

## First International Workshop on Complex Sciences in the Engineering of Computing Systems

to be held at the 25<sup>th</sup> International Conference on Architecture of Computing Systems

TU München, Germany  
February 28/29<sup>th</sup>, 2012

<http://web.sg.ethz.ch/workshops/csecs-2012/>

### CALL FOR PAPERS

**Submission Deadline: December 8<sup>th</sup>, 2011 (hard)**

The emergent properties of complex adaptive systems pervade natural and social sciences. Interestingly, also man-made systems like the Internet, the Web or Peer-to-Peer networks are being studied by an increasingly large and diverse research community that is frequently subsumed under the term *Complex Science*. Among the current research, the study of the properties of complex network systems, as well as dynamical processes unfolding within them have been particularly successful. Such studies have uncovered some of the principles that contribute to the astonishing robustness and adaptivity of various systems which can be framed in the formalism of networks. Some of these systems also exhibit properties of self-organization. During the last decade, these advances have paved the way for a number of interesting engineering applications. From an operative viewpoint, the resulting research framework allows the toolkit of statistical physics to be applied to a wide variety of systems, each composed by a sufficiently large number of interacting elements.

In this workshop, we seek to shed light on how methods, abstractions and ideas from the (statistical) physics perspective on complex adaptive systems – with examples coming from nature, society and technology – can be utilized in the design, modeling and analysis of current and future computing systems. Being a particularly promising domain, a special emphasis will be laid on how the recently developed *statistical mechanics of networks* –encompassing complex and dynamic structures– can facilitate the design of robust and adaptive computing architectures that inherit some of the remarkable properties of natural systems. An important aim of the workshop is to strengthen the ties between complementary research communities that otherwise rarely get in contact. By this, we hope to contribute to the formation of a community centered around computer engineering, and with an interdisciplinary component, that focuses on the following question: how can the dynamics unfolding in computing infrastructures be analyzed, as well as actively managed and utilized, based on abstractions and methods from statistical physics.

This workshop intends to address these questions in the context of different computing systems. The focus of the workshop includes – but is not limited to – the following topics:

- Complex systems approaches to design and analyze robust and adaptive architectures
- Applications of the statistical mechanics of networks to self-organized formation and optimization of communication structures
- Complex network science approaches to adaptive large-scale network-on-chip designs
- Statistical mechanics perspective on self-organizing peer-to-peer topologies
- Statistical methods to quantify properties of large dynamic communication networks
- Applications of percolation theory to the analysis of robustness in (interdependent) communication networks
- Modeling and analysis of information diffusion and error spreading in communication networks
- Modeling of cascading failures in cyber-physical systems
- Applications of complex networks and random graph theory in the modeling of Internet architecture
- Application of complex networks science to the design and analysis of energy/smart grid infrastructures
- Physics-inspired models for autonomic and organic computing systems
- Application of reaction-diffusion systems to computing
- Monte-Carlo methods for the (run-time) adaptation and optimization of computing systems
- Application of physics abstractions to systems engineering and analysis
- Network science approaches to the modeling and analysis of software structures like inheritance hierarchies or dependency networks
- Physics-inspired, non-conventional programming models for self-organizing, spatial and many-core computing systems
- Physics-inspired field-based coordination approaches
- Non-linear synchronization and consensus phenomena in communication and wireless networks
- Socio-physical models for collective user behavior in pervasive systems, opportunistic networking as well as in novel user-oriented online services

### Important Dates

<b>Submission Deadline</b>	<b>December 8<sup>th</sup>, 2011</b>
Acceptance Notification	2 weeks after submission December 22 <sup>nd</sup> latest
Camera-ready Deadline	January 3 <sup>rd</sup> , 2012
<b>Workshop</b>	<b>February 28/29<sup>th</sup>, 2012</b>

### Organizers

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### Paper Submissions

The organizers welcome the submission of papers in English language of up to 12 pages describing original work previously unpublished and currently not under review elsewhere. Interdisciplinary work that demonstrates how methods, models and abstractions from complex sciences and statistical physics can facilitate the engineering of reliable and adaptive computing architectures is particularly solicited. All submissions will be blindly reviewed by at least three members of the program committee. Accepted papers will be published in the GI Edition – Lecture Notes in Informatics (LNI) series. Selected high-quality contributions of interest to a wider community may be invited to resubmit an extended version to the interdisciplinary journal *Advances in Complex Systems*.

### Contact

For more information on the workshop, submission and formatting instructions, the review process, as well as for a list of the tentative program committee, please visit the website of the workshop at

<http://web.sg.ethz.ch/workshops/csecs-2012>

or contact the organizers.