

ESF Strategic Workshop on

Uncertainty Management In Simulation-Optimization Of Complex Systems: Algorithms And Applications

Rome (Italy), 9-12 May 2012

Convened by:
Gabriella Dellino ^① and **Carlo Meloni** ^②

① IMT Institute for Advanced Studies, Lucca, IT

② Politecnico di Bari, Bari, IT

Sponsor:



Fondazione C.D.
Tardini - NPO



Italian Operational
Research Society



Conference of the
University Colleges



European University
College Association



The European Science Foundation (ESF) is an association of 72 Member Organisations devoted to scientific research in 30 European countries. The Mission of ESF is to provide a common platform for its Member Organisations in order to advance European research and to explore new directions for research at the European level. Through its activities, the ESF serves the needs of the European research community in a global context.

The main objectives of ESF for the years 2006-2010 (extended to 2011 and 2012) as defined by its *Strategic Plan* are to promote Science Strategy and Science Synergy, paving the way for initiatives across disciplinary and geographic boundaries in the European Research Area (ERA).

The Exploratory Workshops scheme is one of the key instruments of the Science Strategy “pillar”. Each year, ESF supports approximately 50 Exploratory Workshops across all scientific domains. The focus of the scheme is on workshops aiming to explore an emerging and/or innovative field of research or research infrastructure, also of interdisciplinary character. Workshops are expected to open up new directions in research or new domains. It is expected that a workshop shall conclude with plans for follow-up research activities and/or collaborative actions or other specific outputs at international level.

European Science Foundation

1 quai Lezay Marnésia
BP 90015
67080 Strasbourg Cedex
France
Fax: +33 (0)3 88 37 05 32
<http://www.esf.org>

ESF Exploratory Workshops:

Paul Egerton

Corporate focal point for Peer Review and Evaluation

Valerie Allspach-Kiechel

Senior Administrator

Tel: +33 (0)3 88 76 71 36

Isabelle May

Senior Administrator

Tel: +33 (0)3 88 76 71 46

Email: ew-office@esf.org

<http://www.esf.org/workshops>

Convenor:

Carlo Meloni
meloni@deemail.poliba.it

Politecnico di Bari
Via E. Orabona 5
70125 Bari
Italy

Co-convenor:

Gabriella Dellino
g.dellino@imtlucca.it

IMT Institute for Advanced Studies
Piazza San Ponziano 6
55100 Lucca
Italy

Main Objectives of the Workshop:

Several optimization problems arise in production, transportation and logistics, energy management, finance, engineering and applied sciences; in all these contexts, managers carry on a decision making process, which is usually affected by uncertainties, so the final outcome can be noisy. There are applications in virtually any area of business, government, science and engineering, so methodologies to support decisions in uncertain environments are urgently needed.

The exploratory workshop aims at investigating strategies to account for uncertainty in complex systems described by computer simulations. When optimizing the performances of these systems, accounting or neglecting uncertainty may lead to completely different results; therefore, uncertainty management is a major issues in simulation-optimization. Because of its wide field of applications, simulation-optimization issues have been addressed by different communities with different methods, and from slightly different perspectives. Alternative approaches have been developed, also depending on the application context, without any well-established method clearly outperforming the others.

This exploratory workshop brings together researchers from different—though interrelated—areas; namely, statistical methods, experimental design, stochastic programming, global optimization, metamodeling, and design and analysis of computer simulation experiments. Our goal is to take advantage of such a multidisciplinary environment, to attain a much better mutual understanding of the commonalities and differences of the various approaches to simulation-based optimization, especially in uncertain environments. We aim to start a panel discussion on the topic, taking the first steps towards an advancement of the state-of-the-art in this research area, also accounting for potential real-world applications to improve also the state-of-the-practice. We expect significant contributions from the participants, all being very active and talented researchers in the area; further, the resulting interdisciplinary background among the attendees will definitely provide an added value to the workshop.

Workshop Agenda

The workshop can offer many possibilities for cooperation. To maximize its possible results, it was generally agreed that such a workshop should be organized in detail with the active contribution of all the invited participants.

For the entire duration of the workshop preparation, internet-based research communications and meetings will be promoted by using suitable tools chosen by the participants. Internet-based tools will be used also for the preparation of manuscripts and presentations before the workshop and for the editorial projects following the event.

An official website of the workshop will be set up (www.simopt.net). The dissemination among participants will take place through constantly updated news about the progress of the activities on related scientific and technological themes, and on financial opportunities for new research projects.

Report publication and dissemination

The discussion and results of the workshop will be collected in an edited book to reach people that did not take part in the research project but who could be equally interested in up-coming activities (e.g., research groups and networks to promote new research projects or share new research experiences and challenges). The official site of the workshop (www.simopt.net) is planned to support all the follow-up actions. Moreover, the convenors are going to organize a Special Issue on the topics of the workshop on some prominent scientific journal. This initiative will be open to the scientific community and will get momentum from this exploratory workshop.

PROGRAMME

The workshop is organized in thematic sessions; each talk will be followed by a discussion among participants. Panel discussions and round tables characterize some sessions of the workshop. Each presentation — which could report on a co-authored work — also includes a brief introduction to the speaker's research group and its activities.

Wednesday, 9 May 2012

Afternoon *Arrival*
 19.30-21.00 *Welcome party*

Thursday, 10 May 2012

09.50-10.10 *Registration*

10.10-10.30 **Welcome by Convenors**
Gabriella Dellino (IMT Institute for Advanced Studies, Lucca, IT)
Carlo Meloni (Politecnico di Bari, Bari, IT)

10.30-11.00 *Coffee / Tea Break*

11.00-12.30 Morning Session: Advanced tutorials in simulation-optimization

11.00-11.30 **"Simulation modeling and optimization for operations management"**
Jan Fransoo (Eindhoven University of Technology, Eindhoven, NL)

11.30-12.00 **"Optimization of computationally expensive black-box systems"**
Dirk Deschrijver (Ghent University, Ghent, BE)

12.00-12.30 **"On the use of several environmental conditions in an evolutionary simulation optimization search"**
Henri Pierreval (Institut Français de Mécanique Avancée, Aubière, FR)

12.30-14.30 *Lunch*

14.30-16.00 Afternoon Session I: Optimization and uncertainty management approaches

14.30-15.00 **"Partition based global optimization methods"**
Veronica Piccialli (Università di Roma Tor Vergata, Rome, IT)

15.00-15.30 **"Stochastic nonlinear programming by Monte-Carlo estimators"**
Leonidas Sakalauskas (Vilnius University, Vilnius, LT)

15.30-16.00 **"Uncertainty management using sequential parameter optimization"**
Thomas Bartz-Beielstein (Cologne University of Applied Sciences, Cologne, DE)

16.00-16.30 *Coffee / Tea break*

16.30-18.00 **Afternoon Session II: Metamodeling and bootstrapping**

16.30-17.00 **"Accounting for statistical uncertainty using regression
metamodels with bootstrapping"**

Russell Cheng (University of Southampton, Southampton, UK)

17.00-17.30 **"Variability of metamodels in simulation-optimization"**

Gabriella Dellino (IMT Institute for Advanced Studies, Lucca, IT)

17.30-18.00 **"Kriging and bootstrapping: some applications"**

Wim Van Beers (University of Amsterdam, Amsterdam, NL)

19.30 *Dinner*

Friday, 11 May 2012

09.00-10.00 **Morning Session I: Simulation-optimization methods**

09.00-09.30 **"Expected improvement in efficient global optimization through
bootstrapped Kriging"**

Inneke Van Nieuwenhuysse (Katholieke Universiteit Leuven, Leuven, BE)

09.30-10.00 **"Uncertainty problems in simulation-based energy management:
dealing with stochastic computer models"**

Bertrand Iooss (Université Mathématiques de Toulouse, Toulouse, FF)

10.00-11.00 **Presentation of the European Science Foundation (ESF)**

Julius Zilinskas (ESF Standing Committee for Physical and Engineering Sciences
- PESC)

11.00-11.30 *Coffee / Tea Break*

11.30-12.45 **Morning Session II: Methodology – Issues and Challenges**

11.30-11.45 **Introduction to the topic**

11.45-12.15 **Panel discussion**

12.15-12.45 **Actions**

12.45-14.45 *Lunch*

14.45-16.15 **Afternoon Session I: Simulation and optimization applications**

14.45-15.15 **"Risk adjusted stochastic dual dynamic solution to a disaster
preparedness and relief distribution"**

Ebru Angün (Galatasaray University, Istanbul, TR)

15.15-15.45 **"Optimal stock allocation in the airport maintenance supply chain"**

Annalisa Cesaro (ISTAT Istituto Nazionale di Statistica, Rome, IT)

15.45-16.15 **"Applications of simulation and optimization research in logistics"**

Kostanca Katragjini (Universidad Politécnica de Valencia, Valencia, S)

16.15-16.45 *Coffee / Tea break*

16.45-18.00	Afternoon Session II: Applications – Old and new opportunities
16.45-17.00	Introduction to the topic
17.00-17.30	Panel discussion
17.30-18.00	Actions
19.30	<i>Social dinner</i>

Saturday, 12 May 2012

09.00-11.00	Morning Session: Forward-looking discussion
09.00-10.00	Proposals of joint research programmes
10.00-11.00	Discussion on follow-up activities and plans for future cooperation Round table
11.00-13.00	<i>End of Workshop and departure</i>

European Science Foundation

Objectives of the ESF Standing Committee for Physical and Engineering Sciences (PESC)

The **ESF Standing Committee for Physical and Engineering Sciences (PESC)** covers a broad number of fields from physics, chemistry, mathematics, informatics and computer sciences, to engineering, material and technical sciences. PESC has the following responsibilities and tasks:

- to develop scientific initiatives within the ESF operational framework;
- to make proposals for 'a la carte' scientific initiatives;
- to undertake studies on large research facilities and assist in the evaluations and assessments and other special reviews requested by Member Organisations;
- to provide specialist advice and input on a wide range of ESF actions and contribute to the development of the ESF science policy agenda and take a strategic view of the scientific area for which it has responsibility; and
- where appropriate, to work with other Committees and groups in promoting multidisciplinary and interdisciplinary activities.

ESF Physical and Engineering Sciences and Space Science Unit:

Jean-Claude Worms

Head of Unit

Thibaut Léry

Senior Science Officer

Catherine Lobstein

Senior Administrator

Nathalie Geyer

Administrator

Tel: +33 (0)3 88 76 71 30

Email: pesc@esf.org

<http://www.esf.org/pesc>