

Parameterized Complexity News

Newsletter of the Parameterized Complexity Community

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Welcome

Frances Rosamond, Editor, Charles Darwin University
Congratulations to many award and prize-winners, graduates, new jobs, and wonderful research. I've mentioned a few awards winners that may have been missed earlier. The 10th IPEC is in Patras, where ALGO includes a Birthday Special Event Honoring Paul Spirakis for his contributions to Computer Science.

Tenth IPEC

See you at the 10th IPEC, co-located with ALGO in Patras, Greece, 16–18 September. Co-chairs are **Thore Husfeldt**, ITU Copenhagen and Lund Univ and **Iyad Kanj**, DePaul Univ. Keynote speakers are Dimitrios Thilikos, Univ Athens, GR & CNRS, LIRMM, FR and Virginia Vassilevska Williams, Stanford Univ, USA.

Grants, Awards and Prizes

Yixin Cao, Two Grant Awards

Congratulations to **Yixin Cao**, Hong Kong Polytechnic Univ, awarded a Hong Kong GRF for *Efficient algorithms for graph modification problems* and an award from the

NSF of China for *Combinatorial and algorithmic studies on cycles*, totaling more than two million Hong Kong dollars (approx 260,000 Euro) for the next three years.



Figure 1: Yixin Cao at Hong Kong Polytechnic birthday lunch for Mike Fellows. Back row: Junbing Liang, Fei Long, **Yixin Cao**, Zili Shao, Yingqun Xiao. Front row: Head of Computing Prof. Jiannong Cao, Mike, Fran Rosamond, Prof. George Baciu.

Jianer Chen, NSF of China Award

Congratulations to **Jianer Chen** for an NSF of China Award for *Frontier Research in Parameterized Computation and Applications*, 2015–2019, 2.7M (Chinese Yuan). Int'l Collaborators Fedor Fomin, Dániel Marx.

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Edith Elkind, ERC Starting Grant

Congratulations to **Edith Elkind**, Univ of Oxford, who has received a 2014 ERC Starting Grant of about 1.1-million Euro for *Algorithms for Complex Collective Decisions on Structured Domains*. Edith is also part of the OpenDreamKit project, a 7-million Euros EU Framework 2020 open source software project to extend interactive computing environments.

Michael Fellows, Honorary Fellow of the Royal Society of New Zealand

Congratulations to **Michael Fellows**, Charles Darwin Univ, who has been named Honorary Fellow of the Royal Society of New Zealand (second person whose primary research is algorithms to receive this honor). Honorary Fellows include Einstein, Bohr, Curie, Darwin, Fleming, Priestley, Richter, Rutherford, altogether 230 since 1870.

Gudmundsson, Fellows, Gaspers, Mestre win ARC Grant

Congratulations to **Michael Fellows**, **Serge Gaspers**, **Joachim Gudmundsson** and **Julian Mestre** for winning a 2-year, 355k AUD Australian Research Council Award for *Local reoptimization for turbocharging heuristics*. Int'l collaborator Fedor Fomin.



Figure 2: Mike Hinckey, Editor-in-Chief of the *Journal of the Brazilian Computer Society* presenting the award to Uéverton dos Santos Souza.

Petteri Kaski, ERC Starting Grant

Congratulations to **Petteri Kaski**, Information and Computer Science, Aalto Univ and Helsinki Institute for Information Technology, for an ERC Starting Grant of about 1.1-million Euro for *Theory and Practice of Advanced Search and Enumeration*, start date was 2013.

Christian Komusiewicz, DFG Award

Congratulations to **Christian Komusiewicz** on a 3-year, 340k Euro DFG Award for *Multivariate Algorithms for Graph and String Problems in Bioinformatics*. He will take up a position in Jena in October with plans to establish a junior research group. "Visitors welcome."

Stephan Kreutzer, ERC Consolidator

Congratulations to **Stephan Kreutzer**, TU Berlin, who received an ERC Consolidator Grant for *Structure Theory for Directed Graphs*, start date was 2014.

Bingkai Lin, SODA Best Paper Award and the Best Student Paper Award

Congratulations to **Bingkai Lin**, Univ Tokyo for receiving both the SODA Best Paper Award and the Best Student Paper Award for showing k -BI-CLIQUE is $W[1]$ -hard. (www.siam.org/meetings/da15/paper.php).

Radu Curticapean, Best Student ICALP

Congratulations to **Radu Curticapean**, for receiving the 2015 ICALP Best Student Paper Award, Track A, with *Block Interpolation: A framework for tight exponential-time counting complexity*. In 2013, Radu was awarded the Best Student ICALP Paper Award, Track A, with *Counting matchings of size k is $\#W[1]$ -hard*. ICALP best student paper awards are given to papers that are solely authored by students. Radu will finish his Ph. D. with Markus Blaser this summer, and has accepted a post-doc position with Dániel Marx.

Jason Crampton, Gregory Gutin, Daniel Karapetyan, Best ACM SACMAT Paper

Congratulations to **Jason Crampton**, **Gregory Gutin**, and **Daniel Karapetyan**, Royal Holloway, Univ of London, for *Valued Workflow Satisfiability Problem*, the Best Paper Award at ACM SACMAT 2015. The paper studies theoretical and experimental FPT algorithms for a new generalization of problems in access control.

Britta Dorn, Tübingen Teaching Award

Congratulations to **Britta Dorn**, Univ Tübingen, who has been elected by her students to receive the Department of Mathematics Teaching Award. Britta is modest about her well-earned award: I have super nice students (about 300-400 each term...). And I try to do some extra things, not just the normal classes, like giving a course at the Children University or at a science pub.

Ling-An Lin, CDU Master's Award

Congratulations to **Ling-An Lin** for the Charles Darwin Univ., Australia, School of Engineering and Information Technology Master by Coursework Research Prize for her thesis, *A Parameterized Approach to Heterogeneous Diabetes Treatment Data*. Ling was also awarded for *Outstanding Academic Achievement in Postgraduate Information Technology*. Her advisors are Peter Shaw, Judith Egan, Faisal Abu-Khzam and Timothy Skinner.

Uéverton dos Santos Souza, Two PhD Awards

Congratulations to **Uéverton dos Santos Souza**, Fluminense Federal Univ, Rio de Janeiro, whose PhD thesis, *Multivariate Investigation of NP-Hard Problems: Boundaries Between Parameterized Tractability and Intractability*, was awarded third best thesis in Informatics of all of Latin America in the "I Concurso Latinoamericano de Tesis de Doctorado" of "XLI Conferencia Latinoamericana en Informática (CLEI 2015)." PhD theses from EIGHT different countries were received: Argentina, Brazil, Chile, Colombia, Cuba, Peru, Uruguay, and Venezuela. Additionally, the Congress of the Brazilian Computer Society announced that Uéverton was the third place winner in the best thesis award of the Brazilian Computer Society. Uéverton's advisors were Fábio Protti, Maise Dantas da Silva, and Dieter Rautenbach.

Toby Walsh – Killer Robots

Interviews with **Toby Walsh** (NICTA and UNSW, AU) have been in the *Guardian Weekly* (31 July - 6 Aug, p. 7) the *Australian* (28 July), NYT (www.nytimes.com/2015/07/28/technology/.html) and many other places, discussing weapons systems that operate independently of human control. Scientists at IJCAI-15 are set to release an open letter to the UN asking for a ban on autonomous weapons systems, so-called "killer robots". They warn that autonomous weapons can be mass produced relatively efficiently, unlike nuclear weapons requiring large scale investment in materials, infrastructure and skilled personnel.

The letter has received the backing of Apple co-founder Steve Wozniak, Skype co-founder Jaan Talinn, renowned physicist Stephen Hawking and Tesla founder Elon Musk. All four have recently highlighted the risk posed in a scenario where technology is able to replicate without the need for human guidance.

"It's easy to reposition technology and there are many things AI can help with in battlefield conditions, think of robotic minefield clearance, that's a wonderful use of the technology," Toby said. "What we are arguing is that humans must not be taken out the loop when it comes to decision making."

New book – *Parameterized Algorithms*

Parameterized Algorithms by by Marek Cygan, Fedor V. Fomin, Lukasz Kowalik, Daniel Lokshtanov, Dániel Marx, Marcin Pilipczuk, Michal Pilipczuk, Saket Saurabh. Springer 2015. Available by download as an e-book.

This comprehensive textbook presents fundamental tools and techniques in Parameterized Algorithms. It is a self-contained guide to the area. The book covers many of the recent developments of the field, including application of important separators, branching based on linear programming, Cut & Count to obtain faster algorithms on tree decompositions, algorithms based on representative families of matroids, and use of the Strong Exponential Time Hypothesis. A number of older results are revisited and explained in a modern and didactic way.

The book provides a toolbox of algorithmic techniques. Part I is an overview of basic techniques, each chapter discussing a certain algorithmic paradigm. The material covered in this part can be used for an introductory course on fixed-parameter tractability. Part II discusses more advanced and specialized algorithmic ideas, bringing the reader to the cutting edge of current research. Part III presents complexity results and lower bounds, giving negative evidence by way of W[1]-hardness, the Exponential Time Hypothesis, and kernelization lower bounds.

In this manner the book starts with very basic concepts, and goes all the way to selected topics in the frontier of the current research (like tools for cut problems or usage of matroids), while at the same time providing the necessary foundations for proving complexity lower bounds needed by an algorithm designer. The main idea behind the book is that it can serve as a versatile textbook for teaching a 1-2 semester course on parameterized algorithms on graduate, or advanced undergraduate level. All the results and concepts are introduced at a level accessible to graduate students and advanced undergraduate students. There are 15 chapters, each ending with around 15-30 exercises together with hints and bibliographic notes to original publications and related work. The book is illustrated by Felix Reidl.

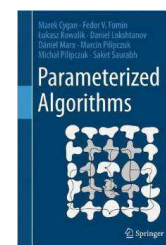


Figure 3: *Parameterized Complexity* by Cygan et al.

Parameterized Streaming: Maximal Matching and Vertex Cover

by Rajesh Chitnis, *The Weizmann Institute of Science, Israel* and MohammadTaghi Hajiaghayi, *University of Maryland, College Park*

In recent times, we have to increasingly deal with *big* graphs such as the Web graph, social networks, etc. It is highly infeasible to store such graphs in memory, yet we need to solve various fundamental problems on them. One model that has proved successful in dealing with this issue is the *streaming* model: the vertex set is known in advance, and the input is a sequence of edges. We will denote the vertex set by $V = [n]$. The stream of edges is given by $\langle a_1, a_2, \dots, a_m \rangle$ where each $a_i \in [n] \times [n]$. There are two kinds of models: either the edges can only be inserted, or we can have both edge deletions and insertions (these are called as dynamic streams). The goal is to design algorithms for solving the problem at hand without remembering the whole graph; ideally maintaining space which is sublinear in the size of the graph.

Unfortunately many basic problems such as checking if the graph is connected are known to require $\Omega(n)$ space [2]. Muthukrishnan suggested the *semi-streaming* model which allows $O(n \cdot \text{polylog } n)$ space. In this model Feigenbaum et al. [1] showed that one can indeed solve various problems like Connectivity, Bipariteness, Min Spanning Tree etc. However, many of the instances that we encounter in real world applications often have solutions that are very small compared to the size of the input. Consider for example the problem of finding the minimum number of fire stations to cover an entire city, or similar cases where we expect that a small number of facilities should serve a large number of locations. In these scenarios, assuming that the number of fire stations or facilities is a small number k (compared to n) is very practical. Therefore, it is meaningful to solve instances of graph problems whose solutions are small (say, sublinear in the input size) in a streaming fashion using space which is bounded with respect to the size of their solutions, and not the input size. In order to make progress on this objective, we *parameterize* problems with a parameter k , and look for a solution whose size is bounded by k . We therefore seek *parameterized streaming algorithms* whose space and time complexities are bounded with respect to k , i.e., sublinear in the size of the input.

In the parameterized Vertex Cover, we are given an integer k and the question is whether a graph G on n vertices has a vertex cover of size at most k ? We use the notation that $\tilde{O}(f(k)) = O(f(k) \cdot \log^{O(1)} m)$, where m is the number of edges. In a joint work with Graham Cormode and Morteza Monemizadeh [4], we give results for this problem in the following three models:

1. Insertion-Only Streams: In this model the edges can only be inserted. By essentially mimicking the kernelization algorithm of Buss and Goldsmith [5], we obtain a one-pass deterministic algorithm for the parameterized

Vertex Cover problem which maintains $O(k^2)$ space such that at each timestamp in time $\tilde{O}(2^k)$ it can either extract a solution of size at most k for the current instance, or report that no such solution exists. Interestingly, we are also able to show a matching lower bound for the space complexity of our algorithm via communication complexity. Formally, we show that any (randomized) parameterized streaming algorithm must use $\Omega(k^2)$ space.

2. Dynamic Streams: In this model the edges can be both inserted and deleted. This leads to the following challenge: when an edge is deleted we must have ensured that the algorithm has enough information to take this into account, while only keeping a bounded amount of working space. By using the observation that a graph with a vertex cover of size k can have at most kn edges, we are able to design a randomized algorithm (probability of failure is polynomially small in n) for the parameterized Vertex Cover problem which uses $\tilde{O}(nk)$ space and in time $\tilde{O}(nk + 2^k)$ it can either extract a solution of size at most k for the final instance, or report that no such solution exists. The high-level idea is to maintain a *kn-sample recovery algorithm*, which is a data structure which accepts insertions and deletions of elements so that at any moment it can provide a sample of size kn from the elements stored in it (provided there are at least kn such elements). Barkay et al. [6] showed how to maintain a k -sample recovery algorithm using $\tilde{O}(k)$ space.

3. Promise in Dynamic Streams: In this model the edges can still be both inserted and deleted, but now we are *promised* that at every timestamp there is a solution of cost at most k . For this model, we are able to design a one-pass $\tilde{O}(k^2)$ -space streaming algorithm that in time $\tilde{O}(2^k)$ extracts a solution for the final instance with probability $1 - \delta/n^{O(1)}$, where $\delta < 1$.

In order to show the above result, we attack the Vertex Cover problem via the Maximal Matching problem. Under the promise that the size of maximal matching is always at most k , we give a one-pass $\tilde{O}(k^2)$ -space algorithm that maintains a maximal matching such that after each edge insertion/deletion we can update the current maximal matching in $\tilde{O}(k^2)$ time. This algorithm is interesting in its own right, and partially solves Open Problem 64 from [7] which asks “can we approximate the size of the maximum cardinality matching up to constant factor given a single pass and $o(n^2)$ space?”. The proof of this result in [4] is quite complicated, and a much simpler algorithm was recently given in [9]. In [9], it is shown that a similar approach also gives a $\tilde{O}(k^2)$ space algorithm for the Point Line Cover problem under the promise that the given n points can be covered by at most k lines.

Future Directions: In [4], we also gave a simple $O(nk)$ space for Feedback Vertex Set in insertion-only streams and showed a lower bound of $\Omega(n)$. It might be interesting to look at other parameterized problems in the streaming setting.

Another interesting research direction is to look at

connections between kernels and parameterized algorithms in the streaming setting. Fafanie and Kratsch [8] defined streaming kernelization, and showed positive and negative results for various problems.

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NEW – Application Section on the Wiki

Many thanks to **Gregory Gutin** for adding *Access Control* as an application area on the Parameterized Complexity community wiki (www.fpt.wikidot.com).

Application Activities

Gregory Gutin, Royal Holloway, University of London, organized a special Session at EURO 2015 (a huge conference in operations research, 3K people or so, <http://www.euro2015.org>). He reports that three out of four talks at his session are FPT related, including reports on “recent implementations of FPT algorithms that beat fair and square a SAT solver and even CPLEX on relatively difficult instances.” The implementations and experimental results are important at OR conferences. Gregory said some looked at the FPT wiki and were surprised to see access control as one of the areas of application (see above).

Up-To-Date on the WIKI

Conference and arXiv papers are maintained on www.fpt.wikidot.com at *FPT papers in Conferences* and *FPT papers On-Line* by **Bart Jansen**. Please let Bart know your papers (or add them yourself).

Positions Available

Please note the *Positions Available* page on the wiki. Stefan Szeider lets us know that positions are available at TU – Wien, specially addressed to female applicants. Deadline is 30 August. See <https://www.ac.tuwien.ac.at/jobs/> or contact Stefan.

Conferences/Workshops

GROW 2015 – October

7th Workshop on Graph Classes, Optimization, and Width Parameters (GROW 2015), October 2015, Aussois, France Chair, **Christophe Paul**, Montpellier.

Multivariate Algorithmics and Approximation – Nov 2015

Banff (Seminar 15w5118) on *Approximation Algorithms and Parameterized Complexity*, Nov 29 – Dec 4, 2015. Organizers: **Michael Fellows** (Charles Darwin Univ), **Hadas Shachnai** (Technion), **Klaus Jansen** (Univ Kiel), **Roberto Solis-Oba** (Univ Western Ontario).

Multi-Winner Elections – February 2016

Social Choice: Multi-Winner Elections - Complexity Theory to Social Choice to Political Science. 7th Summer Workshop of the Centre for Mathematics in Social Science of the Univ of Auckland, NZ. Dates: 18-19 February 2016. Included is a Mathematical Psychology Day with tutorials on Experimental methods in Economics and Political Science and on PREFLIB, an online library of preferences, and a discussion panel on the role of experiments, on the one hand, and theoretical results in Mathematics and Computer Science, on the other, in Economics and Political Science. Invited speakers: Bernard Grofman (UC, Irvine), Charles Plott (Caltech), Jean-Francois Laslier (Paris School of Economica), Rolf Niedermeier (Technical Univ Berlin), Piotr Faliszewski (AGH Univ Technology, Krakow). Chair, **Arkadii Slinko** (a.slinko@auckland.ac.nz).

Creative Mathematical Sciences Communication - Tel Aviv –Sept/Oct 2016

The *Second Int'l Conf. on Creative Mathematical Sciences Communication* (CMSC) was held Dec '14 at IMSc, organized by **R. Ramanujam** and **Frances Rosamond** (<http://www.imsc.res.in/~cmsc2014/index.html>).

Research scientists and teachers discussed ways of sharing frontiers of computer science/math. A highlight was the extremely well-organized Tamil Nadu Science Forum Childrens Festival where the international science visitors (us!) were showered with flower petals as guests of honor and welcomed by over 300 children and teachers from 20 primary schools, together with cameramen and reporters from local TV and newspapers. After many photographs, the crowd dispersed into numerous classrooms where teachers and visitors shared math ideas with fascinated students. TNSF is a people's movement committed to science popularization and education and run by dedicated volunteers (https://en.wikipedia.org/wiki/Tamilnadu_Science_Forum).

Benny Chor and **Noy Rotbart** are Chairs of the 3rd CMSC which will take place in Tel Aviv in Sept or Oct 2016. The first CMSC was held in Darwin, AU (www.cdu.edu.au/conference/csmaths).

Congress of Brazilian Computer Society – Aug 2015

At the *Congress of Brazilian Computer Society*, Uéverton Souza and Vinicius Santos presented a short course on Parameterized Complexity, which was the first course in Portuguese on this topic. Their text is available at <http://bit.ly/AnaisCSBC2015>, file “anais_do_JAL2015” (Chapter 5 Uma Introdução à Complexidade Parametrizada).

ELC Workshop on Parameterized Algorithms – March 2015

The *ELC Workshop on Parameterized Algorithms* was held at the Univ of Electro-Communications, Chofu, Tokyo in March. Organizers were **Rémy Belmonte**, **Naoki Katoh**, and **Yoshio Okamoto**. Speakers included Michal Pilipczuk, Valia Mitsou, Bingkai Lin, Yushi Uno, Saket Saurabh, Michael Lampis, Yixin Cao, and Rémi Watrigant.

WorKer – June 2015

The 2015 *WorKer: Workshop on Kernelization* was held at the Sophus Lie Conference Center in Nordfjordeid (accessed via a scenic fjord ferry from Bergen), and was organized by **Pal Drange** (Chair), **Markus Dregi**, **Fedor Fomin**, **Daniel Lokshtanov**, **Dániel Marx** and **Saket Saurabh**. See the outstanding talks and Open Problem Session at <https://worker2015.b.uib.no/>.

Moving Around – Promotions and New Positions

CONGRATULATIONS on promotions and new positions, all good news and well deserved.

Manu Basavaraju has accepted a position of Assistant Professor of Computer Science, National Institute of Technology, Surathkal, India.

Ljiljana Brankovik has been promoted to Professor at Univ Newcastle, Australia.

Édouard Bonnet, **Radu Curticapean**, **Andread Feldmann**, **Valia Mitsou**, **O-Joung Kwon**, and **Till Miltzow** are now all post-docs with Dániel Marx at the Institute for Computer Science and Control (Hungarian Academy of Sciences). Dániel has additional postdoc positions available for the ERC Starting Grant PARAMTIGHT: “Parameterized complexity and the search for tight complexity results”.

Laurent Bulteau is in the Bamboo Team at Lyon Univ.

Andrew Drucker will move to the Univ of Chicago as Assistant Professor.

Stefan Fafianie is at the Univ of Bonn.

Tobias Friedrich is Chair for the Algorithm Engineering Institute at Hasso Plattner Institute, Univ of Potsdam.

Jens Gramm has joined Robert Bosch GmbH, Berlin.

Nina Gierasimczuk has a permanent job at DTU Compute in Copenhagen. She will be joining in January.

Jiong Guo is Professor at Shandong Univ in Jinan, China.

Lars Jafke will start a PhD with Harry Buhrman and Bart Jansen in Amsterdam.

Bart Jansen is Assistant Professor at TU-Eindhoven.

Jukka Kohonen has accepted a postdoc with Petteri Kaski at the Helsinki Institute for Information Technology and Aalto Univ.

Stefan Kratsch is a faculty member at the Univ of Bonn Institute of Computer Science.

Vadim Lozen has been promoted to Professor at Univ of Warwick.

Neeldhara Misra has accepted a joint appointment with the Department of Mathematics and the Department of Computer Science at one of the newest universities in India, IIT-Gandhinagar.

Amer Mouwad has a postdoc with Daniel Lokshtanov at the Univ of Bergen.

Jesper Nederlof is Assistant Professor at TU-Eindhoven.

Sebastian Ordyniak is now in Vienna as a postdoc with Stefan Szeider.

Daniel Paulusma has been promoted to Professor at Durham Univ.

Geevarghese Philip has joined the faculty of Chennai Mathematical Institute (CMI), which has research groups in Computer Science and Mathematics that are among the best known in the country. Philip is teaching a Parameterized Algorithms course at CMI this semester.

Astrid Pieterse will start a PhD with Bart Jansen in TU – Eindhoven.

Stefan Ruemmele has accepted a postdoc with a joint project led by Serge Gaspers, Joachim Gudmundsson, Julian Mestre, and Mike Fellows in the USYD SACT research group and UNSW Algorithms group. Welcome to Oz.

Hadas Shachnai has been promoted to Professor at the Technion, Israel.

Somnath Sikdar will move from Univ Aachen to Zalando Corp in Berlin.

Ramanujan Sridharan, MSR has joined the Algorithms and Complexity group led by Stefan Szeider at TU – Wien.

Uéverton dos Santos Souza was approved in competition for Professor of Computing Institute of the Fluminense Federal Univ, Rio de Janeiro.

Toby Walsh is NICTA Chair of AI at Univ of New South Wales (UNSW), Australia.

Ahn Quyen Vuong is at the Univ of Bonn.

CONGRATULATIONS New PhDs

Edouard Bonnet, *Positive and Negative Results in Approximation and Parameterized Complexity*, Univ Dauphine, Paris, Advisor: Prof. Vanelis Paschos. Dr. Bonnet has accepted a postdoc with D. Marx at the Institute for Computer Science and Control, Hungarian Academy of Sciences (MTA SZTAKI). Congratulations, Dr. Bonnet.

Robert Brederick, *Multivariate Complexity Analysis of Team Management Problems*, TU Berlin, Advisor: Prof. Dr. Rolf Niedermeier. Congratulations, Dr. Brederick.

O-jeung Kwon, *On the structural and algorithmic properties of linear rank-width*, KAIST, South Korea, Prof. Sang-il Oum. Congratulations, Dr. O-jeung Kwon. Dr. Kwon has accepted a postdoc position in the Hungarian Academy of Sciences with Dániel Marx.

André Nichterlein, *Degree-Constrained Editing of Small-Degree Graphs*, TU Berlin, Advisor: Prof. Dr. Rolf Niedermeier. Congratulations, Dr. Nichterlein.

Friedrich Slivovsky, *Structure in #SAT and QBF*, TU Wien, Vienna, Advisor: Prof. Dr. Stefan Szeider. Congratulations, Dr. Slivovsky.

Amu Mouawad, *On Reconfiguration Problems: Structure and Tractability*, Department of Computer Science, Univ of Waterloo, Advisor: Prof. Naomi Nishimura. Congratulations, Dr. Mouawad.

Reza SaeiDinvar, *Algorithmic and Combinatorial Problems on Graph Classes*, Univ Bergen, Advisor: Prof. Pinar Heggernes. Congratulations, Dr. Saei.

Rémi Watrigant, *Approximation and parameterized complexity of graph optimization problems: partitions and subgraphs*, LIRMM of Montpellier, Advisors: Prof. Marin Bougeret and Prof. Rodolphe Giroudeau. Congratulations, Dr. Watrigant.

Families

Nadja Betzler and **Johannes Uhlmann** have a baby girl. Congratulations!

Congratulations to the new bride and groom, **Robert** and **Olga Ganian**.

Congratulations to **Ondrej Suchý** who has a second son since March.