Engineering Complex Systems
with Big data and information Technology

ECS-BIT'18

IdeaLeague Doctoral School

Interested in the role of big data analysis and emergent IT technologies in complex systems engineering in large-scale, interconnected, highly complex and dynamic socio-technical systems? The ECS-BIT'18 IdeaLeague doctoral school, with sessions in Delft, Aachen, Milan, and Göteborg, will offer the students a broad perspective on how these topics are studied in different disciplines.

Theme

The aim of the Doctoral School on Engineering Complex Systems with Big data and Information Technology (ECS-BIT'18) is to deepen the understanding of Engineering Complex Systems as a discipline combining interdisciplinary knowledge to address the great challenges posed by large-scale, interconnected, and therefore highly complex and dynamic, socio-technical systems, investigating the role of big data analysis and emergent IT technologies in complex systems engineering.

Overview

The IDEA League Doctoral School on Engineering Complex Systems with Big data and information Technology (ECS-BIT'18) will be held visiting TU Delft (NL), RWTH Aachen University (D), Politecnico di Milano (I), and Chalmers University of Technology (S) in the period February 1st - August 31, 2018 for a total of 9 days. The school will provide a unique opportunity to visit some of the leading Technical Universities in Europe and for networking with PhD students from IdeaLeague universities with the goal of promoting also long term future research collaboration.

Important Dates:

Applications open: October 1st, 2017
Application Deadline: November 15, 2017
Acceptance of the participants: December 5, 2017
School (tentative dates):
- Delft (NL), Feb. 1-2, 2018 (2 days)
- Aachen (D), March 2018 (2 days)
- Milano (I), May 2018 (3 days)

- Göteborg (S), August 30-31, 2018 (2 days).

Goals and Audience

The goal of the IDEA league doctoral school on Engineering Complex Systems with Big data and information Technology (ECS-BIT'18) is to survey fundamental and applied aspects of engineering complex system using big data and information technology (IT), as well as to identify novel opportunities and research directions with a multidisciplinary perspective through a series of *lectures* by *international experts*. The school will provide attendees with a great opportunity to meet distinguished scholars and to establish contacts that may lead to research collaborations in the future, offering the opportunity of meeting researchers in four universities during the doctoral school. Participants will be given the opportunity of exploring multidisciplinarity dimensions through group work. The intended audience are postgraduate students, PhD students, and young researchers from universities and industrial labs around the world.
Ph.D. students with a strong interest in complex data management issues are welcome from different disciplines. However, students attending the course are expected to have a basic academic knowledge background in computer science, data science, or closely related subjects

Credits:
- 3 credits for participation in the school
- 5 credits for participation and group work final report delivery, with final evaluation (pass/fail)

Speakers and Topics

The doctoral school intends to cover the field broadly from policy and management perspectives and the computer science perspective.

Typical structure for the two/three days session at each location:
- presentation of the local university and hosting department
- presentation of the theme for the session
- lectures of the chosen subjects for the session
- group work by students in groups of student from different disciplines, on a topic chosen by the group, focusing on the issues presented during the class, discussing possible research and innovation ideas
- Short presentation of the results of the group work by the students and discussion
- One social event
- In the first location, an introduction to IdeaLeague and initiatives for students will be also given.

Sessions and lecturers (tentative schedule):

Session 1: Uncertainty and networking (TUDelft, 2 days)

- Uncertainty Management Methods for Engineering Systems (Paulien Herder, TU Delft)

- Engineering Big Data Architectures and interdependent systems (Marijn Janssen , TU Delft)

Session 2: Engineering social systems and the big data perspective (Aachen, 2 days)

- Social Systems and the Big Data Perspective
    o Social Network Design and Analytics (Matthias Jarke, RWTH Aachen)
    o Heterogeneous Data Integration : The Knowledge Pipeline (Stefan Decker, RWTH Aachen)
    o Safety and Reliability in Complex Systems (Stefan Kowalewski)
    o Modelling and Verifying Complex Systems (Joost-Pieter Katoen)

Session 3: Quality and processes in complex systems (PoliMI, 3 days)

- Quality of data and services
    o Modeling, monitoring, assessment methods, resilient process design (Barbara Pernici, Polimi)
    o Data analysis (Michela Arnaboldi, Piercesare Secchi/Vantini, Polimi)
        o The opportunity of Big data and the change of quality
        o Enquiring modes and impact on data and modeling

– Resilience engineering of interdependent infrastructure systems: from modeling to governance (Paolo Trucco, Polimi, Giovanni Sansavini, ETH)

– Complex models for global sustainability. Applications to health, energy and water management (Marino Gatto et al., Polimi)

Session 4: Quality in complex dependable cyber-physical systems (Chalmers, 2 days)

- Specific quality requirements of cyber-physical systems
    o Dependability, with safety and security, real-time requirements (Ivica Crnkovic, Christain Berger, Chalmers)
    o Specific quality requirements on autonomous systems (Christian Berger, Chalmers)
    o Requirements Engineering and user experience for dependable systems (Alesia Knauss)

- Achieving quality for complex systems in specific domains

- o Performance tuning in Cloud-computing (Philipp Leitner, University of Zurich, Chalmers)
- o Dynamic software deployment and dynamic system quality verification (Patrizion Pellicione, Chalmers)
- o Quality Management for Internet of things (Romina Spalazzese, Malmö University)

Call for Participation

Submission System: Prospective participants should apply online before November 15, 2017. Applications will open on October 1st. Further information will be provided in this site.

Submission: The number of participants is limited to a maximum of 40. When applying, prospective attendees need to provide, in a single PDF file:

- A one page resumé including information on home institution, current status (PhD student, post-doc, researcher, …), expected graduation date in case of PhD students, publications (if any, an existing publication track is by no means mandatory and fresh PhD students are welcome as well), type of basic academic knowledge background in computer science, data science, or closely related subjects, and any other information the applicant deems relevant.
- A two-page extended abstract describing current and future research the applicant is focusing on; the content of the extended abstract will match the content of the poster that the applicant, if accepted, will be presenting during a poster session at the school. The extended abstract should contain a statement about motivations for participating in the doctoral school.
- A letter of recommendation from supervisor

Format: For preparing the extended abstract, please use the <u>ACM SigConference template</u>. The extended abstracts of accepted applicants with be delivered as school proceedings to all attendees and published online on the school website.

Selection Criteria: Selection will be based on the expected benefit the applicant may gain by attending the school, on geographical distribution, and on the prospective mixture of attendees with different backgrounds and research areas that will be attending the school.

Cost: Participation to the school is *free of charge* for students of IdeaLeague institutions, and covers overnight stay for the duration of the school, all meals (excluding breakfast) and social activities, excluding travel costs which are *not* covered for students of IDEALeague institutions. The registration fee for non-IdeaLeague attendees is € 750.00, and it does not cover overnight stay costs nor travel costs.

Organization

The school is organized by Barbara Pernici (Politecnico di Milano), Paulien Herder and Marijn Janssen (Delft University of Technology), Giovanni Sansavini (ETH), Matthias Jarke (RWTH Aaachen), Ivica Crnkovic (Chalmers University of Technology). The school is funded by IDEALeague and co-funded by the universities in which the school will take place.