Parameterized Complexity News

Newsletter of the Parameterized Complexity Community

www.fpt.wikidot.com April 2013

Welcome

Frances Rosamond, Editor, Charles Darwin University
Welcome to the Parameterized Complexity Newsletter. Congratulations to award winners and graduates. Note that the community wiki **www.fpt.wikidot.com** now has a Table of Races for Computational Social Choice, many thanks to Robert Bredereck, TU Berlin. Each voting problem can and should be viewed under several parameterizations. Voting is by nature multivariate. The Psychology and Cognitive Science Section is greatly expanded, thanks to Johan Kwisthout and Iris van Rooij, Radboud University, who will be giving tutorials at CogSci2013. Parameterized complexity now has a BLOG! See article by Neeldhara on how to contribute. Would you like to edit a column for the newsletter? Contact me at Frances.Rosamond@cdu.edu.au.

Figure 1: DBAI Group

IPEC Nerode Award

The Nerode Prize 2013 Committee: Rolf Niedermeier (TU Berlin, Chair), Georg Gottlob (Oxford), and Peter Widmayer (ETH Zurich), has unanimously awarded Chris Calabro (Google Inc.), Russell Impagliazzo (UC San Diego), Valentine Kabanets (Simon Fraser U.), Ramamohan Paturi (UC San Diego), and Francis Zane (Alcatel Lucent) the 2013 EATCS-IPEC Nerode Prize for outstanding papers in the area of multivariate algorithmics. See `http://eatcs.org/`. Congratulations.

The Vienna DBAI–Three Awards

Congratulations to **Prof. Dr. Reinhard Pichler and the Data-Base and Artificial Intelligence Group** at TU-Wein for being awarded *three* FWF Austrian Science Fund awards.

The FAIR project, *Fixed-Parameter Tractability in Artificial Intelligence and Reasoning* studies the parameterized complexity of logic based problems such as answer-set programming and description logics. Awarded 350k EUR.

Contents of this issue:

The D-FLAT project, *Extending the Answer-Set Programming Paradigm to Decomposed Problem Solving* combines tree decomposition techniques with the declarative language "answer-set programming" (ASP). It extends Group previous work, including a tool that allows to specify a dynamic programming algorithm by means of ASP and serves for rapid prototyping of algorithms that exploit bounded treewidth. Awarded 280k EUR.

The project FAIR: *Fragment-Driven Belief Change* studies belief revision, update, and merging, which are subareas of Artificial Intelligence that deal with incorporating new information into existing knowledge bases. A part of the project is devoted to a parameterized complexity analysis of these problems. Awarded 350k EUR.

Gerhard Woeginger–Humboldt

Congratulations to **Gerhard J. Woeginger**, TU Eindhoven for a *Humboldt Research Award*, which provides 60k EURO for visiting German researchers for up to one year. Gerhard is visiting Prof Rolf Niedermeir and the Algorithmics and Complexity Theory group at TU Berlin from Oct 2012–June 2013, where they are working on parameterized questions in computational social choice and some graph problems.

Falk Hüffner–DFG Award

Congratulations to **Falk Hüffner**, TU Berlin for the Deutsche Forschungsgemeinschaft (DFG)award for his two-year project *Algorithm Engineering for NP-hard Problems: Parameterized Algorithms versus Established Techniques*. The award is about 174k EURO.

Neeldhara Misra-INSPIRE

Congratulations to **Neeldhara Misra** who has been awarded an Innovation in Science Pursuit for Inspired Research Award for *Parameterized Methods in Bioinformatics*. The award provides the equivalent of an IIT Assistant Professor position, which Neeldhara will avail at the Indian Institute of Science, Bangalore, for the next five years. INSPIRE awards are competitive across six categories: Life, Physical, Engineering, Chemical, Mathematical, and Earth and Atmospheric Sciences. Neeldhara's proposal was short-listed, and then she presented to a committee of experts. The award offers young achievers the "opportunity for independent research in the near term and to emerge as a future leader in the long term."

Rajesh Chitnis–Simons Award

Congratulations to **Rajesh Chitnis**, a CS third-year Ph.D. student advised by Assoc. Prof. Mohammad Hajiaghayi at Univ of Maryland. Rajesh has been awarded $48,000 in funding by the Simons Foundation for *New Techniques and Applications of Parameterized Complexity*. This is a two-year grant for graduate students in theoretical computer science. This is a prestigious award in which there were only six recipients last year among all U.S. and Canadian institutions of higher education. The laudation from UOM Prof. and Chair Samir Khuller says: Rajesh brings great credit to the Computer Science Dept., and especially the Theory and Algorithms group with this major award. His publication record is stellar, and he has a number of terrific results to his name as a young graduate student. We look forward to seeing more great things from him.

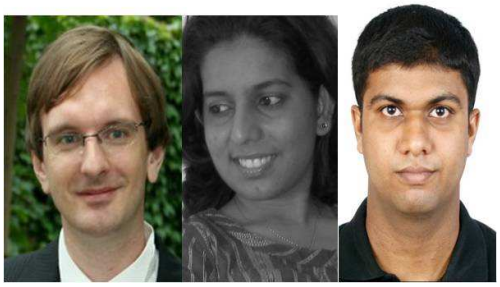

Figure 2: Falk, Neel, Rajesh

PC has a BLOG!

by Neeldhara Misra, IIS, Bangalore, BLOG Editor We are excited to announce the Parameterized Complexity BLOG. The blog will join the parameterized complexity newsletter and wiki in announcing new results and open problems. There is space for posting lecture notes and expositions of existing results. It has been set up to be a group blog so join right in and help create a healthy dose of activity.

ACCESS the BLOG at `http://www.fptnews.org`
SIGN UP: `http://www.fptnews.org/contribute/`

Citation Statistics

by Mike Fellows, Charles Darwin Univ, AU

I recently gathered some citation statistics that the community may find interesting and may be able to use in some way. I thought I'd check around and see the relative performance, in citation rates, of parameterized complexity and algorithmics papers accepted to the two

journals where I am Associate Editor, that is JCSS and TALG. The data was gathered using *Publish-or-Perish*.

Statistics for JCSS.
Period I: all papers published in JCSS in the years 2003-2013 (11 years), average number of cites per paper: 19.5 (788 papers).
Period I: same, but restricted to papers in my area (45 papers), av cites/paper: 29.1.
Period II (more recent) 2008-2013: average number of cites over all papers published in JCSS in this period is 9.9. Over the PC area (27 papers) published in JCSS in this period, the av cites/paper is 23.2.

Similar statistics were found for TALG.
2006–April 2013 (all papers): average cites/paper: 15.7.
2006–April 2013 (papers in Parameterized Complexity) av cites/paper: 20.7.
2009–April 2013 (all papers): av cites/paper: 8.4.
2009–April 2013 (papers in PC) av cites/paper: 16.1.

SOLVED! k-Vertex-Disjoint Path

Congratulations to **Marek Cygan, Dániel Marx, Marcin Pilipczuk, Michal Pilipczuk** for showing (110 page paper!) that the planar directed k-Vertex-Disjoint Paths problems is FPT. The long-standing open problem was listed in the Downey and Fellows monograph in the Appendix: *Research Horizons, A Lineup of FPT Suspects*. See arXiv: 1304.4207v1[cs.DM]15 April.

Protein Mixture, Hitting Set, Linear Algebra

by Peter Damaschke and Leonid Molokov, Chalmers Univ of Technology

Congratulations to **Leonid Molokov** who has successfully defended his PhD thesis *Protein mixture inference as hitting set variants and linear algebra problems* at Chalmers University of Technology in Gothenburg, Sweden. The Main supervisor: Peter Damaschke, Co-supervisor: Devdatt Dubhashi, Discussion leader at the "half-time defense" in 2011: Sebastian Böcker, Opponent at the defense: Henning Fernau. Partial support came from the Swedish Research Council, through Peter Damaschke's grants "Combinatorial inference algorithms – parameterization and clustering" and "Generalized and fast search strategies for parameterized problems", and from the Chalmers Bioscience Initiative through Devdatt Dubhashi's grant.

The thesis comprises several FPT-related papers (1; 2; 4; 6). The biological background is the problem of reconstructing a mixture of proteins after splitting them into peptides. Only the mixture of peptides is visible, but one cannot see which candidate protein produced which peptide. The inference problem can be expressed as Set Cover (or equivalently, Hitting Set). However, experimental errors like spurious and missing peptides further complicate the problem. Interesting parameters include the number of occurrences of peptides in the candididate proteins, the number of proteins in the mixture, and the number of errors. In (1) we count the minimal hitting sets containing a fixed vertex, as an indication of the likelihood of the protein represented by that vertex, and we bound the size of an "enumerative kernel". A two-stage process of error correction prior to protein inference is proposed in (2; 4). It leads to some nice (hyper-)graph editing problems. Jiong Guo and Yash Raj Shrestha have already further developed some of our results (5). We also studied the combinatorics of inferring protein quantities. In a simplified error model (6) we assume that a few peptide quantities are randomly and independently disturbed, and we aim at the reconstruction of their correct values. For the case that every peptide occurs at most twice, we can manage this in FPT time by a graph contraction algorithm, helped by a piece of matroid theory. Other articles within the project addressed the concise description of all small hitting sets in hypergraphs (3) and the enumeration of sparse solutions (more precisely: their supports) of systems of linear equations (7).

[1] P. Damaschke, L. Molokov: The union of minimal hitting sets: Parameterized combinatorial bounds and counting. J. Discr. Algor. 7 (2009), 391–401

[2] L. Molokov: Application of combinatorial methods to protein identification in peptide mass fingerprinting. KDIR 2010, pp. 307–313

[3] P. Damaschke: Parameterized algorithms for double hypergraph dualization with rank limitation and maximum minimal vertex cover. Discr. Optim. 8 (2011), 18–24 (Special Issue on Parameterized Complexity of Discrete Optimization)

[4] P. Damaschke, L. Molokov: Parameterized reductions and algorithms for a graph editing problem that generalizes vertex cover. Theor. Comp. Sci. 452 (2012), 39–46 (conference version in WADS 2011, LNCS 6844, pp. 279–289)

[5] J. Guo, Y.R. Shrestha: Kernelization and parameterized complexity of star editing and union editing. ISAAC 2012, LNCS 7676, pp. 126-135

[6] P. Damaschke, Ö. Eğecioğlu, L. Molokov: Fixed-parameter tractability of error correction in graphical linear systems. WALCOM 2013, LNCS 7748, 245–256

[7] P. Damaschke: Sparse solutions of sparse linear systems: Fixed-parameter tractability and an application of complex group testing. Theor. Comp. Sci., in

press (conference version in IPEC 2011, LNCS 7112, pp. 94–105)

Papers at Conferences/Online

We appreciate **Bart Jansen** for his heroic job posting papers on the FPT Community Wiki. See `http://fpt.wikidot.com`. There are two pages. One contains FPT-related papers which have appeared online, such as on the arXiv or on ECCC. The other is FPT papers at conferences.

Conferences and Workshops

NII Shonan PC, Japan MAY

Parameterized Complexity and the Understanding, Design and Analysis of Heuristics
DATES: May 6–11.
Organizers:
Gregory Gutin, Univ of London, UK
Kazuo Iwama, Kyoto Univ, Japan
Dimitrios Thilikos, National and Kapodistrian Univ Athens, Hellenic Republic

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Structure, Vienna, MAY

First Symposium on Structure in Hard Combinatorial Problems, Vienna Univ of Technology.
Symposium chairs:
Bart Selman (Cornell University)
Stefan Szeider (Vienna University of Technology)
DATES: Thur, May 16–Sat, May 18
`http://www.vcla.at/events/structure2013/`
Parameterized complexity is prominently featured.
Co-located event: Prof. Donald E. Knuth (Stanford) will give a lecture on May 16th.

APEX JULY

Int'l Workshop on Approximation, Parameterized and EXact algorithms APEX'2013, Satellite Workshop of ICALP. Riga, Latvia.
`http://www.lamsade.dauphine.fr/apex2013`.
Invited speakers:
Daniel Marx, Hungarian Academy of Sciences, Hungary
Maxim Sviridenko, University of Warwick, UK
Paper submission: MAY 1
Symposium: July 6-7

FPT in Cognitive Science JULY

Tutorial: Using Parameterized Complexity Analysis in Cognitive Science at the **35th Annual Mtg of the Cognitive Science Society CogSci2013**, Berlin.
`http://cognitivesciencesociety.org`
DATE: Wed, 31 July
Lecturers:
Iris van Rooij, Johan Kwisthout, Mark Blokpoel, Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour
Todd Wareham, Department of Computer Science, Memorial Univ Newfoundland, St. John's, Canada

At the same venure:
Symposium: Constraints on Bayesian Explanation at which work by the above authors, **Complexity-theoretic perspective on the preconditions for Bayesian tractability**, will be presented. Learn about Parameterized Complexity of both exact and approximate Bayesian inference as postulated by contemporary models in cognitive (neuro)science.

The paper that was selected as among the best ICCM2012 papers has now been published in the journal *Cognitive Systems Research*, `http://www.sciencedirect.com/science/article/pii/S1389041712000617\#`

Max Planck ADFOCS AUGUST

Max Planck summer school ADFOCS (Advanced Course on the Foundations of Computer Science) goes FPT.
`http://www.mpi-inf.mpg.de/conference/adfocs13/`.
DATES: Aug 5 - 9
Max Planck Institute for CS, Saarbrücken.
Speakers and topics:
Lukasz Kowalik: Algebraic Approaches to Exact Algorithms
Dániel Marx: Algorithmic Graph Structure Theory
Saket Saurabh: Parameterized Algorithms using Matroids
In all cases, no FPT-specific background knowledge is assumed.

NEW IDEAS Workshop AUGUST

Parameterized Complexity "NEW IDEAS" Workshop, Charles Darwin Univ, AU on two days 31 July and 01 Aug. Mike has new ideas to share including "Turbo-Greedy": how to parameterized in order to speed up greedy heuristics, new insights on parameterizing Bayesian Networks, Nash Equilibria, Incrementalization, ultra-finitized arithmetic, approximation and modeling, other exciting multivariate algorithmic problems. The

workshop will be broad, and we look forward to hearing your ideas.
Cost is $75. Thurs we will visit the famous Mindil Beach market.
CONTACT: Frances.Rosamond@cdu.edu.au or Michael.Fellows@cdu.edu.au.

CS-Maths Outreach AUGUST

First Int'l Conf on Creative Mathematical Sciences Communication, Charles Darwin Univ, Australia starts 1pm Fri, 2 Aug. Depart 6 Aug to Outback, return Darwin Sat, 10 Aug.
`www.cdu.edu.au/conference/csmaths`.
CONTACT: Frances.Rosamond@cdu.edu.au.
This conference looks at the new paradigm of mathematics outreach in the world. It has a monumental impact that is just beginning to evolve. The website gives the bios of a brilliant line-up of keynote speakers. Join a visionary, catalytic mix of educators, mathematical science researchers and others.

* Examine how mathematical THINKING strategies nurture 21st Century competencies.
* Look at the process of sharing unsolved maths problems and the frontiers of the field.
* Determine methods of fostering curiosity and perseverance in maths.
* Design cultural and whole body activities that show understanding and relevance to Indigenous peoples, and connect math with the inner self and community.
*Cultivate relationships between educators, mathematicians, computer science researchers and government to enhance math curiosity and enthusiasm.
* Discuss with Tim Bell and others the future directions of Computer Science Unplugged! which started as a grassroots movement and now is translated into 17 languages.
* Share successful activities with colleagues, including instances where outreach has inspired new research questions or directions. For example, Mike Fellows will describe how "Kid Crypto" inspired the new research direction of Polly Cracker crypto systems.
MAKE A DIFFERENCE IN THE WORLD

IPEC SEPT

9th Int'l Symposium on Parameterized and Exact Computation IPEC 2013,co-located with ALGO, which also hosts ESA, WABI, WAOA, ATMOS, and ALGOSENSORS. Sophia Antipolis, France.
`http://www.kr.tuwien.ac.at/events/ipec2013/`.
Abstract registration: JUNE 12
Paper submission: JUNE 15
Symposium: September 4-6
Invited speaker: Ramamohan Paturi, USCD, will speak on "Exact Complexity and Satisfiability".

Excellent Student Paper Awards may be awarded by the Program Committee to one or more papers accepted to the symposium. A paper is eligible for the award if all authors are students at the time of submission, where a student is someone who has not been awarded a PhD.

GROW in Greece OCT

6th workshop on Graph Classes, Optimization, and Width Parameters.
Santorini Island, Greece.
DATES: October 09-11.
`http://grow2013.isoftcloud.gr/`.
Join researchers working on problems related to Graph Classes, Optimization, and Width Parameters. A special issue of *Discrete Applied Mathematics* will be dedicated to papers related to GROW 2013.
Participation is by invitation.
CONTACT: Dimitrios M. Thilikos, sedthilk@thilikos.info

Cognitive Science Dagstuhl 2014

Dagstuhl Seminar 14341: Resource-bounded Problem Solving
DATES: August 17-22, 2014
Organizers:
Yll Haxhimusa (TU Wien, Austria), Iris van Rooij (Radboud University, The Netherlands), Sashank Varma (U. Minnesota, USA), Todd Wareham (Memorial Univ, Canada)
`http://www.dagstuhl.de/en/program/calendar/semhp/?semnr=14341`

Report on WorKer2013

Workshop on Kernelization (WorKer), Warsaw.
Organisers: Marek Cygan, Lukasz Kowalik, Marcin Pilipczuk.
Programmee included:

- An update on graph cut problems
- Tutorial: Matroid theory and kernelization by Saket Saurabh, Stefan Kratsch and Magnus Wahlström
- Tutorial: Kernel-size lower bounds: the evidence from complexity theory by Andrew Drucker)
- Two invited talks: Techniques used outside the kernelization area which might turn out useful in kernelization, on planar graphs by Piotr Sankowski and on spanners by Seth Pettie
- Additional short contributed talks

Pictures and comments `http://corner.mimuw.edu.pl/?p=430`.

Moving Around

Klaus Jansen has received an offer of a full professorship in the optimization group in the department of informatics at the university of Bergen.

Christian Komusiewicz has accepted a position as a post-doc at the Laboratoire Informatique de Nantes Atlantique (LINA) at the Université de Nantes for a year. Christian's host is Guillaume Fertin and they will be working on parameterized algorithms for bioinformatics problems motivated by the study of genome rearrangements and biological networks.

Anders Yeo has accepted a position at the Singapore Univ of Technology and Design on the 1st April as a visiting professor.

Danny Hermelin congratulations—now back in Israel at Ben-Gurion University.

Magnus Wahlström, formerly at Max Planck Institut fűr Informatik. Magnus has started at Royal Holloway, Univ of London as a lecturer from 1st April 2013.

CONGRATULATIONS New PhDs

Stefan Rümmele, *The Parameterized Complexity of Nonmonotonic Reasoning*, September 2012, TU Wien,Supervisor: Prof. Reinhard Pichler. Congratulations, Dr. Rümmele.

Mathias Weller, *Aspects of Preprocessing Applied to Combinatorial Graph Problems*, December 5th. Supervisor: Prof. Rolf Niedermeier. Committee: Gerhard Woeginger and Christophe Paul. Mathias has accepted a Post Doc in the Dept Informatique de LIRMM Université Montpellier II. He is happy to leave the Berlin snow. Congratulations, Dr. Weller.

Mark Jones, *Above And Below Guarantee Parameterizations For Combinatorial Optimisation Problems*, Dept Computer Science Royal Holloway, Univ of London, 4th March 2013. Supervisors: Prof. Gregory Gutin and Prof. Anders Yeo. Prof. Fedor Fomin and Prof. Colin Cooper, Examiners. Congratulations, Dr. Jones.

Figure 3: Ida Josephine Dorn

Congratulations to Britta and Bennie on the birth of their daughter Ida Josefine, born March 22. Welcome to another little FPT'er.