



Multisession Workshop

Informatics

Friday 18 July 2014, 16:00h, IEC

Chair: Carlo Ghezzi (Politecnico di Milano – Dipartimento di Elettronica e Informazione)

16:00- 17.30 **Part 1: New Frontiers in Informatics (NEFI)**

Speakers:

Jordi Cortadella *Inexact Computing*

Carme Torras *Social robots: technology meets the humanities*

Mario Pérez Jiménez *Modelling real-life phenomena*

Martin Golumbic *Recent Trends in Intersection Graphs*

Pere Brunet *Ubiquitous interactive inspection of 3D data*

17:30- 18:00 **Break**

18:00- 19:00 **Part 2: Big data, data science, and data analytics (BD-DS-DA)**

Speakers

Ricardo Baeza-Yates *Big Data or Right Data?*

Veljko Milutinovic *DataFlow SuperComputing*



Arnold Smeulders *Visual search*

Hermann Maurer *Concerns about dangers of ICTs is mounting*

Part 1: New Frontiers in Informatics (NEFI)

16:00 – 16:15 “Inexact Computing”



Jordi Cortadella received the M.S. and Ph.D. degrees in Computer Science from the Universitat Politècnica de Catalunya, Barcelona, in 1985 and 1987, respectively. He is a Professor in the Department of Software of the same university. In 1988, he was a Visiting Scholar at the University of California, Berkeley. His research interests include formal methods and computer-aided design of VLSI systems with special emphasis on asynchronous circuits, concurrent systems and logic synthesis. He has co-authored numerous research papers and has been invited to present tutorials at various conferences.

Prof. Cortadella has served on the technical committees of several international conferences in the field of Design Automation and Concurrent Systems. He received best paper awards at the Int. Symp. on Advanced Research in Asynchronous Circuits and Systems (2004), the Design Automation Conference (2004) and the Int. Conf. on Application of Concurrency to System Design (2009). In 2003, he was the recipient of a Distinction for the Promotion of the University Research by the Generalitat de Catalunya. He is member of the Academia Europaea.

Abstract

Landauer’s limit defines the minimum amount of energy to change one bit of information. When devices performing computations approach this limit, they become highly unreliable and the uncertainty in the validity of the results increases exponentially.

In the era of the Internet of Things with billions of devices supporting smart cities, wearable computing, sensor networks, domotics, etc., computing will soon face sustainability issues due to the high energetic demand of these devices. A significant part of the energy is invested in guaranteeing exact computations. However, a question arises: is it really necessary to do exact computations when the results are going to be delivered to human beings or other unreliable machines? Can we live with computations that are “good enough”?

Inexact computing is an emerging paradigm that can address some of the sustainability aspects of computing. The talk will consider the impact and challenges of dealing with inexact computations and the implications in hardware and software design.



16:15 – 16:30 “Social robots: technology meets the humanities”



Carme Torras is Research Professor at the Spanish Scientific Research Council (CSIC). She received M.Sc. degrees in Mathematics and Computer Science from the Universitat de Barcelona and the University of Massachusetts, Amherst, respectively, and a Ph.D. degree in Computer Science from the Universitat Politècnica de Catalunya (UPC). Prof. Torras has published five books and about two hundred papers in the areas of robot kinematics, geometric reasoning, computer vision, and neurocomputing. She is currently Editor of the IEEE Transactions on Robotics. She has supervised thirteen PhD thesis, and has been local project leader of nine European projects, among them, the IP project “Perception, Action and COgnition through Learning of Object-Action Complexes” (PACO-PLUS), and the ongoing 7th framework project “Intelligent observation and execution of Actions and manipulations” (IntellAct). She was awarded the Narcís Monturiol Medal of the Generalitat de Catalunya in 2000, and she became ECCAI Fellow in 2007, member of Academia Europaea in 2010, and member de la Reial Acadèmia de les Ciències i les Arts de Barcelona in 2013.

Abstract

Where is robotics research heading to? Industrial robots are giving way to social robots designed to aid in healthcare, education, entertainment and services. In the near future, robots will assist disabled and elderly people, do chores, act as playmates for youngsters and adults, and even work as nannies and reinforcement teachers. Besides the scientific and technological challenges that this robotic evolution entails, which will be briefly showcased through results from some European projects, ethical issues are gaining attention within the robotics community. How will our increasing interaction with robots affect individual identity, society and the future of humankind? Can this evolution be predicted? Can it somehow be guided? Roboticians have turned to the humanities in search for answers. Philosophy, psychology and law are shedding principled light on these issues, while arts and science-fiction freely speculate about the role the human being and the machine may play in this “pas a deux” in which we are irremissibly engaged.



16:30 – 16:45 “Modelling real-life phenomena”



Mario J. Pérez-Jiménez is a full professor in the Department of Computer Science and Artificial Intelligence, University of Sevilla, Spain, where he is the head of the Research Group on Natural Computing. His main research interests include computational complexity theory, natural computing, bioinformatics, and computational modelling for systems biology and population dynamics. He is a member of the editorial board of five ISI journals and the main researcher in various Asian, European and Spanish research projects. He has been an independent expert for the evaluation of NEST (New and Emergent Science and Technology) proposals under the Sixth Framework Programme of the European Community, and from May 2006 he is an European Science Foundation peer reviewer.

Abstract

Mathematical models have emerged as a powerful indispensable tool for scientific investigation, allowing us to study and make predictions on a variety of problems in different research domains.

A computational bio-inspired framework to model real-life phenomena is presented in this talk. Some applications to modelling signal transduction in cellular processes and population dynamics of real ecosystems are studied.

16:45 – 17:00 “Recent Trends in Intersection Graphs”



Martin Charles Golumbic is Professor of Computer Science and Director of the Caesarea Edmond Benjamin de Rothschild Institute for Interdisciplinary Applications of Computer Science at the University of Haifa. His current area of research is in combinatorial mathematics and graph theory interacting with real world problems in computer science and artificial intelligence.

Professor Golumbic is the founding Editor-in-Chief of the journal “Annals of Mathematics and Artificial Intelligence”, author of the book “Algorithmic Graph Theory and Perfect Graphs”, co-author of the book “Tolerance Graphs”. He has published extensively in the areas of combinatorial mathematics, algorithmic analysis, expert systems, artificial intelligence, and programming languages. His most recent book is “Fighting Terror Online: The Convergence of Security, Technology, and the Law”, published by Springer-Verlag.

Abstract

After a brief introduction, with examples, on the topic of intersection graphs and containment graphs, we will report on recent work and current research directions on the intersection graphs of k -bend paths on a grid. The motivation for studying these families, called $\$B_k\$$ -VPG graphs and $\$B_k\$$ -EPG graphs, originated from applications in circuit design. The graph



colouring problem on such special families of intersection graphs is of particular interest, and rich mathematical problems also arise.

17:00 – 17:15 “Ubiquitous interactive inspection of 3D data”



Pere Brunet is an active retired Full Professor in Computer Science at the Polytechnic University of Catalonia in Barcelona. He was Vice President for Research at the Universidad Politécnic de Catalunya between 1988 and 1992. He is actively working in Computer Science since 1967. He started his research work in Computer Graphics in 1979. His group was a pioneer on Computer Graphics research in Spain, leading afterwards to the creation of many other research groups in the country. His research interests include computer-aided geometric design, hierarchical geometric representations and virtual reality. He received the XI Catalan Foundation Prize for Research in 2001. He also received the Distinguished Career Award of the Eurographics Association in 2008, being the third recipient of this award. He received the Spanish National Informatics Award "Jose Garcia Santesmases" in 2010. He is a member of the Royal Academy of Engineering of Spain, having been its vice-president from 2007 to 2011. He is a member of the Academia Europaea. He has been a member of the CAETS Council and he is a member of the Euro-CASE Board. He is a corresponding member of the Academy of Engineering of Portugal.

Abstract

Real-time inspection of huge datasets in small and mobile devices is nowadays becoming a promising tool in many different areas. Apart from browsing maps and geographic data, and besides ubiquitous applications supporting virtual visits of distant countries, cities, museums and artworks, novel systems will foster the emergent area of telemedicine. Upcoming telemedicine software tools will help in the cooperative inspection of 3D human organ reconstructions, allowing real-time collaborative diagnose among medical doctors in distant locations. Challenges come from the fact that 3D data sizes are becoming bigger and bigger, whereas ubiquitous inspection requires data visualization in small and limited devices, also with network bandwidth limitations. This talk will present the main present technical challenges for the real-time inspection of huge amounts of 3D data in small mobile devices and will discuss possible avenues for the next future.

Break 17:30-18:00



Part 2: Big data, data science, and data analytics (BD-DS-DA)

18:00 – 18:25 “Big Data or Right Data?”

Ricardo Baeza-Yates is VP of Yahoo! Research for Europe and Latin America, leading the labs at Barcelona, Spain and Santiago, Chile, since 2006. He is also part time Professor at the Dept. of Information and Communication Technologies of the Universitat Pompeu Fabra in Barcelona, Spain, since 2005. Until 2005 he was Professor and Director of the Center for Web Research at the Department of Computer Science of the Engineering School of the University of Chile. He obtained a Ph.D. from the University of Waterloo, Canada, in 1989. He is co-author of the best-seller Modern Information Retrieval textbook, published in 1999 by Addison-Wesley with a second enlarged edition in 2011, as well as co-author of the 2nd edition of the Handbook of Algorithms and Data Structures, Addison-Wesley, 1991; and co-editor of Information Retrieval: Algorithms and Data Structures, Prentice-Hall, 1992, among more than 300 other publications. He has received the Organization of American States award for young researchers in exact sciences (1993) and the CLEI Latin American distinction for contributions to CS in the region (2009). In 2003 he was the first computer scientist to be elected to the Chilean Academy of Sciences. During 2007 he was awarded the Graham Medal for innovation in computing, given by the University of Waterloo to distinguished ex-alumni. In 2009 he was named ACM Fellow and in 2011 IEEE Fellow.

Abstract

Big data nowadays is a fashionable topic, independently of what people mean when they use this term. But being big is just a matter of volume, although there is no clear agreement in the size threshold. On the other hand, it is easy to capture large amounts of data using a brute force approach. So the real goal should not be big data but to ask ourselves, for a given problem, what is the right data and how much of it is needed. For some problems this would imply big data, but for the majority of the problems much less data will and is needed. In this keynote we explore the trade-offs involved and the main problems that come with big data: scalability, redundancy, bias, noise, spam, and privacy.

18:25 – 18:45 “DataFlow SuperComputing”

Veljko Milutinovic received his PhD from the University of Belgrade, spent about a decade on various faculty positions in USA (mostly at Purdue University), and was a codesigner of the DARPA's first GaAs RISC microprocessor. Now he teaches and conducts research at the University of Belgrade, mostly in dataflow computing, with stress on simulations and mappings of algorithms.

He has about 2400 Google Scholar citations (his h-index is over 20, and his g-index is over 40).



Abstract

This presentation analyses the essence of DataFlow SuperComputing, defines its advantages and sheds light on the related programming model. DataFlow computers, compared to ControlFlow computers, offer speedups of 20 to 200 (even 2000 for some applications), power reductions of about 20, and size reductions of also about 20. However, the programming paradigm is different, and has to be mastered. The talk explains the paradigm, using Maxeler as an example, and sheds light on the ongoing research in the field. Examples include GeoPhysics, CivilEngineering, DataMining, etc. Emphasis is on research done at the University of Belgrade.

18:45 – 19:00 “Visual search”



Arnold W.M. Smeulders graduated from Delft Technical University in Physics and Leyden Medical Faculty (PhD) both on a computer vision topics of the time. He is professor at the University of Amsterdam, leading the ISIS group on visual search engines. We have been a top three performer in the international TRECvid scientific competition for visual concept search over the last 10 years. In 2010 Euvision was co-founded as a university spin-off. He is scientific director of COMMIT/, the large public private-ICT-research program of the Netherlands. He is past associated editor of the IEEE trans PAMI and current of IJCV. He is IAPR fellow and Member of the Academia Europaea. He was visiting professor in Hong Kong, Tsukuba, Modena, Cagliari, and Orlando.

Abstract

In computer vision research, in the last ten years considerable progress has been made on the issue of naming things in digital pictures automatically, that is not using the annotation of the image (as Google does in their picture search options). Recognizing an instance of an arbitrary object class from a picture started in 2003 when Fergus and Zisserman aimed at recognizing a “motor bicycle” on the basis of a few assumptions. They were: 1. parts of one object are spatially close, 2. specific parts are recurring among all members of the concept class (such as a part of a wheel which will be visible on all pictures of a motor bicycle), and 3. the recognition of these class-specific parts can be learned from examples. This has started visual concept recognition by computation from the data given some visual examples. A decade later we will soon be able to learn to recognize from 50 – 1000 examples per class some 20,000 different things, a number compatible with the cognitive repertoire of individuals with reasonable success. In the talk an overview of the standard algorithm, and new extensions such as algorithms to localise the object, or algorithms to search for objects on the basis of just 1 example image. We end with: what is next in visual search?



19:00 – 19:15 “Concerns about dangers of ICTs is mounting”



Hermann Maurer has been Professor for Informatics in Canada, USA, New Zealand, Germany and Austria, starting in 1966. He has some 700 publications and over 1.000 invited talks to his credit, 3 honorary doctorates and a number of high distinctions. He has been (co)founder of some 20 companies and is proud to have supervised over 400 MSc's and some 60 PhD's. He is currently also one member of the board of Academia Europaea. More than you ever want to know about him on www.iicm.edu/maurer

Abstract

It seems clear by now that cognitive facilities are damaged by the large scale arrival of the internet. It is also clear that big brother, the danger of massive breakdowns and of cyberwars, not just cybercriminality is constantly rising. We give a few brief examples and then explain how at least some of the problems can and should be confronted.