Lecture Notes in Computer Science 6625

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison
Lancaster University, UK

Takeo Kanade
Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler
University of Surrey, Guildford, UK

Jon M. Kleinberg
Cornell University, Ithaca, NY, USA

Alfred Kobsa
University of California, Irvine, CA, USA

Friedemann Mattern
ETH Zurich, Switzerland

John C. Mitchell
Stanford University, CA, USA

Moni Naor
Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz
University of Bern, Switzerland

C. Pandu Rangan
Indian Institute of Technology, Madras, India

Bernhard Steffen
TU Dortmund University, Germany

Madhu Sudan
Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos
University of California, Los Angeles, CA, USA

Doug Tygar
University of California, Berkeley, CA, USA

Gerhard Weikum
Max Planck Institute for Informatics, Saarbruecken, Germany

Cecilia Di Chio Anthony Brabazon
Gianni A. Di Caro Rolf Drechsler
Muddassar Farooq Jörn Grahl Gary Greenfield
Christian Prins Juan Romero
Giovanni Squillero Ernesto Tarantino
Andrea G.B. Tettamanzi Neil Urquhart
A. Şima Uyar (Eds.)

Applications of Evolutionary Computation

EvoApplications 2011: EvoCOMNET, EvoFIN, EvoHOT, EvoMUSART, EvoSTIM, and EvoTRANSLOG
Torino, Italy, April 27-29, 2011
Proceedings, Part II

Springer

Volume Editors

see next page

Cover illustration:
"Globosphere" by Miguel Nicolau and Dan Costelloe (2010),
University of Dublin, Ireland

ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-20519-4 e-ISBN 978-3-642-20520-0
DOI 10.1007/978-3-642-20520-0
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2011925061

CR Subject Classification (1998): F.1, D.2, C.2, I.4, I.2.6, J.5

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

© Springer-Verlag Berlin Heidelberg 2011
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. Violations are liable to prosecution under the German Copyright Law.
The use of general descriptive names, 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 protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Volume Editors

Cecilia Di Chio
cdichio@gmail.com

Anthony Brabazon
School of Business
University College Dublin, Ireland
anthony.brabazon@ucd.ie

Gianni A. Di Caro
"Dalle Molle" Institute for
Artificial Intelligence (IDSIA)
Lugano, Switzerland
gianni@idsia.ch

Rolf Drechsler
Universität Bremen, Germany
drechsle@informatik.uni-bremen.de

Muddassar Farooq
National University of Computer
and Emerging Sciences
Islamabad, Pakistan
muddassar.farooq@nu.edu.pk

Jörn Grahl
Department of Information Systems
Johannes Gutenberg University,
Germany
grahl@uni-mainz.de

Gary Greenfield
University of Richmond, USA
ggreenfi@richmond.edu

Christian Prins
Technical University of Troyes, France
christian.prins@utt.fr

Juan Romero
Facultad de Informatica
University of A Coruña, Spain
jj@udc.es

Giovanni Squillero
Politecnico di Torino, Italy
giovanni.squillero@polito.it

Ernesto Tarantino
Institute for High Performance
Computing and Networking, Italy
ernesto.tarantino@na.icar.cnr.it

Andrea G. B. Tettamanzi
Università degli Studi di Milano, Italy
andrea.tettamanzi@unimi.it

Neil Urquhart
Centre for Emergent Computing
Edinburgh Napier University, UK
n.urquhart@napier.ac.uk

A. Şima Uyar
Dept. of Computer Engineering
Istanbul Technical University, Turkey
etaner@cs.itu.edu.tr

Preface

The EvoApplications conference brings together many researchers working in all aspects of Evolutionary Computation. Evolutionary Computation is based on the essential operators of natural evolution, i.e., reproduction, variation and selection. Researchers working in the field of Evolutionary Computation use these operators to solve all kinds of problems in optimization, machine learning and pattern recognition. The present volume presents an overview of the latest research in Evolutionary Computation. Areas where evolutionary computation techniques have been applied range from telecommunication networks to complex systems, finance and economics, games, image analysis, evolutionary music and art, parameter optimization, scheduling and logistics. These papers may provide guidelines to help new researchers tackling their own problem using Evolutionary Computation.

The current volume represents roughly half of the papers accepted by EvoApplications 2011. The conference EvoApplications has been in existence since 2010 but actually originated from EvoWorkshops in 1998. Thus, for over 13 years, this event has brought together researchers from all around the world for an exchange of ideas. The EvoApplications conference itself adapts to the need of the participating researchers, with old events disappearing and new events appearing covering hot research topics. Some events have matured into conferences such as EuroGP in 2000, EvoCOP in 2004, and EvoBIO in 2007.

EvoApplications is part of EVO*, Europe's premier co-located events in the field of evolutionary computing (EC). EVO* was held from the 27th to the 29th of April 2011 in the beautiful city of Torino (Italy), which, having been the first capital city of Italy, held major celebrations for the 150th anniversary of national unity. Evo* 2011 included, in addition to EvoApplications, EuroGP, the main European event dedicated to genetic programming; EvoCOP, the main European conference on evolutionary computation in combinatorial optimization; EvoBIO, the main European conference on EC and related techniques in bioinformatics and computational biology. The proceedings for all of these events, EuroGP 2011, EvoCOP 2011 and EvoBIO 2011, are also available in the LNCS series (volumes 6621, 6622, and 6623, respectively).

Moreover, thanks to the large number of submissions received, the proceedings for EvoApplications 2011 are divided into two volumes. The present volume, which contains contributions for EvoCOMNET, EvoFIN, EvoHOT, EvoMUSART, EvoSTIM and EvoTRANSLOG; and volume one (LNCS 6624), which contains contributions for EvoCOMPLEX, EvoGAMES, EvoIASP, EvoINTELLIGENCE, EvoNUM and EvoSTOC.

The central aim of the EVO* events is to provide researchers, as well as people from industry, students, and interested newcomers, with an opportunity to present new results, discuss current developments and applications, or to

simply become acquainted with the world of EC. Moreover, it encourages and reinforces possible synergies and interactions between members of all scientific communities that may benefit from EC techniques.

EvoApplications 2011 consisted of the following individual events:

- *EvoCOMNET*, the 8th European Event on the Application of Nature-Inspired Techniques for Telecommunication Networks and Other Parallel and Distributed Systems
- *EvoCOMPLEX*, the 2nd European Event on Evolutionary Algorithms and Complex Systems
- *EvoFIN*, the 5th European Event on Evolutionary and Natural Computation in Finance and Economics
- *EvoGAMES*, the 3rd European Event on Bio-inspired Algorithms in Games
- *EvoHOT*, the 6th European Event on Bio-inspired Heuristics for Design Automation
- *EvoIASP*, the 13th European Event on Evolutionary Computation in Image Analysis and Signal Processing
- *EvoINTELLIGENCE*, the 2nd European Event on Nature-Inspired Methods for Intelligent Systems
- *EvoMUSART*, the 9th European Event on Evolutionary and Biologically Inspired Music, Sound, Art and Design
- *EvoNUM*, the 4th European Event on Bio-inspired Algorithms for Continuous Parameter Optimization
- *EvoSTIM*, the 6th European Event on Scheduling and Timetabling
- *EvoSTOC*, the 8th European Event on Evolutionary Algorithms in Stochastic and Dynamic Environments
- *EvoTRANSLOG*, the 5th European Event on Evolutionary Computation in Transportation and Logistics

EvoCOMNET addresses the application of EC techniques to problems in distributed and connected systems such as telecommunication and computer networks, distribution and logistic networks, interpersonal and inter-organizational networks, etc. To address the challenges of these systems, this event promotes the study and the application of strategies inspired by the observation of biological and evolutionary processes, which usually show the highly desirable characteristics of being distributed, adaptive, scalable and robust.

EvoCOMPLEX covers all aspects of the interaction of evolutionary algorithms (and metaheuristics in general) with complex systems. Complex systems are ubiquitous in physics, economics, sociology, biology, computer science and many other scientific areas. Typically, a complex system is composed of smaller aggregated components, whose interaction and interconnectedness are non-trivial. This leads to emergent properties of the system, not anticipated by its isolated components. Furthermore, when the system behavior is studied from a temporal perspective, self-organization patterns typically arise.

EvoFIN is the only European event specifically dedicated to the applications of EC, and related natural computing methodologies, to finance and economics. Financial environments are typically hard, being dynamic, high-dimensional,

noisy and co-evolutionary. These environments serve as an interesting test bed for novel evolutionary methodologies.

EvoGAMES aims to focus the scientific developments onto computational intelligence techniques that may be of practical value for utilization in existing or future games. Recently, games, and especially video games, have become an important commercial factor within the software industry, providing an excellent test bed for application of a wide range of computational intelligence methods.

EvoHOT focuses on all bio-inspired heuristics applied to the electronic design automation. The event's goal is to show the latest developments, industrial experiences and successful attempts to *evolve rather than* design new solutions. EvoHOT 2011 allowed one both to peek into the problems that will be faced in the next generation of electronics, and to demonstrate innovative solutions to classic CAD problems, such as fault tolerance and test.

EvoIASP, the longest-running of all EvoApplications which celebrated its thirteenth edition this year, has been the first international event solely dedicated to the applications of EC to image analysis and signal processing in complex domains of high industrial and social relevance.

EvoINTELLIGENCE is devoted to the use of nature-inspired methods to create intelligent systems. The scope of the event includes research in evolutionary robotics, artificial life and related areas. EvoIntelligence research also includes research in creating intelligent behavior that can be found in everyday devices such as a digital video recorder or smart phone.

EvoMUSART addresses all practitioners interested in the use of EC techniques for the development of creative systems. There is a growing interest in the application of these techniques in fields such as art, music, architecture and design. The goal of this event is to bring together researchers that use EC in this context, providing an opportunity to promote, present and discuss the latest work in the area, fostering its further development and collaboration among researchers.

EvoNUM aims at applications of bio-inspired algorithms, and cross-fertilization between these and more classic numerical optimization algorithms, to continuous optimization problems in engineering. It deals with theoretical aspects and engineering applications where continuous parameters or functions have to be optimized, in fields such as control, chemistry, agriculture, electricity, building and construction, energy, aerospace engineering and design optimization.

EvoSTIM presents an opportunity for EC researchers in the inter-related areas of planning, scheduling and timetabling to come together, present their latest research and discuss current developments and applications.

EvoSTOC addresses the application of EC in stochastic and dynamic environments. This includes optimization problems with changing, noisy and/or approximated fitness functions and optimization problems that require robust solutions. These topics recently gained increasing attention in the EC community and EvoSTOC was the first event that provided a platform to present and discuss the latest research in this field.

EvoTRANSLOG deals with all aspects of the use of evolutionary computation, local search and other nature-inspired optimization and design techniques for the transportation and logistics domain. The impact of these problems on the modern economy and society has been growing steadily over the last few decades, and the event aims at design and optimization techniques such as EC approaches allowing the use of computer systems for systematic design, optimization and improvement of systems in the transportation and logistics domain.

Continuing in the tradition of adapting the list of the events to the needs and demands of the researchers working in the field of EC, two events were resumed this year: EvoHOT, the 6th European Event on Bio-inspired Heuristics for Design Automation, and EvoSTIM, the 6th European event on Scheduling and Timetabling.

The number of submissions to EvoApplications 2011 was again high, cumulating 162 entries (with respect to 143 in 2009 and 191 in 2010). The following table shows relevant statistics for EvoApplications 2011, where the statistics for the 2010 edition are also reported:

Event	2011			Previous edition		
	Submissions	Accept	Ratio	Submissions	Accept	Ratio
EvoCOMNET	15	8	53%	17	12	71%
EvoCOMPLEX	11	5	45%	12	6	50%
EvoENVIRONMENT	-	-	-	5	4	80%
EvoFIN	8	6	75%	17	10	59%
EvoGAMES	17	11	65%	25	15	60%
EvoHOT	7	5	71%	-	-	-
EvoIASP	19	7	37%	24	15	62%
EvoINTELLIGENCE	5	3	60%	8	5	62%
EvoMUSART	43	24	56%	36	16	44%
EvoNUM	9	5	56%	25	15	60%
EvoSTIM	9	4	44%	-	-	-
EvoSTOC	8	5	63%	11	6	54%
EvoTRANSLOG	11	4	36%	11	5	45%
Total	162	87	54%	191	109	57%

As for previous years, accepted papers were split into oral presentations and posters. However, this year, the paper length for these two categories was the same for all the events. The low acceptance rate of 54% for EvoApplications 2011, along with the significant number of submissions, is an indicator of the high quality of the articles presented at the events, showing the liveliness of the scientific movement in the corresponding fields.

Many people helped make EvoApplications a success. We would like to thank the following institutions:

– The University of Torino - School for Biotechnologies and Molecular Biotechnology Center, for supporting the local organization

– The Human Genetics Foundation of Torino (HuGeF), the Museum of Human Anatomy ("Luigi Rolando") and the Museum of Criminal Anthropology ("Cesare Lombroso") for their patronage of the event
– The Centre for Emergent Computing at Edinburgh Napier University, UK, for administrative help and event coordination

We want to especially acknowledge our invited speakers: Craig Reynolds (Sony Computer Entertainment, USA) and Jean-Pierre Changeux.

Even with an excellent support and location, an event like EVO* would not have been feasible without authors submitting their work, members of the Programme Committees dedicating energy in reviewing those papers, and an audience. All these people deserve our gratitude.

Finally, we are grateful to all those involved in the preparation of the event, especially Jennifer Willies for her unfaltering dedication to the coordination of the event over the years. Without her support, running such a type of conference with a large number of different organizers and different opinions would be unmanageable. Further thanks to the local organizer Mario Giacobini for making the organization of such an event possible and successful. Last but surely not least, we want to especially acknowledge Penousal Machado for his hard work as Publicity Chair and webmaster (assisted by Pedro Miguel Cruz and João Bicker), and Marc Schoenauer for his continuous help in setting up and maintaining the MyReview management software.

April 2011

Cecilia Di Chio
Anthony Brabazon
Gianni Di Caro
Rolf Drechsler
Muddassar Farooq
Jörn Grahl
Gary Greenfield
Christian Prins
Juan Romero
Giovanni Squillero
Ernesto Tarantino
Andrea G. B. Tettamanzi
Neil Urquhart
A. Şima Uyar

Organization

EvoApplications 2011 was part of EVO* 2011, Europe's premier co-located events in the field of evolutionary computing, which also included the conferences EuroGP 2011, EvoCOP 2011 and EvoBIO 2011.

Organizing Committee

EvoApplications Chair	Cecilia Di Chio, UK
Local Chairs	Mario Giacobini, University of Torino, Italy
Publicity Chair	Penousal Machado, University of Coimbra, Portugal
EvoCOMNET Co-chairs	Gianni A. Di Caro, IDSIA, Switzerland Muddassar Farooq, National University of Computer and Emerging Sciences, Pakistan Ernesto Tarantino, Institute for High-Performance Computing and Networking, Italy
EvoCOMPLEX Co-chairs	Carlos Cotta, University of Malaga, Spain Juan J. Merelo, University of Granada, Spain
EvoFIN Co-chairs	Anthony Brabazon, University College Dublin, Ireland Andrea G.B. Tettamanzi, University of Milano, Italy
EvoGAMES Co-chairs	Mike Preuss, TU Dortmund University, Germany Julian Togelius, IT University of Copenhagen, Denmark Georgios N. Yannakakis, IT University of Copenhagen, Denmark
EvoHOT Co-chairs	Giovanni Squillero, Politecnico di Torino, Italy Rolf Drechsler, University of Bremen, Germany
EvoIASP Chair	Stefano Cagnoni, University of Parma, Italy
EvoINTELLIGENCE Chair	Marc Ebner, University of Tübingen, Germany

EvoMUSART Co-chairs	Gary Greenfield, University of Richmond, USA Juan Romero, University of A Coruña, Spain
EvoNUM Co-chairs	Anna I Esparcia-Alcázar, S2 Grupo, Spain Anikó Ekárt, Aston University, UK
EvoSTIM Co-chairs	A. Şima Uyar, Istanbul Technical University, Turkey Neil Urquhart, Edinburgh Napier University, UK
EvoSTOC Co-chairs	Ferrante Neri, University of Jyväskylä, Finland Hendrik Richter, HTWK Leipzig University of Applied Sciences, Germany
EvoTRANSLOG Co-chairs	Christian Prins, Technical University of Troyes, France Jörn Grahl, Johannes Gutenberg University, Germany

Programme Committees

EvoCOMNET Programme Committee

Özgür B. Akan	Koc University, Turkey
Enrique Alba	University of Malaga, Spain
Qing Anyong	National University of Singapore, Singapore
Payman Arabshahi	University of Washington, USA
Mehmet E. Aydin	University of Bedfordshire, UK
Iacopo Carreras	CREATE-NET, Italy
Frederick Ducatelle	IDSIA, Switzerland
Luca Gambardella	IDSIA, Switzerland
Jin-Kao Hao	University of Angers, France
Malcolm I. Heywood	Dalhousie University, Canada
Kenji Leibnitz	Osaka University, Japan
Domenico Maisto	ICAR CNR, Italy
Roberto Montemanni	IDSIA, Switzerland
Conor Ryan	University of Limerick, Ireland
Muhammad Saleem	FAST National University of Computer and Emerging Technologies, Pakistan
Chien-Chung Shen	University of Delaware, USA
Tony White	Carleton University, Canada
Lidia Yamamoto	University of Strasbourg, France
Nur Zincir-Heywood	Dalhousie University, Canada

EvoCOMPLEX Programme Committee

Antonio Córdoba	Universidad de Sevilla, Spain
Carlos Cotta	Universidad de Málaga, Spain

Jordi Delgado	Universitat Politècnica de Catalunya, Spain
Marc Ebner	University of Tübingen, Germany
José E. Gallardo	Universidad de Málaga, Spain
Carlos Gershenson	UNAM, Mexico
Anca Gog	Babes-Bolyai University, Romania
Márk Jelasity	University of Szeged, Hungary
Juan Luis Jiménez	Universidad de Granada, Spain
Juan J. Merelo	Universidad de Granada, Spain
Joshua L. Payne	University of Vermont, USA
Mike Preuss	Universität Dortmund, Germany
Katya Rodríguez-Vázquez	UNAM, Mexico
Kepa Ruiz-Mirazo	Euskal Herriko Unibertsitatea, Spain
Robert Schaefer	AGH University of Science and Technology, Poland
Marco Tomassini	Université de Lausanne, Switzerland
Alberto Tonda	Politecnico di Torino, Italy
Fernando Tricas	Universidad de Zaragoza, Spain
Leonardo Vanneschi	University of Milano-Bicocca, Italy

EvoFIN Programme Committee

Eva Alfaro-Cid	Instituto Tecnológico de Informática, Spain
Alexandros Agapitos	University College Dublin, Ireland
Antonia Azzini	Università degli Studi di Milano, Italy
Anthony Brabazon	University College Dublin, Ireland
Robert Bradley	University College Dublin, Ireland
Louis Charbonneau	Concordia University, Canada
Gregory Connor	National University of Ireland Maynooth, Ireland
Ian Dempsey	Pipeline Trading, USA
Manfred Gilli	University of Geneva and Swiss Finance Institute, Switzerland
Philip Hamill	University of Ulster, UK
Ronald Hochreiter	WU Vienna University of Economics and Business, Austria
Serafin Martinez Jaramillo	Bank of Mexico, Mexico
Youwei Li	Queen's University Belfast, UK
Piotr Lipinski	University of Wroclaw, Poland
Dietmar Maringer	University of Basel, Switzerland
Michael O'Neill	University College Dublin, Ireland
Robert Schafer	AGH University of Science and Technology, Poland
Enrico Schumann	Switzerland
Andrea Tettamanzi	Università degli Studi di Milano, Italy

Nikolaos Thomaidis	University of the Aegean, Greece
Ruppa Thulasiram	University of Manitoba, Canada
Garnett Wilson	Memorial University of Newfoundland, Canada

EvoGAMES Programme Committee

Lourdes Araujo	UNED, Spain
Wolfgang Banzhaf	Memorial University of Newfoundland, Canada
Luigi Barone	University of Western Australia, Australia
Robin Baumgarten	Imperial College London, UK
Paolo Burelli	IT-Universitetet i København, Denmark
Simon Colton	Imperial College London, UK
Ernesto Costa	Universidade de Coimbra, Portugal
Carlos Cotta	Universidad de Málaga, Spain
Marc Ebner	University of Tübingen, Germany
Anikó Ekárt	Aston University, UK
Anna I Esparcia Alcázar	S2 Grupo, Spain
Antonio J Fernández Leiva	Universidad de Málaga, Spain
Francisco Fernández	Universidad de Extremadura, Spain
Edgar Galvan-Lopes	University College Dublin, Ireland
Leo Galway	University of Ulster, UK
Mario Giacobini	Università degli Studi di Torino, Italy
Johan Hagelbäck	Blekinge Tekniska Högskola, Sweden
John Hallam	University of Southern Denmark
David Hart	Fall Line Studio, USA
Erin Hastings	University of Central Florida, USA
Philip Hingston	Edith Cowan University, Australia
Stefan Johansson	Blekinge Tekniska Högskola, Sweden
Krzysztof Krawiec	Poznan University of Technology, Poland
Pier Luca Lanzi	Politecnico di Milano, Italy
Simon Lucas	University of Essex, UK
Penousal Machado	Universidade de Coimbra, Portugal
Tobias Mahlmann	IT-Universitetet i København, Denmark
Hector P. Martinez	IT-Universitetet i København, Denmark
J.J. Merelo	Universidad de Granada, Spain
Risto Miikkulainen	University of Texas at Austin, USA
Antonio Mora	Universidad de Granada, Spain
Steffen Priesterjahn	University of Paderborn, Germany
Jan Quadflieg	TU Dortmund, Germany
Moshe Sipper	Ben-Gurion University, Israel
Noor Shaker	IT-Universitetet i København, Denmark
Terry Soule	University of Idaho, USA
Christian Thurau	Fraunhofer-Institut für Intelligente Analyse- und Informationssysteme, Germany

EvoHOT Programme Committee

Angan Das	Intel Corporation, USA
Rolf Drechsler	University of Bremen, Germany
Gregor Papa	Jozef Stefan Institute, Slovenia
Javier Perez	Universidad Pedagógica y Tecnológica de Colombia, Colombia
Marco Santambrogio	Politecnico di Milano, Italy
Alberto Tonda	Politecnico di Torino, Italy
Ernesto Sanchez	Politecnico di Torino, Italy
Giovanni Squillero	Politecnico di Torino, Italy

EvoIASP Programme Committee

Antonia Azzini	Università degli Studi di Milano, Italy
Lucia Ballerini	University of Edinburgh, UK
Leonardo Bocchi	University of Florence, Italy
Stefano Cagnoni	University of Parma, Italy
Oscar Cordon	European Center for Soft Computing, Spain
Sergio Damas	European Center for Soft Computing, Spain
Ivanoe De Falco	ICAR - CNR, Italy
Antonio Della Cioppa	University of Salerno, Italy
Laura Dipietro	MIT, USA
Marc Ebner	University of Tübingen, Germany
Francesco Fontanella	University of Cassino, Italy
Şpela Ivekoviç	University of Dundee, UK
Mario Koeppen	Kyushu Institute of Technology, Japan
Krisztof Krawiec	Poznan University of Technology, Poland
Jean Louchet	INRIA, France
Evelyne Lutton	INRIA, France
Luca Mussi	University of Parma, Italy
Ferrante Neri	University of Jyväskylä, Finland
Gustavo Olague	CICESE, Mexico
Riccardo Poli	University of Essex, UK
Stephen Smith	University of York, UK
Giovanni Squillero	Politecnico di Torino, Italy
Kiyoshi Tanaka	Shinshu University, Japan
Andy Tyrrell	University of York, UK
Leonardo Vanneschi	University of Milano-Bicocca, Italy
Mengjie Zhang	Victoria University of Wellington, New Zealand

EvoINTELLIGENCE Programme Committee

Riad Akrour	INRIA Saclay Île-de-France, France
Amit Benbassat	Ben-Gurion University, Israel
Peter Bentley	University College London, UK

Stefano Cagnoni	University of Parma, Italy
Marc Ebner	Eberhard Karls Universität Tübingen, Germany
Aniko Ekart	Aston University, UK
Ian Horswill	Northwestern University, USA
Christian Jacob	University of Calgary, Canada
Gul Muhammad Kahn	University of Engineering and Technology, Pakistan
William B. Langdon	King's College, London
Penousal Machado	University of Coimbra, Portugal
Michael O'Neill	University College Dublin, Ireland
Michael Orlov	Ben-Gurion University, Israel
Thomas Ray	University of Oklahoma, USA
Marc Schoenauer	INRIA, France
Moshe Sipper	Ben-Gurion University, Israel
Giovanni Squillero	Politecnico di Torino, Italy
Ivan Tanev	Doshisha University, Japan
Mengjie Zhang	Victoria University of Wellington, New Zealand

EvoMUSART Programme Committee

Mauro Annunziato	Plancton Art Studio, Italy
Dan Ashlock	University of Guelph, Canada
Peter Bentley	University College London, UK
Eleonora Bilotta	University of Calabria, Italy
Jon Bird	University of Sussex, UK
Tim Blackwell	Goldsmiths College, University of London, UK
Oliver Bown	Monash University, Australia
Paul Brown	University of Sussex, UK
Kevin Burns	Mitre Corporation, USA
Stefano Cagnoni	University of Parma, Italy
Amilcar Cardoso	University of Coimbra, Portugal
Vic Ciesielski	RMIT, Australia
John Collomosse	University of Surrey, UK
Simon Colton	Imperial College, UK
Palle Dahlstedt	Göteborg University, Sweden
Hans Dehlinger	Independent Artist, Germany
Alan Dorin	Monash University, Australia
Scott Draves	Independent Artist, USA
Erwin Driessens	Independent Artist, The Netherlands
Carla Farsi	University of Colorado, USA
Josè Fornari	NICS/Unicamp, Brazil
Marcelo Freitas Caetano	IRCAM, France
Philip Galanter	Texas A&M College of Architecture, USA
Pablo Gervs	Universidad Complutense de Madrid, Spain
Andrew Gildfind	Google, Inc., Australia

Gary Greenfield	University of Richmond, USA
Carlos Grilo	Instituto Politècnico de Leiria, Portugal
Amy K. Hoover	University of Central Florida, USA
Andrew Horner	University of Science and Technology, Hong Kong
Christian Jacob	University of Calgary, Canada
Colin Johnson	University of Kent, UK
Craig Kaplan	University of Waterloo, Canada
William Latham	Goldsmiths College, University of London, UK
Matthew Lewis	Ohio State University, USA
Yang Li	University of Science and Technology Beijing, China
Alain Lioret	Paris 8 University, France
Penousal Machado	University of Coimbra, Portugal
Bill Manaris	College of Charleston, USA
Ruli Manurung	University of Indonesia, Indonesia
Jon McCormack	Monash University, Australia
James McDermott	University of Limerick, Ireland
Eduardo Miranda	University of Plymouth, UK
Nicolas Monmarchè	University of Tours, France
Gary Nelson	Oberlin College, USA
Luigi Pagliarini	Pescara Electronic Artists Meeting and University of Southern Denmark, Italy
Alejandro Pazos	University of A Coruna, Spain
Somnuk Phon-Amnuaisuk	University Tunku Abdul Rahman, Malaysia
Rafael Ramirez	Pompeu Fabra University, Spain
Juan Romero	University of A Coruna, Spain
Brian Ross	Brock University, Canada
Artemis Sanchez Moroni	Renato Archer Research Center, Brazil
Antonino Santos	University of A Coruna, Spain
Benjamin Schroeder	Ohio State University, USA
Jorge Tavares	University of Coimbra, Portugal
Stephen Todd	IBM, UK
Paulo Urbano	Universidade de Lisboa, Portugal
Anna Ursyn	University of Northern Colorado, USA
Maria Verstappen	Independent Artist, The Netherlands
Rodney Waschka II	North Carolina State University, USA
Gerhard Widmer	Johannes Kepler University Linz, Austria

EvoNUM Programme Committee

Eva Alfaro	Instituto Tecnológico de Informática, Spain
Anne Auger	INRIA, France
Wolfgang Banzhaf	Memorial University of Newfoundland, Canada
Xavier Blasco	Universidad Politécnica de Valencia, Spain

Hans-Georg Beyer	Vorarlberg University of Applied Sciences, Austria
Ying-ping Chen	National Chiao Tung University, Taiwan
Carlos Cotta	Universidad de Malaga, Spain
Marc Ebner	Universität Würzburg, Germany
Gusz Eiben	Vrije Universiteit Amsterdam, The Netherlands
A. Şima Uyar	Istanbul Technical University, Turkey
Francisco Fernández	Universidad de Extremadura, Spain
Nikolaus Hansen	INRIA, France
José Ignacio Hidalgo	Universidad Complutense de Madrid, Spain
Andras Joo	Aston University, UK
Bill Langdon	King's College London, UK
J.J. Merelo	Universidad de Granada, Spain
Salma Mesmoudi	INRIA, France
Christian Lorenz Müller	ETH Zurich, Switzwerland
Boris Naujoks	Log!n GmbH, Germany
Ferrante Neri	University of Jyväskylä, Finland
Gabriela Ochoa	University of Nottingham, UK
Petr Pošík	Czech Technical University, Czech Republic
Mike Preuss	University of Dortmund, Germany
Günter Rudolph	University of Dortmund, Germany
Ivo F. Sbalzarini	ETH Zurich, Switzerland
Marc Schoenauer	INRIA, France
Hans-Paul Schwefel	University of Dortmund, Germany
P.N. Suganthan	Nanyang Technological University, Singapore
Ke Tang	University of Science and Technology of China, China
Olivier Teytaud	INRIA, France
Darrell Whitley	Colorado State University, USA

EvoSTIM Programme Committee

Ben Paechter	Edinburgh Napier University, UK
Emma Hart	Edinburgh Napier University, UK
Ryhd Lewis	Cardiff Business School, UK
John Levine	Strathclyde University, UK
Sanem Sariel	Istanbul Technical University, Turkey
Rong Qu	University of Nottingham, UK
Ender Ozcan	University of Nottingham, UK
Nelishia Pillay	University of KwaZulu-Natal, South Africa
Peter Cowling	University of Bradford, UK
Sanja Petrovic	University of Nottingham, UK

EvoSTOC Programme Committee

Hussein Abbass	University of New South Wales, Australia
Dirk Arnold	Dalhousie University, Canada
Hans-Georg Beyer	Vorarlberg University of Applied Sciences, Austria
Peter Bosman	Centre for Mathematics and Computer Science, The Netherlands
Juergen Branke	University of Karlsruhe, Germany
Andrea Caponio	Technical University of Bari, Italy
Ernesto Costa	University of Coimbra, Portugal
Kalyanmoy Deb	Indian Institute of Technology Kanpur, India
Andries Engelbrecht	University of Pretoria, South Africa
Yaochu Jin	Honda Research Institute Europe, Germany
Anna V. Kononova	University of Leeds, UK
Jouni Lampinen	University of Vaasa, Finland
Xiaodong Li	RMIT University, Australia
John McCall	Robert Gordon University, UK
Ernesto Mininno	University of Jyväskylä, Finland
Yew Soon Ong	Nanyang Technological University of Singapore, Singapore
Zhang Qingfu	University of Essex, UK
William Rand	University of Maryland, USA
Khaled Rasheed	University of Georgia, USA
Hendrik Richter	HTWK Leipzig University of Applied Sciences, Germany
Philipp Rohlfshagen	University of Birmingham, UK
Kay Chen Tan	National University of Singapore, Singapore
Ke Tang	University of Science and Technology of China, China
Yoel Tenne	Sydney University, Australia
Renato Tinos	Universidade de Sao Paulo, Brazil
Ville Tirronen	University of Jyväskylä, Finland
Shengxiang Yang	University of Leicester, UK
Gary Yen	Oklahoma State University, USA

EvoTRANSLOG Programme Committee

Christian Blum	Univ. Politecnica Catalunya, Spain
Peter A.N. Bosman	Centre for Mathematics and Computer Science, The Netherlands
Marco Caserta	University of Hamburg, Germany
Loukas Dimitriou	National Technical University of Athens, Greece
Karl Doerner	University of Vienna, Austria

Andreas Fink	Helmut Schmidt University Hamburg, Germany
Martin Josef Geiger	Helmut Schmidt University Hamburg, Germany
Stefan Irnich	RWTH Aachen University, Germany
Philippe Lacomme	University Blaise Pascal, Clermont-Ferrand, France
Mohamed Reghioui	University Abdelmalek Essaadi, Tetouan, Morocco
Franz Rothlauf	University of Mainz, Germany
Kay Chen Tan	National University of Singapore, Singapore
Theodore Tsekeris	Center of Planning and Economic Research, Greece
Stefan Voß	University of Hamburg, Germany
Oliver Wendt	University of Kaiserslautern, Germany

Sponsoring Institutions

- The University of Torino - School for Biotechnologies and Molecular Biotechnology Center, Torino, Italy
- The Human Genetics Foundation of Torino (HuGeF)
- The Museum of Human Anatomy ("Luigi Rolando"), Torino, Italy
- The Museum of Criminal Anthropology ("Cesare Lombroso"), Torino, Italy
- The Centre for Emergent Computing at Edinburgh Napier University, UK

Table of Contents – Part II

EvoCOMNET Contributions

Investigation of Hyper-Heuristics for Designing Survivable Virtual Topologies in Optical WDM Networks 1
Fatma Corut Ergin, A. Şima Uyar, and Ayşegül Yayimli

On Improving the Capacity of Solving Large-scale Wireless Network Design Problems by Genetic Algorithms 11
Fabio D'Andreagiovanni

Dynamic Routing Exponent Strategies for Ant-Based Protocols 21
Rui Fang, Zequn Huang, Louis F. Rossi, and Chien-Chung Shen

Ant-Based Multipath Routing for Wireless Mesh Networks 31
Laurent Paquereau and Bjarne E. Helvik

A Multiobjective Gravitational Search Algorithm Applied to the Static Routing and Wavelength Assignment Problem 41
Álvaro Rubio-Largo, Miguel A. Vega-Rodríguez, Juan A. Gómez-Pulido, and Juan M. Sánchez-Pérez

A Population Based Incremental Learning for Delay Constrained Network Coding Resource Minimization 51
Huanlai Xing and Rong Qu

Extremal Optimization Applied to Task Scheduling of Distributed Java Programs 61
Eryk Laskowski, Marek Tudruj, Ivanoe De Falco, Umberto Scafuri, Ernesto Tarantino, and Richard Olejnik

Data-Centered Scheduling for Addressing Performance Metrics on WSN 71
Lia Susana d.C. Silva-Lopez and Jonatan Gomez

EvoFIN Contributions

Using Evolutionary Neural Networks to Test the Influence of the Choice of Numeraire on Financial Time Series Modeling 81
Antonia Azzini, Mauro Dragoni, and Andrea G.B. Tettamanzi

Market Microstructure: Can Dinosaurs Return? A Self-Organizing Map Approach under an Evolutionary Framework 91
Michael Kampouridis, Shu-Heng Chen, and Edward Tsang

Macro-economic Time Series Modeling and Interaction Networks 101
Gabriel Kronberger, Stefan Fink, Michael Kommenda, and Michael Affenzeller

Learning and Predicting Financial Time Series by Combining Natural Computation and Agent Simulation 111
Filippo Neri

A Preliminary Investigation of Overfitting in Evolutionary Driven Model Induction: Implications for Financial Modelling 120
Clíodhna Tuite, Alexandros Agapitos, Michael O'Neill, and Anthony Brabazon

On the Performance and Convergence Properties of Hybrid Intelligent Schemes: Application on Portfolio Optimization Domain 131
Vassilios Vassiliadis, Nikolaos Thomaidis, and George Dounias

EvoHOT Contributions

Genetic Defect Based March Test Generation for SRAM 141
Stefano Di Carlo, Gianfranco Politano, Paolo Prinetto, Alessandro Savino, and Alberto Scionti

Improving ESOP-Based Synthesis of Reversible Logic Using Evolutionary Algorithms 151
Rolf Drechsler, Alexander Finder, and Robert Wille

Evolution of Test Programs Exploiting a FSM Processor Model 162
Ernesto Sanchez, Giovanni Squillero, and Alberto Tonda

Enhanced Reverse Engineering Using Genetic-Algorithms-Based Experimental Parallel Workflow for Optimum Design 172
Damir Vučina and Igor Pehnec

Fault-Tolerance Simulation of Brushless Motor Control Circuits 184
Huicong Wu, Jie Chu, Liang Yuan, Qiang Zhao, and Shanghe Liu

EvoMUSART Contributions

Parallel Evolutionary Optimization of Digital Sound Synthesis Parameters 194
Batuhan Bozkurt and Kamer Ali Yüksel

Combining Structural Analysis and Multi-Objective Criteria for Evolutionary Architectural Design 204
Jonathan Byrne, Michael Fenton, Erik Hemberg, James McDermott, Michael O'Neill, Elizabeth Shotton, and Ciaran Nally

Music Translation of Tertiary Protein Structure: Auditory Patterns of the Protein Folding 214
Riccardo Castagna, Alessandro Chiolerio, and Valentina Margaria

Ludic Considerations of Tablet-Based Evo-Art 223
Simon Colton, Michael Cook, and Azalea Raad

Evolving Art Using Multiple Aesthetic Measures 234
E. den Heijer and A.E. Eiben

A Genetic Algorithm for Dodecaphonic Compositions 244
Roberto De Prisco, Gianluca Zaccagnino, and Rocco Zaccagnino

A Customizable Recognizer for Orchestral Conducting Gestures Based on Neural Networks 254
Roberto De Prisco, Paolo Sabatino, Gianluca Zaccagnino, and Rocco Zaccagnino

Generative Art Inspired by Nature, Using NodeBox 264
Tom De Smedt, Ludivine Lechat, and Walter Daelemans

Evolving Four-Part Harmony Using Genetic Algorithms 273
Patrick Donnelly and John Sheppard

A Sonic Eco-System of Self-Organising Musical Agents 283
Arne Eigenfeldt and Philippe Pasquier

Creating Choreography with Interactive Evolutionary Algorithms 293
Jonathan Eisenmann, Benjamin Schroeder, Matthew Lewis, and Rick Parent

Modelling Human Preference in Evolutionary Art 303
Anikó Ekárt, Divya Sharma, and Stayko Chalakov

Evolution of Architectural Floor Plans 313
Robert W.J. Flack and Brian J. Ross

Path of Patches: Implementing an Evolutionary Soundscape Art Installation 323
José Fornari

Weighted Markov Chain Model for Musical Composer Identification 334
Maximos A. Kaliakatsos-Papakostas, Michael G. Epitropakis, and Michael N. Vrahatis

SANTIAGO - A Real-time Biological Neural Network Environment for Generative Music Creation 344
Hernán Kerlleñevich, Pablo Ernesto Riera, and Manuel Camilo Eguia

Neurogranular Synthesis: Granular Synthesis Controlled by a Pulse-Coupled Network of Spiking Neurons 354
Kevin McCracken, John Matthias, and Eduardo Miranda

Interactive Biomimetic Space: An Interactive Installation to Explore Living Architecture 364
Liraz Mor, Chao Liu, and Sebastian von Mammen

Using Grammatical Evolution to Parameterise Interactive 3D Image Generation 374
Miguel Nicolau and Dan Costelloe

Evolving Textures from High Level Descriptions: Gray with an Accent Color 384
Craig Reynolds

Aesthetic Classification and Sorting Based on Image Compression 394
Juan Romero, Penousal Machado, Adrian Carballal, and Olga Osorio

iSoundScape: Adaptive Walk on a Fitness Soundscape 404
Reiji Suzuki, Souichiro Yamaguchi, Martin L. Cody, Charles E. Taylor, and Takaya Arita

The *T. albipennis* Sand Painting Artists 414
Paulo Urbano

Merging Aesthetics with Functionality: An Interactive Genetic Algorithm Based on the Principle of Weighted Mutation 424
Eirini Vouliouri

EvoSTIM Contributions

Nature-Inspired Optimization for Biped Robot Locomotion and Gait Planning 434
Shahriar Asta and Sanem Sariel-Talay

Experimental Comparison of Selection Hyper-heuristics for the Short-Term Electrical Power Generation Scheduling Problem 444
Argun Berberoğlu and A. Şima Uyar

A Genetic Algorithm for Radiotherapy Pre-treatment Scheduling 454
Sanja Petrovic and Elkin Castro

Planning and Optimising Organisational Travel Plans Using an Evolutionary Algorithm 464
Neil Urquhart

EvoTRANSLOG Contributions

A PSO-Based Memetic Algorithm for the Team Orienteering Problem 471
Duc-Cuong Dang, Rym Nesrine Guibadj, and Aziz Moukrim

Heuristics for a Real-World Mail Delivery Problem 481
Elisabeth Gussmagg-Pfliegl, Fabien Tricoire, Karl F. Doerner, Richard F. Hartl, and Stefan Irnich

Integrated Generation of Working Time Models and Staff Schedules in Workforce Management 491
Volker Nissen, Maik Günther, and René Schumann

Optimization of the Nested Monte-Carlo Algorithm on the Traveling Salesman Problem with Time Windows 501
Arpad Rimmel, Fabien Teytaud, and Tristan Cazenave

Author Index 511

Table of Contents – Part I

EvoCOMPLEX Contributions

Evolving L-Systems as an Intelligent Design Approach to Find Classes of Difficult-to-Solve Traveling Salesman Problem Instances 1
Farhan Ahammed and Pablo Moscato

A Design Framework for Ultra-Large-Scale Autonomic Systems 12
Michele Amoretti

Stochastic Local Search to Automatically Design Boolean Networks with Maximally Distant Attractors 22
Stefano Benedettini, Andrea Roli, Roberto Serra, and Marco Villani

A Study on the Mutation Rates of a Genetic Algorithm Interacting with a Sandpile 32
Carlos M. Fernandes, Juan L.J. Laredo, Antonio M. Mora, Agostinho C. Rosa, and Juan J. Merelo

On the Design of Boolean Network Robots 43
Andrea Roli, Mattia Manfroni, Carlo Pinciroli, and Mauro Birattari

EvoGAMES Contributions

Multiple Tree for Partially Observable Monte-Carlo Tree Search 53
David Auger

Evolving Interesting Maps for a First Person Shooter 63
Luigi Cardamone, Georgios N. Yannakakis, Julian Togelius, and Pier Luca Lanzi

Revisiting Monte-Carlo Tree Search on a Normal Form Game: NoGo . . . 73
C.-W. Chou, O. Teytaud, and S.-J. Yen

Nested Look-Ahead Evolutionary Algorithm Based Planning for a Believable Diplomacy Bot 83
Markus Kemmerling, Niels Ackermann, and Mike Preuss

Towards Procedural Strategy Game Generation: Evolving Complementary Unit Types 93
Tobias Mahlmann, Julian Togelius, and Georgios N. Yannakakis

Improving and Scaling Evolutionary Approaches to the MasterMind Problem 103
Juan J. Merelo, Carlos Cotta, and Antonio Mora

Training Neural Networks to Play Backgammon Variants Using Reinforcement Learning 113
Nikolaos Papahristou and Ioannis Refanidis

Evolving Behaviour Trees for the Mario AI Competition Using Grammatical Evolution 123
Diego Perez, Miguel Nicolau, Michael O'Neill, and Anthony Brabazon

Learning Chasing Behaviours of Non-Player Characters in Games Using SARSA 133
Somnuk Phon-Amnuaisuk

Driving Faster Than a Human Player 143
Jan Quadflieg, Mike Preuss, and Günter Rudolph

Upper Confidence Trees with Short Term Partial Information 153
Olivier Teytaud and Sébastien Flory

EvoIASP Contributions

Segmentation of Ultrasound Breast Images: Optimization of Algorithm Parameters 163
Leonardo Bocchi and Francesco Rogai

A Hybrid Particle Swarm Optimisation with Differential Evolution Approach to Image Segmentation 173
Wenlong Fu, Mark Johnston, and Mengjie Zhang

Transparent, Online Image Pattern Classification Using a Learning Classifier System 183
Ignas Kukenys, Will N. Browne, and Mengjie Zhang

Tracking Multiple Targets with Adaptive Swarm Optimization 194
Jun Liu, Hongbin Ma, and Xuemei Ren

Advanced Metaheuristic Approaches and Population Doping for a Novel Modeling-Based Method of Positron Emission Tomography Data Analysis 204
Jarkko Pekkarinen, Harri Pölönen, and Ferrante Neri

Evolutionary Synthesis of a Trajectory Integrator for an Analogue Brain-Computer Interface Mouse 214
Riccardo Poli, Mathew Salvaris, and Caterina Cinel

Automatic Selection of Pareto-Optimal Topologies of Hidden Markov Models Using Multicriteria Evolutionary Algorithms 224
Pawel Swietojanski, Robert Wielgat, and Tomasz Zielinski

EvoINTELLIGENCE Contributions

When Novelty Is Not Enough 234
Giuseppe Cuccu and Faustino Gomez

A Part-Of-Speech Lexicographic Encoding for an Evolutionary Word Sense Disambiguation Approach 244
Antonia Azzini, Mauro Dragoni, and Andrea G.B. Tettamanzi

Migrating Birds Optimization: A New Meta-heuristic Approach and Its Application to the Quadratic Assignment Problem 254
Ekrem Duman, Mitat Uysal, and Ali Fuat Alkaya

EvoNUM Contributions

Opposition-Based Learning in Compact Differential Evolution 264
Giovanni Iacca, Ferrante Neri, and Ernesto Mininno

Data Mining Using Unguided Symbolic Regression on a Blast Furnace Dataset 274
Michael Kommenda, Gabriel Kronberger, Christoph Feilmayr, and Michael Affenzeller

DISPAR-Tournament: A Parallel Population Reduction Operator That Behaves Like a Tournament 284
Ogier Maitre, Deepak Sharma, Nicolas Lachiche, and Pierre Collet

Global Characterization of the CEC 2005 Fitness Landscapes Using Fitness-Distance Analysis 294
Christian L. Müller and Ivo F. Sbalzarini

A Framework for Multi-model EDAs with Model Recombination 304
Thomas Weise, Stefan Niemczyk, Raymond Chiong, and Mingxu Wan

EvoSTOC Contributions

An Investigation of Selection Hyper-heuristics in Dynamic Environments 314
Berna Kiraz, A. Şima Uyar, and Ender Özcan

Memory-Based Immigrants for Ant Colony Optimization in Changing Environments 324
Michalis Mavrovouniotis and Shengxiang Yang

Solving Dynamic Constrained Optimization Problems with Asynchronous Change Pattern 334
Hendrik Richter and Franz Dietel

Flexible Variable Neighborhood Search in Dynamic Vehicle Routing 344
Briseida Sarasola, Mostepha R. Khouadjia, Enrique Alba, Laetitia Jourdan, and El-Ghazali Talbi

CHC-Based Algorithms for the Dynamic Traveling Salesman Problem 354
Anabela Simões and Ernesto Costa

Author Index 365