PARAMETERIZED COMPLEXITY TUTORIAL

Sponsored by CATS, ACSW Week

Participation Free: Coffee/tea and lunch are included as part of the Tutorial. Please email frances.rosamond@cdu.edu.au for any dietary concerns and to RSVP for lunch.

Reference: *Confronting Intractability via Parameters*, by Rodney G. Downey and Dimitrios M. Thilikos, located at arXiv here: http://arxiv.org/abs/1106.3161

Venue: Story Hall Seminar rooms 1&2 (level 7).

9:00—10:00	**Michael Fellows** Charles Darwin Univ	Origins, Main Ideas and Overview for the Working Computer Scientist
10:00-10:30	Coffee/Tea Break	
10:30-11:30 11:30-12:30	**Mike Langston** Univ Tennessee and Oak Ridge National Lab **Franz J. Brandenburg** University Passau, Germany	Analysis of genome-scale biological data Ranking problems with incomplete information: FPT of distance Problems
12:30-1:30	Lunch	
1:30-2:30 2:30-3:30	**Gabor Erdelyi** University Siegen, Germany **Ljlijana Brankovich** Univ Newcastle, Australia	Decision making, voting, and social choice Approximation and Parameterized Complexity
3:30-4:00	Coffee/Tea Break	
4:00-5:30	**Michael Fellows** Charles Darwin Univ	Polynomial Kernelization: Upper and Lower Bound Techniques

Speaker Biography and Abstract

Mike Fellows. Professor Michael Fellows received his PhD from the University of California, San Diego, in 1985 and has since taught at universities in the USA, Canada, New Zealand and Australia. In 2006, he received the prestigious Humboldt Research Award for his foundational work on parameterized complexity. The first book in the area, *Parameterized Complexity*, with Rod Downey of Victoria University in Wellington, based on their papers in the 1990's, has been cited more than 2,000 times, and the field has developed into a vigorous branch of contemporary theoretical computer science having strong applications in such areas as Bioinformatics and Artificial Intelligence. Prof Fellows is an Associate Editor of the *ACM Transactions on Algorithms* and of the *Journal of Computer and System Sciences*. He has contributed to a number of areas, including Cryptography, Bioinformatics, Network Mapping, Computational Social Choice, and Computer Science Education for the Elementary Grades. His work has been cited more than 8,000 times altogether. Prof Fellows is currently an Australian Professorial Fellow at Charles Darwin University, Darwin, Australia.

Mike Fellows Presentation. The opening session will use three extended case studies to introduce the key issues of the field. The final session will survey the contemporary context of programmatic thinking about the deployment of mathematics to serve practical computing, in which pre-processing (kernelization) has both a central and a leveraged role. The natural relationship between PC and heuristics has been a subject of papers and talks since the beginnings of parameterized complexity, and has been especially recognized within the kernelization community. There is an annual Kernelization workshop is called *WorKer*.

Michael Langston is Professor of Electrical Engineering and Computer Science at the University of Tennessee. He also serves as a Collaborating Scientist at the Oak Ridge National Laboratory. His current research efforts are primarily focused on the development, synthesis, analysis and high performance implementation of graph algorithms for the analysis of high throughput biological data. In addition to maintaining his research program, he regularly teaches courses on discrete optimization, graph theory, parallel computing and related subjects.

Michael Langston Presentation. We will discuss the use of fixed-parameter tractable algorithms and powerful computational platforms in the analysis of genome-scale biological data. Effective load balancing and efficient combinatorial search are core concerns. We will address issues with noisy data, and the role of model organisms in successful applications to human health. Examples will be drawn from genomic, transcriptomic, methylation and other types of high-throughput data.

Franz J. Brandenburg received his Diploma in Mathematics (1973), his PhD in informatics (1978) and his Habilitation (1982) from the University of Bonn. In 1979 he was a postdoc in the research group of Professor Ron Book at the University of Santa Barbara. Since 1983 he has been a full professor of Informatics at the University of Passau, Germany. He was advisor for about 200 Diploma and Master theses and has supervised 15 PhD students. His teaching includes Master courses on Efficient Algorithms, Graph Drawing, Computational Complexity, Computational Geometry and Algorithmics. His current research interests are in Algorithmics with emphasis on Graph Drawing.

Franz J. Brandenburg Presentation. We will discuss ranking problems with incomplete information: Fixed parameter tractability of distance Problems. The difference between two linear orders or permutations is commonly measured by the number of disagreements. This difference can be computed efficiently. However, the difference problem becomes NP-hard if we take a linear and a partial order and consider maximal agreement. A closer analysis shows that the problem has a linear kernel, which we shall elaborate. In consequence the problem is fixed parameter tractable.

Gabor Erdelyi holds the chair in Decision and Organization Theory and is Professor of Economics at University Siegen, Germany. He holds a Ph.D. in computer science (2009) and a Diploma in mathematics (2004) from Heinrich-Heine-Universität, Düsseldorf. Between March and October 2011 he worked as a postdoc at Nanyang Technological University Singapore.

Gabor Erdelyi Presentation. We will discuss computational aspects of decision making, voting, and social choice.

Ljiljana Brankovic is Associate Professor of Computer Science at the University of Newcastle, Australia. She received a Bachelor of Engineering (Electrical) from the University of Belgrade in 1987. She obtained her PhD in Computer Science from the University of Newcastle in 1998. Her main research interests are graph theory, graph algorithms and data security.

Ljiljana Brankovic Presentation. We explore parameterized approximation problems, where the problem in question is a parameterized decision problem, and the required approximation factor is treated as a second parameter for the problem. We can set $k = 1/\varepsilon$ as the parameter. We can define a classical optimization problem to have an efficient P-time approximation scheme (EPTAS) if it can be approximated to a goodness of $(1 + \varepsilon)$ of optimal in time $f(1/\varepsilon)n^c$ where c is a constant.

http://fpt.wdfiles.com/local--files/courses-in-pc/CATS.htm