

Research and Development in Intelligent Systems XXIV

Max Bramer Frans Coenen Miltos Petridis
Editors

Research and Development in Intelligent Systems XXIV

Proceedings of AI-2007, the Twenty-seventh SGAI
International Conference on Innovative Techniques
and Applications of Artificial Intelligence

Max Bramer, BSc, PhD, CEng, CITP,
FBCS, FIET, FRSA, FHEA
Faculty of Technology
University of Portsmouth, Portsmouth, UK

Frans Coenen, BSc, PhD
Department of Computer Science,
University of Liverpool, Liverpool, UK

Miltos Petridis, DipEng, MBA, PhD,
MBCS, AMBA
University of Greenwich, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN 978-1-84800-093-3 e-ISBN 978-1-84800-094-0

© Springer-Verlag London Limited 2008

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the publishers, or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency. Enquiries concerning reproduction outside those terms should be sent to the publishers.

The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant laws and regulations and therefore free for general use.

The publisher makes no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability for any errors or omissions that may be made.

Printed on acid-free paper

9 8 7 6 5 4 3 2 1

springer.com

TECHNICAL PROGRAMME CHAIR'S INTRODUCTION

M.A.BRAMER

University of Portsmouth, UK

This volume comprises the refereed technical papers presented at AI-2007, the Twenty-seventh SGAI International Conference on Innovative Techniques and Applications of Artificial Intelligence, held in Cambridge in December 2007. The conference was organised by SGAI, the British Computer Society Specialist Group on Artificial Intelligence.

The papers in this volume present new and innovative developments in the field, divided into sections on Constraint Satisfaction, AI Techniques, Data Mining and Machine Learning, Multi-Agent Systems, Data Mining, and Knowledge Acquisition and Management. The volume also includes the text of short papers presented as posters at the conference.

This year's prize for the best refereed technical paper was won by a paper entitled 'An Evolutionary Algorithm-Based Approach to Robust Analog Circuit Design using Constrained Multi-Objective Optimization' by Giuseppe Nicosia, Salvatore Rinaudo and Eva Sciacca. SGAI gratefully acknowledges the long-term sponsorship of Hewlett-Packard Laboratories (Bristol) for this prize, which goes back to the 1980s.

This is the twenty-fourth volume in the *Research and Development* series. The Application Stream papers are published as a companion volume under the title *Applications and Innovations in Intelligent Systems XV*.

On behalf of the conference organising committee I should like to thank all those who contributed to the organisation of this year's technical programme, in particular the programme committee members, the executive programme committee and our administrators Rachel Browning and Bryony Bramer.

Max Bramer

Technical Programme Chair, AI-2007

ACKNOWLEDGEMENTS

AI-2007 CONFERENCE COMMITTEE

Dr. Miltos Petridis University of Greenwich	(Conference Chair and UK CBR Organiser)
Dr. Alun Preece University of Aberdeen	(Deputy Conference Chair, Electronic Services)
Dr Frans Coenen University of Liverpool	(Deputy Conference Chair, Local Arrangements and Deputy Technical Programme Chair)
Prof. Adrian Hopgood De Montfort University	(Workshop Organiser)
Rosemary Gilligan	(Treasurer)
Dr Nirmalie Wiratunga The Robert Gordon University	(Poster Session Organiser)
Professor Max Bramer University of Portsmouth	(Technical Programme Chair)
Richard Ellis Stratum Management Ltd	(Application Programme Chair)
Dr. Tony Allen Nottingham Trent University	(Deputy Application Program Chair)
Alice Kerly University of Birmingham	(Research Student Liaison)
Dr. Maria Fasli University of Essex	(Research Student Liaison)
Rachel Browning BCS	(Conference Administrator)
Bryony Bramer	(Paper Administrator)

TECHNICAL EXECUTIVE PROGRAMME COMMITTEE

Prof. Max Bramer, University of Portsmouth (Chair)

Dr. Frans Coenen, University of Liverpool (Vice-Chair)

Dr. Peter Lucas, University of Nijmegen, The Netherlands

Dr. Miltos Petridis, University of Greenwich

Dr. Nirmalie Wiratunga, The Robert Gordon University, Aberdeen

TECHNICAL PROGRAMME COMMITTEE

Alia Abdelmoty (Cardiff University)

Andreas A Albrecht (University of Hertfordshire)

Roman Belavkin (Middlesex University)

Yaxin Bi (University of Ulster)

Mirko Boettcher (University of Magdeburg, Germany)

Max Bramer (University of Portsmouth)

Krysia Broda (Imperial College, University of London)

Ken Brown (University College Cork)

Frans Coenen (University of Liverpool)

George Coghill (University of Aberdeen)

Ernesto Compatangelo (University of Aberdeen)

Bruno Cremilleux (University of Caen)

Madalina Croitoru (University of Southampton)

Ireneusz Czarnowski (Gdynia Maritime University, Poland)

Richard Dapoigny (University of Savoie)

Marina De Vos (University of Bath)

John Debenham (University of Technology; Sydney)

Stefan Diaconescu (Softwin)
Belen Diaz-Agudo (University Complutense of Madrid)

Nicolas Durand (Universite Louis Pasteur, France)

Anneli Edman (University of Upsala)

Virginia Francisco (Universidad Complutense de Madrid)

Adriana Giret (Universidad Polit cnica de Valencia)

Marco Antonio Gomez-Martin (University Complutense of Madrid)

Mark Hall (University of Waikato, New Zealand)

Nadim Haque (BT)

Syed Zahid Hassan (Central Queensland University, Australia)

Joana Hois (University of Bremen)

Arjen Hommersom (University of Nijmegen, The Netherlands)

Adrian Hopgood (De Montfort University)

Piotr Jedrzejowicz (Gdynia Maritime University; Poland)

Rasa Jurgelenaite (Radboud University, The Netherlands)

Konstantinos Kotis (University of the Aegean)

Ivan Koychev (Bulgarian Academy of Science)

T. K. Satish Kumar (University of California, Berkeley)

Peter Lucas (University of Nijmegen)

Daniel Manrique Gamo (University of Madrid)

Raphaël Marée (University of Liege; Belgium)

David McSherry (University of Ulster)

Roberto Micalizio (Università di Torino)

Alfonsas Misevicius (Kaunas University of Technology)

David Muse (University of Sunderland)

Lars Nolle (Nottingham Trent University)

Tomas Eric Nordlander (University College Cork)

Dan O'Leary (University of Southern California)

Barry O'Sullivan (University College Cork)

Nir Oren (University of Aberdeen)

Filipo Perotto

Alun Preece (University of Aberdeen)

Juan Jose Rodriguez (University of Burgos)

Maria Dolores Rodriguez-Moreno (Universidad de Alcala)

Fernando Saenz Perez (Universidad Complutense de Madrid)

Miguel A. Salido (Universidad Politécnica de Valencia)

Rainer Schmidt (University of Rostock, Germany)

Evgueni Smirnov (Maastricht University, The Netherlands)

Fatih Tasgetiren (Sultan Qaboos University, Oman)

Simon Thompson (BT)

Jon Timmis (University of York)

Gianluca Torta (Università di Torino)

Andrew Tuson (City University)

M.R.C. van Dongen (University College Cork)

Carl Vogel (Trinity College Dublin, Ireland)

Graham Winstanley (University of Brighton)

Nirmalie Wiratunga (Robert Gordon University)

Fei Ling Woon (SDG Consulting UK)

CONTENTS

TECHNICAL KEYNOTE ADDRESS

- Adventures in Personalized Web Search 3
Barry Smyth (University College, Dublin)

BEST TECHNICAL PAPER

- An Evolutionary Algorithm-Based Approach to Robust Analog Circuit Design using Constrained Multi-Objective Optimization 7
Giuseppe Nicosia (University of Catania, Italy), Salvatore Rinaudo (ST Microelectronics, Italy), Eva Sciacca (University of Catania, Italy)

CONSTRAINT SATISFACTION

- DisBO-wd: a Distributed Constraint Satisfaction Algorithm for Coarse-Grained Distributed Problems 23
Muhammed Basharu (University College, Ireland), Inés Arana and Hatem Ahriz (The Robert Gordon University, UK)
- Construction of Heuristics for a Search-Based Approach to Solving Sudoku 37
Sian Jones, Paul Roach and Stephanie Perkins (University of Glamorgan)
- Escaping Local Optima: Constraint Weights vs. Value Penalties 51
Muhammed Basharu (University College, Ireland), Inés Arana and Hatem Ahriz (The Robert Gordon University, UK)
- Dynamic Rule Mining for Argumentation Based Systems 65
Maya Wardeh, Trevor Bench-Capon and Frans Coenen (University of Liverpool, UK)

AI TECHNIQUES

- Extending Jess to Handle Uncertainty 81
David Corsar, Derek Sleeman and Anne McKenzie (University of Aberdeen)
- Modelling Affective-based Music Compositional Intelligence with the Aid of ANS Analyses 95
Toshihito Sugimoto, Roberto Legaspi, Akihiro Ota, Koichi Moriyama, Satoshi Kurihara and Masayuki Numao (Osaka University, Japan)
- Supporting Temporal Information in Medical Care Planning 109
Kirsty Bradbrook and Graham Winstanley (University of Brighton, UK)
- Learning Sets of Sub-Models for Spatio-Temporal Prediction 123
Andrew Bennett and Derek Magee (University of Leeds, UK)

DATA MINING AND MACHINE LEARNING

- Frequent Set Meta Mining: Towards Multi-Agent Data Mining 139
Kamal Ali Albashiri, Frans Coenen, Rob Sanderson and Paul Leng (The University of Liverpool, UK)
- A Flexible Framework to Experiment With Ontology Learning Techniques 153
Ricardo A Gacitua, Peter Sawyer and Paul Rayson (Lancaster University, UK)
- Evolving a Dynamic Predictive Coding Mechanism for Novelty Detection 167
Simon J. Haggett and Dominique F. Chu (University of Kent, UK), Ian W. Marshall (Lancaster University, UK)
- Selecting Bi-Tags for Sentiment Analysis of Text 181
Rahman Mukras, Nirmalie Wiratunga and Robert Lothian (The Robert Gordon University, UK)

MULTI-AGENT SYSTEMS

- Merging Intelligent Agency and the Semantic Web 197
John Debenham (UTS, Australia) and Carles Sierra (IIIA, Barcelona, Spain)
- Can Agents Without Concepts Think? An Investigation Using a Knowledge Based System 211
Nicky Moss (The Open University, UK), Adrian Hopgood (De Montfort University, UK) and Martin Weller (The Open University, UK)
- Effective Selection of Abstract Plans for Multi-Agent Systems 223
Toshiharu Sugawara (Waseda University, Japan), Satoshi Kurihara (Osaka University, Japan), Toshio Hirotsu (Toyohashi Univ. of Technology, Japan), Kensuke Fukuda (National Institute of Informatics, Japan), Toshihiro Takada (NTT Communication Science Laboratories, Japan)
- Expressive Security Policy Rules using Layered Conceptual Graphs 237
Madalina Croitoru, Liang Xiao, David Dupplaw and Paul Lewis (University of Southampton, UK)

DATA MINING

- Relevance Feedback for Association Rules by Leveraging Concepts from Information Retrieval 253
Georg Ruß (University of Magdeburg, Germany), Mirko Böttcher and Detlef Nauck (BT Group, UK), Rudolf Kruse (University of Magdeburg, Germany)
- Visualization and Grouping of Graph Patterns in Molecular Databases 267
Edgar H. de Graaf, Walter A. Kusters and Joost N. Kok (LIACS, Leiden University, NL), Jeroen Kazius (LACDR, Leiden University, NL)

A Classification Algorithm based on Concept Similarity <i>João Paulo Domingos-Silva and Newton José Vieira (UFMG, Brazil)</i>	281
--	-----

Metrics for Mining Multisets <i>Walter Kusters and Jeroen Laros (Leiden University, NL)</i>	293
--	-----

KNOWLEDGE ACQUISITION AND MANAGEMENT

Knowledge Management for Evolving Products <i>Thorsten Krebs (University of Hamburg, Germany)</i>	307
--	-----

Recovery from Plan Failures in Partially Observable Environments <i>Roberto Micalizio and Pietro Torasso (Università di Torino, Italy)</i>	321
---	-----

Automatic Character Assignment <i>Gerard Lynch and Carl Vogel (Trinity College Dublin, Ireland)</i>	335
--	-----

SHORT PAPERS

An Agent-Based Algorithm for Data Reduction <i>Ireneusz Czarnowski and Piotr Jedrzejowicz (Gdynia Maritime University, Poland)</i>	351
---	-----

Towards a Computationally Efficient Approach to Modular Classification Rule Induction <i>Frederic Stahl and Max Bramer (University of Portsmouth, UK)</i>	357
--	-----

Mobile Robots and EEG - A Review <i>Kerry A Plant, Prasad V S Ponnappalli and David M Southall (Manchester Metropolitan University, UK)</i>	363
--	-----

Studying Anticipation Behavior in ALife Simulator <i>Ahmed M. Elmalahawy and Pavel Nahodil (Czech Technical University, Czech Republic)</i>	369
--	-----

A Mereological Semantics of Contexts <i>Ander Altuna (University of Leeds, UK)</i>	375
---	-----

Spatial N-player Dilemmas in Changing Environments <i>Colm O'Riordan (NUI, Galway, Ireland), Dara Curran and Humphrey Sorensen (UCC, Ireland)</i>	381
--	-----

Training and Evaluating an E-tutor <i>Kate Taylor (CARET, University of Cambridge, UK)</i>	387
---	-----

An Ambient Intelligence Application Integrating Agent and Service-Oriented Technologies <i>Nikolaos Spanoudakis (Singular Logic S.A., GR), Pavlos Moraitis (Paris Descartes University, FR)</i>	393
--	-----