusz Kacprzyk (Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland)

Organizing Committee

Ernestina Menasalvas (Universidad Politécnica de Madrid, Spain)

Jesús Favela (Centro de Investigación Científica y de Educación Superior de Ensenada, México)

Local Committee

José M. Peña (Universidad Politécnica de Madrid, Spain)

Oscar Marbán (Universidad Carlos III de Madrid, Spain)

Ángel Lucas (Universidad Politécnica de Madrid, Spain)

Sonia Frutos (Universidad Politécnica de Madrid, Spain)

Javier Crespo (Universidad Carlos III de Madrid, Spain)

Eugenio Santos (Universidad Politécnica de Madrid, Spain)

Organization of the Special Track on Uncertainty, Hypermedia and the Web: Search, Personalization and Usability

José Angel Olivas (Universidad de Castilla-La Mancha, Spain)

Miguel-Ángel Sicilia (Universidad Carlos III, Spain)

AWIC 2003 Program Committee

S.S. Anand, UK	B. Mobasher, USA
R. Baeza-Yates, Northern Ireland, UK	C. Montes, Spain
T. Bao Ho, Japan	O. Nasraoui, USA
B. Berendt, Germany	M. Piattini, Spain
A. Büchner, Northern Ireland, UK	P. Quaresma, Portugal
J. Favela, México	R. Rastogi, USA
U. Fayyad, USA	V. Robles, Spain
W. Gaul, Germany	M. Rudnicki, Poland
J. Ghosh, USA	J.W. Shavlik, USA
O. Guenther, Germany	A. Skowron, Poland
M. Hadjimichael, USA	M. Spiliopoulou, Germany
E. Hochsztain, Uruguay	R. Tadeusiewicz, Poland
P. Isasi, Spain	M.A. Vila, Spain
L. Joyanes Aguilar, Spain	A. Wasilewska, USA
J. Kacprzyk, Poland	X. Wu, USA
S. Kaski, Finland	R. Yager, USA
C. A. Knoblock, USA	Y. Yao, Canada
D. H. Kraft, USA	P.S. Yu, USA
R. Kruse, Germany	S. Zadrozny, Poland
T. Y. Lin, USA	M. Zaki, USA
J. Liu, Hong Kong	W. Ziarko, Canada
L. Mason, USA	Z. Zheng, USA
Y. Manolopoulos, Greece	N. Zhong, Japan
S. Millán, Colombia	

Table of Contents

Invited Speakers

Toward Web Intelligence	1
<i>Ning Zhong</i>	
From Search Engines to Question-Answering Systems – The Need for New Tools	15
<i>Lotfi A. Zadeh</i>	
Artificial Intelligence Techniques in Retrieval of Visual Data Semantic Information	18
<i>Ryszard Tadeusiewicz, Marek R. Ogiela</i>	

General Session

A Framework to Integrate Business Goals in Web Usage Mining	28
<i>E. Hochsztain, S. Millán, B. Pardo, J.M. Peña, E. Menasalvas</i>	
Clustered Organized Conceptual Queries in the Internet Using Fuzzy Interrelations	37
<i>Pablo J. Garcés, José A. Olivas, Francisco P. Romero</i>	
Collaborative Filtering Using Interval Estimation Naïve Bayes	46
<i>V. Robles, P. Larrañaga, J.M. Peña, O. Marbán, J. Crespo, M.S. Pérez</i>	
DJ-Boids: Flocks of DJ's to Program Internet Multichannel Radio Stations	54
<i>Jesus Ibanez, Antonio Gomez-Skarmeta, Josep Blat</i>	
Evaluating the Informative Quality of Web Sites by Fuzzy Computing with Words	62
<i>Enrique Herrera-Viedma, Eduardo Peis, María Dolores Olvera, Juan Carlos Herrera, Yusef Hassan Montero</i>	
Mining Association Rules Using Fuzzy Inference on Web Data	73
<i>Mariluz Martínez, Gelver Vargas, Andrés Dorado, Marta Millán</i>	
The “Who Is It?” Problem Application for Customizable Web Sites	83
<i>Pierre-Emmanuel Jouve, Nicolas Nicoloyannis</i>	

Using Case-Based Reasoning to Improve Information Retrieval in Knowledge Management Systems	94
<i>Norbert Gronau, Frank Laskowski</i>	

Web Page Classification: A Soft Computing Approach	103
<i>Angela Ribeiro, Víctor Fresno, María C. Garcia-Alegre, Domingo Guinea</i>	

Special Session: Web Security

Content-Based Methodology for Anomaly Detection on the Web	113
<i>Mark Last, Bracha Shapira, Yuval Elovici, Omer Zaafrany, Abraham Kandel</i>	

Designing Reliable Web Security Systems Using Rule-Based Systems Approach	124
<i>Grzegorz J. Nalepa, Antoni Ligeza</i>	

Secure Intelligent Agents Based on Formal Description Techniques	134
<i>L. Mengual and C. de la Puente</i>	

Special Session: Semantic Web

A Natural Language Interface for Information Retrieval on Semantic Web Documents	142
<i>Paulo Quaresma, Irene Pimenta Rodrigues</i>	

Conceptual User Tracking	155
<i>Daniel Oberle, Bettina Berendt, Andreas Hotho, Jorge Gonzalez</i>	

Coping with Web Knowledge	165
<i>J.L. Arjona, R. Corchuelo, J. Peña, D. Ruiz</i>	

Formalization of Web Design Patterns Using Ontologies	179
<i>Susana Montero, Paloma Díaz, Ignacio Aedo</i>	

Special Session: Web Authoring and Design

A Multi-agent System for Web Document Authoring	189
<i>M. Pérez-Coutiño, A. López-López, M. Montes-y-Gómez, L. Villaseñor-Pineda</i>	

On the Vague Modelling of Web Page Characteristics Regarding Usability	199
<i>Elena García Barriocanal, Miguel A. Sicilia Urbán, J. Antonio Gutiérrez</i>	
Semantic Interoperability Based on Ontology Mapping in Distributed Collaborative Design Environment	208
<i>Jingyi Zhang, Shensheng Zhang, Chun Chen, Bo Wang</i>	
The Use of Data Mining Techniques to Classify Styles and Types of Web-Based Information: Generation of Style Sheets Using Data Mining	218
<i>Kathryn E.B. Thornton, Mark Carrington</i>	

Special Session: Web Information Retrieval

Building Topic Profiles Based on Expert Profile Aggregation	230
<i>Miguel Delgado, María J. Martín-Bautista, Daniel Sánchez, José M. Serrano, María-Amparo Vila</i>	
Carrot ² and Language Properties in Web Search Results Clustering	240
<i>Jerzy Stefanowski, Dawid Weiss</i>	
Practical Evaluation of Textual Fuzzy Similarity as a Tool for Information Retrieval	250
<i>Piotr S. Szczepaniak, Marcin Gil</i>	
Rough – Fuzzy Reasoning for Customized Text Information Retrieval	258
<i>Shailendra Singh, P. Dhanalakshmi, Lipika Dey</i>	

Special Session: Agents for the Web

A Machine Learning Based Evaluation of a Negotiation between Agents Involving Fuzzy Counter-Offers	268
<i>Javier Carbo, Agapito Ledezma</i>	
Autonomous Agents to Support Interoperability and Physical Integration in Pervasive Environments	278
<i>Marcela Rodríguez, Jesus Favela</i>	
Feature Selection Algorithms to Improve Documents' Classification Performance	288
<i>Pedro A.C. Sousa, João Paulo Pimentão, Bruno René D. Santos, Fernando Moura-Pires</i>	
ROSA – Multi-agent System for Web Services Personalization	297
<i>Przemysław Kazienko, Maciej Kiewra</i>	

Supporting Software Maintenance in Web Repositories through a
Multi-agent System 307
Aurora Vizcaino, Jesús Favela, Mario Piattini, Felix García

Special Session: User Behavior

A Hybrid Method for Patterns Mining and Outliers Detection in the
Web Usage Log 318
Mikhail Petrovskiy

Analysis of User’s Behaviour in Very Large Business Application Systems with
Methods of the Web Usage Mining – A Case Study on SAP® R/3® 329
Jorge Marx Gómez, Gamal Kassem, Claus Rautenstrauch, Markus Melato

Automation of the Deep Web with User Defined Behaviours 339
*Vicente Luque Centeno, Carlos Delgado Kloos, Peter T. Breuer,
Luis Sánchez Fernández, Ma. Eugenia Gonzalo Cabellos,
Juan Antonio Herráiz Pérez*

Author Index 349