International Congress on Industrial and Applied Mathematics

How mathematics helps diagnose cancer, protect intimacy, mitigate the climate crisis and predict social movements

- **Near to thirty speakers selected by an international scientific committee will present results in areas such as computing, aeronautics, medicine, environment, robotics and intelligent systems.**

- **ICIAM is celebrated every four years and is the most important event in applied mathematics in the world. The IX edition will held in Valencia from July 15th to 19th**

Valencia, July 4th 2019. A personal digital twin that guides you through complex decisions, a system which predicts -and hits- the changes of opinion of the social groups, a brain simulator that helps to understand how consciousness emerges... It may seem like fiction, but they are present ideas that will be exposed by lecturers during the largest international congress of applied mathematics, which will bring together 4000 specialists from around the world in Valencia (Campus Blasco Ibáñez of the University of Valencia), from July 15 to 19.

The ICIAM2019 program will include close to thirty guest lecturers, all of whom have been selected by a prestigious international scientific committee, and an Industry Day with representatives of large companies who will explain how mathematics drives their business.

The invited speakers will present results in areas where mathematics has traditionally had a great impact, such as computing, cryptography, aeronautics and meteorology, but also in other more recently conquered ones: medicine and life sciences; modeling of group behavior (of social focus); artificial intelligence and machine learning; and climate and environment.

Oncology, neuroscience and cell understanding

Mathematics has broken into medicine and life sciences, so as to study biological processes and also, for the development of diagnostic technologies, such as medical imaging", says the chairman of the ICIAM2019 Scientific Committee **Alfio Quarteroni**, Chair of Modeling and Computing at the Federal Polytechnic University of Lausanne (Switzerland), and leader of the European project iHEART to simulate the human heart. Amongst its achievements is the design of the Swiss sailboat Alinghi which won the America's Cup in 2003 and 2007.

Among the speakers who will deal with medical or biological research problems is **Leah Keshet**, from the University of British Columbia (Vancouver, Canada), first woman president (1995) of the Society for Mathematical Biology, and a pioneer in the development of mathematical models of the cell, and diseases such as autoimmune diabetes.

Spaniard Víctor Manuel Pérez García, director of the Mathematical Oncology Laboratory (MÁLAB) at the University of Castilla-La Mancha, uses mathematical models to investigate cancer and look for new treatments - especially in glioblastoma, the most common and lethal brain tumor.-. He will give an informative talk which will be open to the public (July 18th at 19:45, Palau de las Artes).

Carlos Conca, from the University of Chile, will present his work in modeling the olfactory system: how the brain translates an external stimulus into the perception of information, in this case; smell. For Conca, "one of the challenges of applied mathematics is to provide models that address the most fundamental issue of neuroscience: how our consciousness processes external stimuli, and how this mechanism ultimately leads us to be who we are".

Climate and environment

Hiroshi Suito, from Tohoku University (Japan), also works on medical problems, but his simulations also cover a wide range of environmental problems, including the study of marine flora and oceanography amongst others.

Omar Ghattas, from the University of Texas at Austin, an expert in computational geoscience and modeling geophysical processes -conveying the Earth's mantle, propagating seismic waves, plate tectonics throughout the planet- is one of the few who try to simulate the process of thawing in the polar ice caps, a process still little understood and a key to estimate the consequences of the climate crisis.

Alfredo Bermúdez de Castro, from the University of Santiago de Compostela, will also be exhibiting environmental applications. He is the only Spanish guest lecturer at ICIAM2019 works on computational methods to solve industrial problems, in fields as diverse as fluid mechanics, acoustics, combustion, environment and finance, amongst others.

Cryptography, Artificial Intelligence and social behavior

In areas related to technology,Kazue Sako, from the Security Research Laboratory of NEC (Japan), expert in cryptography, blockchain and cryptocurrencies; and Kristin Lauter, lead researcher in Cryptography and Privacy at Microsoft Research and former president of the Association of Women in Mathematics will talk and analyzes the social impact of Artificial Intelligence.

Yvon Maday, from the Sorbonne University, Paris, and winner of the ICIAM2019 Pioneer Prize, will talk about the impact of mathematical simulation in the industry and other fields: we are "in the worlds of digital technology, of simulation, of intelligence artificial and the data. The idea of using this data to make digital twins of complex machines and, why not, of ourselves, is truly fascinating, although of course it can also scare".

The increasing computing capacity of computers, coupled with the vast amount of data available on almost any system, is allowing mathematics to to gain entrance into the social sciences. They benefit from the study of natural language, important in artificial intelligence; or the investigation of opinion formation, and how a group emerges from individual behavior.

These issues are addressed by Eitan Tadmor, from the University of Maryland (USA) and Hans de Sterck, University of Waterloo (Canada). "With big data and network information infiltrating

almost every aspect of our lives, the role of mathematics in society is growing rapidly. The computational social sciences are a fascinating emerging area: to what extent can we model, understand and direct the functioning of society?", De Sterck asks.

The program also includes interventions from experts in many other areas, such as computing and aeronautics. Among them are Tom Grandine of Boeing; Marsha Berger of the Courant Institute in New York, who also models tsunamis; and Karen Wilcox from the University of Texas at Austin (USA).

More information:

https://iciam2019.org/

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