in this issue

Those of you who managed to make it to sunny Madrid for GECCO this year will already know what a fantastic conference it was from every perspective – great science, great company and great food! For those who missed it, you can catch up with best paper awards and read a summary from this year's General Chair Anna Esparcia-Alcazar inside. You will also find the latest tables of contents from ECJ and GPEM, as well as calls for some of the conferences coming up in 2016. Get writing those papers! The next issue of the newsletter will provide an insider's view on Denver which will be the location for GECCO 2016, just in case you need any persuasion to attend. I'd also like to take this opportunity to congratulate Marc Schoenauer on becoming Chair of SIGEVO from July and to extend a warm thank you to Wolfgang Banzhaf for his hard work over the last four years. As ever, if you would like to contribute to a future issue of the newsletter, please let us know!

Best wishes

Emma Hart (Guest Editor)

GECCO 2015 best papers

Track: Ant Colony Optimization and Swarm Intelligence - ACO+SI

Winner: *Robustness of Ant Colony Optimization to Noise*

Tobias Friedrich, Timo Kötzing, Martin S. Krejca, Andrew M. Sutton (Full text)

Track: Artificial Life, Robotics, and Evolvable Hardware - ALIFE + Generative and Developmental Systems - GDS

Winner: *Innovation Engines: Automated Creativity and Improved Stochastic Optimization via Deep Learning*

Anh Nguyen, Jason Yosinski, Jeff Clune (Full text)

Track: Biological and Biomedical Applications (BIO) +Digital Entertainment and Arts - DETA + Parallel Evolutionary Systems - PES

Winner: *Solving Interleaved and Blended Sequential Decision-Making Problems through Modular Neuroevolution*

Jacob Schrum, Risto Miikkulainen (Full text)

Track: Continuous Optimization - Evolution Strategies and Evolutionary Programming (CO)

Winner: *Towards an Augmented Lagrangian Constraint Handling Approach for the (1+1)-ES*
Dirk V. Arnold, Jeremy Porter (Full text)

Track: Estimation of Distribution Algorithms (EDA)+ THEORY

Winner: *Improved Runtime Bounds for the (1+1) EA on Random 3-CNF Formulas Based on Fitness-Distance Correlation*

Benjamin Doerr, Frank Neumann, Andrew M. Sutton (Full text)

Track: Evolutionary Combinatorial Optimization and Metaheuristics (ECOM)

Winner: *Global vs Local Search on Multi-objective NK-landscapes: Contrasting the Impact of Problem Features*

Fabio Daolio, Arnaud Liefooghe, Sébastien Verel, Hernán Aguirre, Kiyoshi Tanaka (Full text)

Track: Evolutionary Machine Learning -EML

Winner: *Subspace clustering using evolvable genome structure*

Sergio Peignier, Christophe Rigotti, Guillaume Beslon (Full text)

Track: Evolutionary Multi-objective Optimization - EMO

Winner: *Greedy Hypervolume Subset Selection* in the *Three-Objective Case*

Andreia P. Guerreiro, Carlos M. Fonseca, Luís Paquete (Full text)

Track: Genetic Algorithms - GA

Winner: *Mk Landscapes, NK Landscapes and MAX-kSAT: A proof that the only challenging problems are deceptive*

Darrell Whitley (Full text)

Track: Genetic Programming - GP

Winner: *Memetic Semantic Genetic Programming*

Robyn Ffrancon, Marc Schoenauer (Full text)

Track: Real World Applications - RWA

Winner: *Exploiting Linkage Information and Problem-Specific Knowledge in Evolutionary Distribution Network Expansion Planning*

Ngoc Hoang Luong, Han La Poutré, Peter A.N. Bosman (Full text)

Track: Search-Based Software Engineering and Self-* Search (SBSE-SS)

Winner: *Random or Genetic Algorithm Search for Object-Oriented Test Suite Generation?*

Sina Shamshiri, José Miguel Rojas, Gordon Fraser, Phil McMinn (Full text)

Highlights from GECCO 2015, Madrid

The 2015 Genetic and Evolutionary Computation Conference—GECCO 2015 – was held in Madrid in July. This was a special year for several reasons. Firstly, sixteen years ago, in 1999, GECCO was born and held for the first time in Orlando, Florida, USA. So happy birthday sweet sixteen, GECCO! The conference is now in its teenage years, and still growing stronger. Second, thirty years ago the first ICGA, the International Conference on Genetic Algorithms, was held in 1985. Several people who attended that event are still with us today to bear witness to the strength of the (r)evolutionary ideas that were presented there. And last but not least, this year witnessed the highest ever proportion of women in the Organizing Committee, following the spirit of **Women@ GECCO**.

Photos courtesy of Pablo García

GECCO 2015 comprised of 18 regular tracks, plus, for the second year, the Hot Off the Press (HOP) track, which offered authors of outstanding research recently published in journals and other conferences the opportunity to present their work to the GECCO community. Under the guidance of Editor-in-Chief **Sara Silva**, the Track Chairs and Program Committee selected 182 out of the 505 submissions received in all tracks (excluding HOP) for oral presentation as full papers, resulting in an acceptance rate of 36%. Close to 100 short papers were presented in the regular poster session. This also included an additional poster session, where late-breaking abstracts were presented together with student papers.

Photo courtesy of Pablo Garcia

A highlight of the conference was the keynote talks given by salient figures in the GECCO fields of interest. This year, in order to enhance the experience by going back to our origins, a third talk was included from the Natural Sciences field. The speakers and their subjects were:

- **Ricard Solé**, "Re-designing nature with synthetic biology: from artificial ants and tissues to a new biosphere"
- **Kate Smith-Miles**, "Visualising the diversity of benchmark instances and generating new test instances to elicit insights into algorithm performance"
- **Manuel Martín-Loeches**, "Origins and evolution of human language: saltation or gradualism?".

32 tutorials covered topics ranging from broad and introductory to specialized and at the frontier of current research. GECCO also hosted fifteen workshops, including several new ones as well as at least one that predates GECCO itself. Further high points included the 12th Annual "Humies" Awards for Human-Competitive Results, which were again generously supported by **John Koza,** and a record number of nine competitions, ranging from Art to Industry. Finally, Evolutionary Computation in Practice continued to be an important and integral part of GECCO, aiming at ensuring the field is in touch with the "real world".

Many thanks to the Organizing Committee – without their hard work and dedication this would not have been possible. A special mention is due to **Sara Silva,** who did a superb job of maintaining the high quality of the conference. **Anabela Simões** and **Gisele Pappa** ensured an interesting mixture of Tutorials and Workshops respectively, while **Mike Preuss** was in charge of finding challenging Competitions. **Katia Rodríguez-Vázquez's** efforts were devoted to that key component which ensures the conference's future development: the students. **Sima Etaner Uyar** and **Pablo García-Sánchez** made us reach the public via publicity and social media, and **Juan Luis Jiménez-Laredo** compiled all the useful information as Proceedings Chair. Thanks also go to the Track Chairs and the Program Committee for their careful reviewing of the large number of submissions received, and to the workshop chairs and tutorial presenters.

Anna I Esparcia Alcázar, General Chair, Universitat Politècnica de València, Spain

Evolutionary Computation

Volume 23
Issue 2
Summer 2015

Table of contents

Hybrid Evolutionary Approaches to Maximum Lifetime Routing and Energy Efficiency in Sensor Mesh Networks
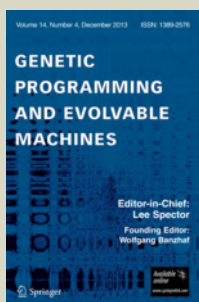
Alma A. M. Rahat: A.A.M.Rahat@exeter.ac.uk

Richard M. Everson: R.M.Everson@exeter.ac.uk

Jonathan E. Fieldsend: J.E.Fieldsend@exeter.ac.uk

Mesh network topologies are becoming increasingly popular in battery-powered wireless sensor networks, primarily because of the extension of network range. However, multihop mesh networks suffer from higher energy costs, and the routing strategy employed directly affects the lifetime of nodes with limited energy resources. Hence when planning routes there are trade-offs to be considered between individual and system-wide battery lifetimes. We present a multiobjective routing optimisation approach using hybrid evolutionary algorithms to approximate the optimal trade-off between the minimum lifetime and the average lifetime of nodes in the network. In order to accomplish this combinatorial optimisation rapidly, our approach prunes the search space using k-shortest path pruning and a graph reduction method that finds candidate routes promoting long minimum lifetimes. When arbitrarily many routes from a node to the base station are permitted, optimal routes may be found as the solution to a well-known linear program. We present an evolutionary algorithm that finds good routes when each node is allowed only a small number of paths to the base station. On a real network deployed in the Victoria & Albert Museum, London, these solutions, using only three paths per node, are able to achieve minimum lifetimes of over 99% of the optimum linear program solution's time to first sensor battery failure. (**Full text**)

Genetic Programming and Evolving Machines

Volume 16
Issue 3
September 2015

Table of contents

CFP: Genetic Programming and Evolvable Machines

Special Issue on Genetic Improvement

Genetic Improvement is the application of evolutionary and searchbased optimisation methods to the improvement of existing software. For example, it may be used to automate the process of bug fixing or to minimise bandwidth, memory or energy use. Genetic programming can use human written software as a feed stock for GI and is able to evolve mutant software tailored to solving particular problems. Other interesting areas are automatic software transplantation, as well as "grow and graft" genetic programming, where software is incubated outside its target human written code and subsequently grafted into it via genetic improvement.

Work on genetic improvement has resulted in several awards, including three "Humies", awarded for human competitive results. This includes the bug fixing work that led to the construction of the GenProg tool. More recently, genetic improvement was able to automatically transplant new functionality into existing software, which resulted in a ACM SIGSOFT Distinguished Paper Award at ISSTA 2015. Scope: We invite submissions on any aspect of genetic improvement. Suggested topics include:

- bandwidth minimisation
- latency minimisation
- fitness optimisation
- energy optimisation
- software specialisation
- memory optimisation
- software transplantation
- bug fixing
- multi-objective optimisation
- trading between quality and non-functional properties

GPEM Special Issue **Submission Deadline: 19 December 2015 |** Full GPEM CFP details from Springer here

CFP - PPSN 2016: 14th International Conference on Parallel Problem Solving from Nature

17-21 September 2016: Edinburgh, Scotland, UK.

This biennial meeting brings together researchers and practitioners in the field of Natural Computing: the study of computational systems inspired by nature, including biological, ecological, physical, chemical, and social systems. This is a fast-growing interdisciplinary field, featuring a range of techniques and methods for dealing with large, complex, and dynamic problems with various sources of potential uncertainties.

PPSN 2016 will showcase a wide range of topics in Natural Computing including, but not restricted to: Evolutionary Computation, Artificial Neural Networks, Artificial Life, Swarm Intelligence, Artificial Immune Systems, Self-Organising Systems, Emergent Behaviours, Molecular Computing, Evolutionary Robotics, Evolvable Hardware and Applications to Real-World Problems. PPSN 2016 will also feature workshops and tutorials covering advanced and fundamental topics in the field of Natural Computing.
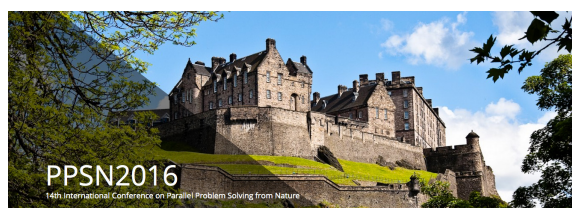
General Chairs:
Emma Hart & Ben Paechter: Edinburgh Napier University, UK.

Tutorials proposal deadline: 18 November 2015
Workshop proposal deadline: 4 January 2016
Paper Submission deadline: 4 April 2016

Full details: **http://ppsn2016.org/conference**

CFPs: EVO*2016 - The Leading European Event on Bio-Inspired Computation

30 March to 1 April 2016, Porto, Portugal

CFP - EuroGP: 19th European Conference on Genetic Programming

EuroGP is the premier annual conference on Genetic Programming, the oldest and the only meeting worldwide devoted specifically to this branch of evolutionary computation. It is always a very enjoyable event attracting participants from all continents, offering excellent opportunities for networking, informal contact, exchange of ideas and discussions with fellow researchers, in a friendly and relaxed environment. High quality papers describing new original research are sought on topics strongly related to the evolution of computer programs, ranging from theoretical work to innovative applications. The conference will feature a mixture of oral presentations and poster sessions. In 2015, the EuroGP acceptance rate was 50% (33.3% for oral presentations).
Full details: http://www.evostar.org/2016/cfp_eurogp.php

CFP - EvoMUSART: 5th International Conference on Evolutionary and Biologically Inspired Music, Sound, Art and Design

Following the success of previous events and the importance of the field of evolutionary and biologically inspired (artificial neural network, swarm, alife) music, sound, art and design, evomusart has become an evo* conference with independent proceedings since 2012. Thus, evomusart 2016 is the fifth International Conference on Evolutionary and Biologically Inspired Music, Sound, Art and Design.

The use of biologically inspired techniques for the development of artistic systems is a recent, exciting and significant area of research. There is a growing interest in the application of these techniques in fields such as: visual art and music generation, analysis, and interpretation; sound synthesis; architecture; video; poetry; design; and other creative tasks.

The main goal of evomusart 2016 is to bring together researchers who are using biologically inspired computer techniques for artistic tasks, providing the opportunity to promote, present and discuss ongoing work in the area. Full details: http://www.evostar.org/2016/cfp_evomusart.php

CFP - EvoApplications: 19th European Conference on the Applications of Evolutionary Computation

EvoApplications, the European Conference on the Applications of Evolutionary Computation -formerly known as EvoWorkshops- brings together researchers in a variety of areas of application of Evolutionary Computation and other Nature-inspired techniques.

EvoApplications invites high quality contributions for its 18th edition, which will be held as part of the EvoStar 2016 event in Porto, Portugal, April 2016 and co-located within EvoStar with three related conferences: EuroGP, EvoCOP and EvoMUSART.

EvoApplications 2016 is composed of 13 tracks, each focusing on an area of application of genetic and evolutionary computation and other related Computational Intelligence fields.
Full details: http://www.evostar.org/2016/cfp_evoapps.php

Submission deadline for Evo*2016: 1 November 2015

GECCO 2016: July 20 0 24, Denver, Colorado, USA

The Genetic and Evolutionary Computation Conference (GECCO 2016) will present the latest high-quality results in genetic and evolutionary computation. Topics include: genetic algorithms, genetic programming, evolution strategies, evolutionary programming, memetic algorithms, hyper heuristics, real-world applications, evolutionary machine learning, evolvable hardware, artificial life, adaptive behavior, ant colony optimization, swarm intelligence, biological applications, evolutionary robotics, coevolution, artificial immune systems, and more.

Deadlines: Workshop and Tutorial Proposals: **November 6, 2015**
Papers: **January 27, 2016**
Full details: www.sigevo.org/gecco-2016

Three vacancies at Newcastle University: Centre for Cloud Security

The newly formed research **Centre on Cloud Security** will seek to understand the different types of criminal behaviour that can be facilitated by the Cloud and then build systems that will allow the detection of such crimes and the collection of digital evidence to lead to the prosecution of Cloud-based criminals.

The centre represents an inter-disciplinary research endeavour that will leverage the strengths of Newcastle, Durham and Leeds Universities in areas of computing systems security, artificial intelligence / machine learning, data mining, psychology, criminology, criminal justice, law, ethics and also and data analytics. The role of the three advertised posts is to execute the machine learning agenda of the centre for Cloud security with focus on developing methods for modelling cloud behaviour, and for detecting/predicting instances of abnormal behaviour and cloud crime. This will involve using knowledge extraction and visualisation techniques to transform and explain these predictions to collect evidence for their possible prosecution.

You will require a PhD or equivalent (or close to completion) in **Machine Learning**, **Data Analysis** or related discipline, and outstanding research outputs in machine learning and its applications. Experience and track record of working in inter-disciplinary collaborations is also essential, along with strong software development skills.

These posts (three are available) are fixed term for 36 months.

Closes: 1st October 2015

Full details here: http://www.jobs.ac.uk/job/ATY434/d1804r-research-assistant-associate-critical

PhD studentship in Evolutionary High Performance Computing and Optimisation for Wave Energy

We are looking for an outstanding, motivated student for a prospective **PhD Studentship in Applied Mathematics** to participate in a strongly research-oriented project: "Evolutionary High Performance Computing and Optimisation of Large Wave Energy Farms" within the Department of Mathematical Sciences at **Loughborough University** (Loughborough, UK). The project will be jointly supervised with the department of Computer Science and will fall within the scopes of the new Centre for Data Science.

A topical challenge for the wave energy industry is to scale up their technology from single converters to large "wave farms". An integral part of this process is a multi- parameter optimisation of the layout of the devices. We are combining analytical models of wave energy farms together with global optimisation heuristics to optimise the power extraction of such systems.

We are looking for a bright student with passion and motivation to make progress in the above areas. The student would be expected to make a contribution to the field with peer reviewed scientific publications, after receiving state-of-the art training in both Applied Mathematics and Computer Science.

The prospective student ideally has a strong background in Mathematics, Numerical Methods, and some background in Fluid Mechanics. Previous knowledge in Ocean Waves and/or Evolutionary Computation would be a plus.

Interested **UK/EU** prospective students are encouraged to contact **Dr Emiliano Renzi** informally at:
E.Renzi@lboro.ac.uk

Please include in your email:
- A complete resume in PDF format
- A short (max one page) cover letter with a description of yourself and your research interests
- The names of two potential referees

About this newsletter

SIGEVOlution is the newsletter of SIGEVO, the ACM Special Interest Group
on Genetic and Evolutionary Computation.
To join SIGEVO, please follow this link [WWW]

Contributing to SIGEVOlution

We solicit contributions in the following categories:

Art: Are you working with Evolutionary Art? We are always looking for nice evolutionary art for the cover page of the newsletter.

Short surveys and position papers: We invite short surveys and position papers in EC and EC related areas. We are also interested in applications of EC technologies that have solved interesting and important problems

Software: Are you are a developer of an EC software and you wish to tell us about it? Then, send us a short summary or a short tutorial of your software.

Lost Gems: Did you read an interesting EC paper that, in your opinion, did not receive enough attention or should be rediscovered? Then send us a page about it.

Dissertations: We invite short summaries, around a page, of theses in EC-related areas that have been recently discussed and are available online.

Meetings Reports: Did you participate to an interesting EC-related event? Would you be willing to tell us about it? Then, send us a short summary, around half a page, about the event.

Forthcoming Events: If you have an EC event you wish to announce, this is the place.

News and Announcements: Is there anything you wish to announce, such as an employment vacancy? This is the place.

Letters: If you want to ask or to say something to SIGEVO members, please write us a letter!

Suggestions: If you have a suggestion about how to improve the newsletter, please send us an email

Contributions will be reviewed by members of the newsletter board.
We accept contributions in LATEX, MS Word, and plain text.
Enquiries about submissions and contributions can be emailed to editor@sigevolution.org

All the issues of SIGEVOlution are also available online at: www.sigevolution.org