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Günther R. Raidl et al. (Eds.)

# Applications of Evolutionary Computing

EvoWorkshops 2004: EvoBIO, EvoCOMNET,  
EvoHOT, EvoIASP, EvoMUSART, and EvoSTOC  
Coimbra, Portugal, April 5-7, 2004  
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Volume Editors

see next page

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# Preface

Evolutionary Computation (EC) deals with problem solving, optimization, and machine learning techniques inspired by principles of natural evolution and genetics. Just from this basic definition, it is clear that one of the main features of the research community involved in the study of its theory and in its applications is multidisciplinary. For this reason, EC has been able to draw the attention of an ever-increasing number of researchers and practitioners in several fields.

In its 6-year-long activity, EvoNet, the European Network of Excellence in Evolutionary Computing, has been the natural reference and incubator for that multifaceted community. EvoNet has provided logistic and material support for those who were already involved in EC but, in the first place, it has had a critical role in favoring the significant growth of the EC community and its interactions with longer-established ones. The main instrument that has made this possible has been the series of events, first organized in 1998, that have spanned over both theoretical and practical aspects of EC.

Ever since 1999, the present format, in which the EvoWorkshops, a collection of workshops on the most application-oriented aspects of EC, act as satellites of a core event, has proven to be very successful and very representative of the multi-disciplinarity of EC. Up to 2003, the core was represented by EuroGP, the main European event dedicated to Genetic Programming. EuroGP has been joined as the main event in 2004 by EvoCOP, formerly part of EvoWorkshops, which has become the European Conference on Evolutionary Computation in Combinatorial Optimization.

EvoWorkshops 2004, of which this volume contains the proceedings, was held in Coimbra, Portugal, on April 5–7, 2004, jointly with the seventh edition of EuroGP and the fourth edition of EvoCOP. EvoWorkshops 2004 consisted of the following individual workshops:

- *EvoBIO*, the 2nd European Workshop on Evolutionary Bioinformatics;
- *EvoCOMNET*, the 1st European Workshop on Evolutionary Computation in Communications, Networks, and Connected Systems;
- *EvoHOT*, the 1st European Workshop on Hardware Optimization Techniques;
- *EvoIASP*, the 6th European Workshop on Evolutionary Computation in Image Analysis and Signal Processing;
- *EvoMUSART*, the 2nd European Workshop on Evolutionary Music and Art; and
- *EvoSTOC*, the 1st European Workshop on Evolutionary Algorithms in Stochastic and Dynamic Environments.

EvoBIO was concerned with the exploitation of evolutionary computation and advanced hybrids of evolutionary computation with other techniques in addressing the very wide range of problems that occur in the analysis and understanding of biological data. In this area, evolutionary computation is playing an increasingly important role in pharmaceutical, biotechnology, and associated industries, as well as in scientific discovery.

EvoCOMNET, the 1st European Workshop on Evolutionary Computation in Communications, Networks, and Connected Systems, addressed the application of evolutionary computation techniques to problems in communication, networks, and connected systems. New communication technologies, faster networks, new types of interpersonal and interorganizational communication as well as the integration and interconnection of production centers and industries have a great impact on the structure of companies and business processes and are the driving forces on our road towards a connected, networked society. EvoCOMNET is a platform for the dissemination of the research and application of EC techniques in facing these new challenges through designing and building more efficient communication systems, networks, and connected systems. The papers presented at the workshop illustrated both the continuing success of EC and the potential of more recent developments to solve real-world problems.

EvoHOT highlighted the latest developments in the field of EC applications to hardware optimization. The works presented show how problems can be examined with complementary approaches, starting from their particular practical aspects or from the evolutionary computation theory. The different subjects tackled cover a broad spectrum. They include classical problems, such as minimization of disjoint sums-of-products based on binary decision diagrams and the multilayer floorplan layout problem, together with some very specific problems, like the implementations of median circuits when limited resources are available, the optimization of mask and illumination geometries, and the optimization of a manipulator trajectory. The behavior of evolutionary techniques on such problems was carefully analyzed, showing the effect of multiobjective optimization and how specific problems can be evaluated and characterized.

EvoIASP, the first European event specifically dedicated to the applications of evolutionary computation to image analysis and signal processing, has been a traditional appointment since 1999. This year it addressed topics ranging from optimization of low-level image and signal processing techniques to complex object-recognition systems and analysis of financial time series, which reflects the breadth of the possible applications in the fields covered by the workshop.

The second edition of EvoMUSART focused on the use of evolutionary computation 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 EvoMUSART was to bring together researchers who use evolutionary computation in this context, providing the opportunity to promote, present, and discuss the latest work in the area, fostering its further developments and collaboration among researchers.



The topic of EvoSTOC was the application of evolutionary algorithms in stochastic environments. This included optimization problems changing over time, the treatment of noise, and the search for robust solutions. These topics recently gained increasing attention in the evolutionary computing community, and EvoSTOC was the first workshop to provide a platform to present and discuss the latest research in the field.

EvoWorkshops 2004 has confirmed its tradition in providing researchers in these fields, as well as people from industry, students, and interested newcomers, with an opportunity to present new results, discuss current developments and applications, or just get acquainted with the world of EC, besides fostering closer future interaction between members of all scientific communities that may benefit from EC techniques.

EvoWorkshops 2004 had the highest number of submissions ever, even after EvoCOP, which had been by far the largest of the EvoWorkshops in the previous years, became an independent conference. The acceptance rates are an indicator of the high quality of the papers presented at the workshops and included in these proceedings.

Workshop	submitted	accepted	acceptance ratio
EvoBIO	21	13	61.9%
EvoCOMNET	27	6	22.2%
EvoHOT	11	6	54.5%
EvoIASP	33	15	45.4%
EvoMUSART	17	9	52.9%
EvoSTOC	14	6	42.9%
Total	123	55	44.7%

We would like to give credit to all members of the program committees, to whom we are very grateful for their quick and thorough work. EvoWorkshops 2004 was sponsored, for the last time, by EvoNet, whose activity as an EU-funded project has come to an end with the organization of this year's events. However, the figures reported above show that EvoWorkshops, as well as the main conferences with which it is jointly organized, has reached a degree of maturity and scientific prestige that will allow the activity promoted by EvoNet in the past six years to go on, and possibly further expand, in the years to come. The organization of the event was made possible thanks to the active participation of many members of the EvoNet working groups, but especially to the invaluable restless work of Jennifer Willies, EvoNet's administrator.

April 2004	Günther R. Raidl	Stefano Cagnoni	Jürgen Branke
	David W. Corne	Rolf Drechsler	Yaochu Jin
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# Organization

EvoWorkshops 2004 was organized by EvoNet jointly with EuroGP 2004 and EvoCOP 2004.

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