LION'6 Invited talks:

Title: Surrogate-Assisted Evolutionary Optimisation: Past, Present and Future

Speaker: Yaochu Jin, Nature-Inspired Computing and Engineering Group, Department of Computing, University of Surrey, UK

Abstract: Surrogate-assisted (or meta-model based) evolutionary computation uses efficient computational models, often known as surrogates or meta-models, for approximating the fitness function in evolutionary algorithms. Research on surrogate-assisted evolutionary computation began over a decade ago and has received considerably increasing interest in recent years. Very interestingly, surrogate-assisted evolutionary computation has found successful applications not only in solving computationally expensive single- or multi-objective optimization problems, but also in addressing dynamic optimization problems, constrained optimization problems and multi-modal optimization problems. This talk provides an up-to-date overview of the history and recent developments in surrogate-assisted evolutionary computation and suggests a few future trends in this research area.

Short bio:

Yaochu Jin received the B.Sc., M.Sc., and Ph.D. degrees from Zhejiang University, China, in 1988, 1991, and 1996, respectively, and the Dr.-Ing. Degree from Ruhr University Bochum, Germany, in 2001.

He is a Professor of Computational Intelligence and Head of the Nature Inspired Computing and Engineering (NICE) Group, Department of Computing, University of Surrey, UK. He was a Principal Scientist with the Honda Research Institute Europe in Germany. His research interests include understanding evolution, learning and development in biology and bio-inspired approaches to solving engineering problems. He (co)authored over 130 peer-reviewed journal and conference papers. He is an Associate Editor of BioSystems, IEEE Transactions on Neural Networks, IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on Nanobioscience, and IEEE Computational Intelligence Magazine.

He has delivered over ten Plenary/Keynote speeches at international conferences on multi-objective machine learning, computational modeling of neural development, morphogenetic robotics and evolutionary design optimization. He is the General Chair of the 2012 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology. He presently chairs the Intelligent System Applications Technical Committee of the IEEE Computational Intelligence Society.

Professor Jin is a Fellow of BCS and Senior Member of IEEE.
**Title:** Optimization problems and algorithms for the high-level control of dynamic systems

**Speaker:** Gérard Verfaillie, ONERA, France

**Abstract:** The high-level control of dynamic systems, such as aircraft, airports, air traffic, or spacecraft, consists in deciding at each control step on which action(s) to be performed as a function of current observations and objectives. Successive decisions must entail that the dynamics of the controlled system satisfies user objectives as best as possible.

To do so, a usual approach, inspired from the Model Predictive Approach in Automatic Control consists at each control step in (i) collecting current observations and objectives (ii) solving a deterministic planning problem over a given horizon ahead, (iii) extracting the first action from the best plan produced, (iv) applying it, and (v) considering the next step.

From the optimization point of view, this implies to be able to solve quickly many successive similar planning problems over a sliding horizon, maybe not in an optimal way.

I will try to present and illustrate this approach and to explain the potential impact of learning techniques.

**Short bio:** Graduated from École Polytechnique (Paris) in 1971 and from SUPAÉRO (French national engineering school in aeronautics and space, Computer science specialization, Toulouse) in 1985, Gérard Verfaillie is now Research supervisor at ONERA (The French Aerospace Lab). His research activity is related to models, methods, and tools for combinatorial optimization and constrained optimization, especially for planning and decision-making.
Title: Autonomous Search

Speaker: Frédéric Saubion, Université d’Angers, France

Abstract: Decades of innovations in combinatorial problem solving have produced better and more complex algorithms. These new methods are better since they can solve larger problems and address new application domains. They are also more complex, which means that they are hard to reproduce and often harder to fine tune to the peculiarities of a given problem. This last point has created a paradox where efficient tools became out of reach for practitioners. Autonomous search represents a new research field defined to precisely address the above challenge. Its major strength and originality consist in the fact that problem solvers can now perform self-improvement operations based on analysis of the performances of the solving process -- including short-term reactive reconfiguration and long-term improvement through self-analysis of the performance, offline tuning and online control, and adaptive control and supervised control. Autonomous search "crosses the chasm" and provides engineers and practitioners with systems that are able to autonomously self-tune their performance while effectively solving problems.

In this talk, we review existing works and we attempt to classify the different paradigms that have been proposed during past years to build more autonomous solvers. We also draw some perspectives and futures directions.

Short bio:

Frédéric Saubion coheads the Metaheuristics, Optimization and Applications team at the Université d’Angers (France); his research topics include hybrid and adaptive evolutionary algorithms and applications of metaheuristics to various domains such as information retrieval, nonmonotonic reasoning and biology. www.info.univ-angers.fr/pub/saubion