

ICIAM Today – Friday Recap

Highlights from talks:

Sonia Kovalevsky Lecture

Linda J. S. Allen (Texas Tech University, USA) delivered the 2015 Sonia Kovalevsky Lecture, *Predicting Population Extinction, Disease Outbreaks and Species Invasions Using Branching Processes*, on Thursday evening. The AWM-SIAM Sonia Kovalevsky Lecture is awarded to highlight significant contributions of women to applied or computational mathematics. This year, that honor goes to Linda Allen. Dr. Allen is being recognized for outstanding contributions in ordinary differential equations, difference equations and stochastic models, with significant applications in the areas of infectious diseases and ecology. In her lecture, Dr. Allen showed that branching processes furnish important methods for estimating the probability of population extinction or of disease outbreaks in stochastic models, and these methods are illustrated in several classic Markov chain population and epidemic models and in new applications to the control of species invasions and of the spatial spread of diseases.

Invited lectures

Nancy Reid (University of Toronto, Canada) presented an invited lecture, *Approximate likelihoods*. In statistical theory inference based on the likelihood function plays a key role and is very widely used in applications, but likelihood functions may be difficult to compute, or depend on assumptions about high order dependencies that may be difficult to verify in complex models. Dr. Reid surveyed various approximations to likelihood and likelihood inference, with a view to identifying common themes and outstanding problems.

Claudia Sagastizábal (Instituto Nacional de Matemática Pura e Aplicada, Brazil) gave an invited lecture, *On Lagrangian Decomposition for Energy Optimization*. Real-life optimization problems often depend on data subject to unknown variations that can be due to imprecise measurements or to the stochastic nature of the data itself. When decisions need to be taken with high precision, it is important to employ methods that are reliable when subject to data variability. For complex problems such as those arising in the energy sector, advanced nonsmooth optimization techniques combined with Lagrangian decomposition provide a satisfactory answer to such concerns. Dr. Sagastizábal reviewed recent approaches, including those referred to as having on-demand accuracy, for different Lagrangian functions.

Jin Keun Seo (Yonsei University, Korea) delivered an invited lecture *Mathematical models and methods for noninvasive bioimpedance imaging*. The mathematical models for bioimpedance imaging are expressed as nonlinear inverse problems involving time-harmonic Maxwell's equations with electrical tissue properties being described by frequency-dependent conductivity and permittivity. Solving the inverse problems with practical significance requires deep knowledge on underlying physical mechanisms, image reconstruction algorithms, uncertainties in modeling, and practical

limitations associated with the measurement sensitivity, specificity, noise, data acquisition time, and so on. In his lecture, Dr. Seo discussed a number of issues in electrical tissue property imaging modalities and challenging problems.

Karl Kempf (Decision Engineering Group, Intel Corporation, USA) delivered an invited lecture entitled "*Applied Mathematics for Business Decision Making: The Next Frontiers*". Making decisions is always difficult, especially when you face a situation where the difference between a good decision and a bad decision can be worth billions of dollars in today's business world. Dr. Kempf provided a rudimentary background on the rise of both intuition and analytics in making decisions and gave quantitative data on the shortcomings of intuitive decision making and the benefits of decision making aided by analytics drawn from 25 years of work directed at improving business decision making at Intel Corporation. All the facts identify the next frontier in applied mathematics for decision making in business as the beneficial merger of intuition and analytics.

Shunlong Luo (Academy of Mathematics and Systems Science, CAS, China) delivered an invited lecture, *Correlations: From Classical to Quantum*. The concept of correlations permeates our world in a profound and ubiquitous way. With the advent of quantum information theory, correlations are playing an increasingly instrumental and significant role in the description and exploitation of nature. In the lecture, Dr. Luo presented an overview of some quantitative and informational aspects of correlations in both classical and quantum regimes, with focus on the interplay between classical and quantum, and their implications for quantum foundations and applications, he also discussed classification and quantification of correlations, touched upon various topics such as classical correlations, quantum discord, quantum steering, quantum entanglement, and quantum nonlocality.

Jesús Sanz Serna (Universidad de Valladolid, Spain) delivered an invited lecture entitled "*Formal series and numerical integrators: some history and some new techniques*". A survey of the use of formal series in the analysis of numerical integrators was presented in the lecture, Dr. Serna gave a brief history of B-series and the associated Butcher group and provided the new theory of word series and extended word series.

Volker Mehrmann (Technische Universität Berlin, Germany) gave an invited lecture, *Modeling, simulation and control of constrained multiphysics systems*. Typically a mathematically oriented remodeling or regularization step has to be carried out, to reformulate the equations for the use in classical simulation, optimization and control tools. Dr. Mehrmann presented a remodeling concept that creates from a given automatically generated model (including over- and under-determined as well as control systems) a new system which has the same solution set, but which is well provably well suited for simulation, control and optimization and which also gives error and perturbation bounds. As a further advantage of the new approach, he showed that all the variables keep their physical meaning.

Simon Tavaré (Cancer Research UK Cambridge Institute, UK) delivered an invited lecture, *Inference for stochastic processes in cancer evolution*. In the talk Dr. Tavaré presented some stochastic models that have been developed to study tumour evolution, including cellular Potts models and their relatives. With the advent of cheap DNA sequencing it is now possible to identify mutations in tumour cells, thus begging the question about how inference about tumour evolution might be performed. After outlining the basic biology and aspects of ancestral inference, Dr. Tavaré described

how Approximate Bayesian Computation methods can be used to estimate relevant biological parameters, and illustrated the methods with examples from glioblastoma and colorectal cancer.

Closing Ceremony

More than 1000 people attended the 2015 **ICIAM** closing ceremony. In her short speech, **ICIAM** President Barbara Keyfitz first congratulated the success of the congress, and she thanked the organizers: six years' hard work makes six day's conference.

Vice Chair of Executive Committee ICIAM2015, Yuefei Wang presented a speech in the closing ceremony, he said that we have a very successful congress: We have a wonderful opening ceremony and beyond our expectation, the total number of registered delegates is over 3400, the largest in the history of **ICIAM** Congresses. Yuefei Wang also cited the conference data, finally he stated that the success of the congress owed to the hard and dedicated efforts of many people. He thanked the **ICIAM** Council members, the committees to run the congress, and specially appreciated the staffs of Congress Secretariat office and the volunteers of the Congress.

Congress Director Lei Guo presented certificates to volunteers of the congress. Barbara Keyfitz and Lei Guo also took photos with the volunteers.

What is the Next

*Congress Director Lei Guo handed over the **ICIAM** flag to **ICIAM** 2019 Director Tomás Chacón.*

The next **ICIAM** Congress will be held in Valencia, Spain in 2019.

See you in **ICIAM 2019!**