Parameterized Complexity News

Newsletter of the Parameterized Complexity Community

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NEWSLETTER REPORTERS WANTED
The PC Newsletter needs two Reporters

Reporter 1: Awards and Prizes. Scout the community to find awards and prizes (Who won and from what institution, Name of award and something about it, Giver, Amount over how many years). This is important because *money likes to park next to money*; i.e., anyone writing a grant proposal needs to be able to cite other winners. It is important because it announces a new direction of the field. It is important because an award usually means money for post-docs and PhDs. The announcement gives advance information to those seeking. Awards such as grants or Best Student Paper Awards deserve to be recognized by the community, and they serve as encouragement to us all.

Reporter 2: Who is moving where, and new PhDs. Here we track the professional careers of our community, from the PhD to a post-doc to a "real job" and maybe family and babies. Every step represents many challenges overcome and is a cause for celebration and recognition.

Enjoy the Newsletter

Congratulations to all for many awards and prizes, graduates, new jobs, and wonderful research. Read about the *Polynomial Planar Directed Grid Theorem* by Meike Hatze et al and the article *Fine-Grained Complexity of Program Verification Tasks* by Peter Chini et al. Compete in the new Parameterized Complexity Essay Contest. Mike Fellows has been nominated for the FOCS Test of Time Award for his 1989 paper that lays out the beginnings of PC. He will describe this bit of history in the next newsletter. Follow fb page `@MikeFellowsFPT`. Have a nice Spring. Frances.Rosamond@uib.no and Valia Mitsou (Univ Paris Diderot) vmitsou@liris.cnrs.fr.

Nerode Prize Winners

CONGRATULATIONS to Nerode Prize Winners **Noga Alon, Raphael Yuster, Uri Zwick** for *Color-coding*, Journal of the Association for Computing Machinery, Vol 42, No 4, pp. 844-856 (1995). Based on its excellent technical exposition and its introduction of a seminal technique that has led to many key research directions in parameterized complexity, the EATCS-IPEC Nerode Prize Committee unanimously voted that this foundational pa-

Contents of this issue:

per by Alon, Yuster, and Zwick be awarded the 2019 Nerode Prize.
The Laudatio: The technique of Color-Coding, introduced by Alon, Yuster, and Zwick introduces the following elegant and powerful insight to find occurrences of a k-vertex pattern subgraph H in a larger host graph G: when randomly assigning one out of k colors to each vertex of G, there is a non-negligible probability that all the vertices of any fixed occurrence of the pattern H receive distinct colors. If the pattern H is tree-like, then dynamic programming can be used to efficiently find such an occurrence of the pattern H with distinctly colored vertices. Color-coding has become a vastly important ingredient in the toolbox of parameterized algorithm design. The technique plays a prominent role in all textbooks on the subject. It has been successfully applied to obtain effective or faster parameterized algorithms for a wide range of problems, including k-path, k-cycle, subgraph isomorphism, packing and matching, graph motif, clustering, motion planning, local search, and graph cut problems. The seminal paper by Alon, Yuster, and Zwick introduces the technique in an accessible way and addresses many related aspects that have become important in parameterized complexity: derandomization, the algorithmic tractability of bounded-treewidth pattern graphs, and speed-ups for input graphs from a proper minor-closed family.

The Award will be presented at the IPEC / ALGO Symposium. The Award Committee is Janier Chen (Texas A & M), Hans Bodlaender (Univ Utrech) and Virginia Williams (MIT).

Eduard Eiben awarded the Austrian National Award of Excellence

CONGRATULATIONS to **Eduard Eiben**, post-doc at Univ Bergen, who was awarded the National Award of Excellence by the Austrian Federal Ministry of Education, Science and Research (BMBWF) for his outstanding dissertation.

Figure 1: Eduard Eiben (Univ Bergen), has been awarded the Austrian National Award of Excellence.

The award ceremony took place in Vienna on December 5th, 2018. Eduard Eiben has been awarded for his dissertation Exploiting new types of structure for fixed-parameter tractability. The work was carried out as part of a research project funded by the Austrian Science Fund FWF at the Institute for Logic and Computation at the Faculty of Informatics at TU Wien. The supervisors were Prof. Stefan Szeider and Dr. Robert Ganian.

Eduard Eiben is the first graduate of the Doctoral Program Logical Methods in Computer Science (LogiCS), which was founded in 2014 by professors at TU Wien, TU Graz, and JKU Linz.

I am particularly pleased that an algorithmic work has been awarded, because algorithms will in future gain an increasingly important role in technological innovation, says Prof. Georg Gottlob, the head of the LogiCS Doctoral College.

Jessica Enright and Kitty Meeks have been elected to the Young Academy of Scotland

CONGRATULATIONS to **Jessica Enright** (Univ of Edinburgh) and **Kitty Meeks** (Univ Glasgow) who have been elected to the Young Academy of Scotland.

Figure 2: Jessica Enright(Univ Edinburgh) and Kitty Meeks(Univ Glasgow) have been elected to the Young Academy of Scotland.

There are only 126 members from all disciplines. The Academy: provides a platform for able and innovative young entrepreneurs, professionals and academics to develop a coherent and influential voice, and to address the most challenging issues facing society in Scotland and beyond. Jessica and Kitty are using parameterized complexity to exploit the structural properties of networks that describe how cattle and sheep move around Britain, as well as how farms contact each other geographically and via wind movement. Jess is the General Secretary of the Edinburgh Mathematical Society, Kitty currently holds a Royal Society of Edinburgh Personal Research Fellowship at the Univ of Glasgow.

Mateus de Oliveira Oliveira awarded the IKTPLUSS Young Researcher Award

CONGRATULATIONS to **Mateus de Oliveira Oliveira** (Univ Bergen, Norway) who has been awarded

the prestigiousthe Norwegian Research Council IKTPLUSS Young Research Talent Award.

Figure 3: Mateus de Oliveira Oliveira (Univ Bergen, Norway) has been awarded the Young Researcher Talent Award.

Mateus project, *Automated Theorem Proving from the Mindset of Parameterized Complexity*, has been granted the Norwegian Research Council IKTPLUSS program: Young Researcher Talent award. The Research Council's awards for young outstanding researchers reward high scientific merit, independence and innovative thinking, and are intended to motivate prize recipients at an early stage in their careers to expand their efforts and continue to pursue a career in research.

Vangelis Paschos has been awarded Visiting Professorship

CONGRATULATIONS to **Vangelis Paschos** (Lamsade, Univ Dauphine) for receiving a Visiting Professorship in the Department of Management and Production Engineering (DIGEP) at the Univ of Torino. The department is the point of reference in Politecnico di Torino for research in the relationship between systems of production of goods and services and the economic environment in which they operate. The DIGEP promotes basic and applied research, training, technology transfer and services to the local community in the areas of systems of production, quality management, product design, management and accounting, industrial plants, law and economics.

Call for papers – Algorithms Special Issue

Contributions of research articles are invited for a forthcoming special issue of "Algorithms" dedicated to *New Frontiers in Parameterized Complexity and Algorithms*. Submissions are welcome encompassing the entire breadth of research in this area, both theoretical and experimental. This includes new developments in lower bounds and fine-grained parameterized complexity analysis. Particularly invited are articles on new research directions and new paradigms of problem parameterization that have been little explored.

Deadline for manuscript submissions: 15 July 2019 (extension possible, speak to Editors)
More information is at the website: https://www.mdpi.com/journal/algorithms/special_issues/Parameterized_Complexity
Guest Editor Frances Rosamond (Univ Bergen)
Co-Guest Editors Neeldhara Misra (IIT-Gandhinaga), Meirav Zehari (Ben-Gurion Univ)

Algorithms (ISSN 1999-4893; CODEN: ALGOCH) is a peer-reviewed open access journal which provides an advanced forum for studies related to algorithms and their applications. Algorithms is published monthly online by MDPI and is indexed by DBLP, Emerging Sources Citation Index (ESCI - Web of Science), Ei Compendex, Scopus and other databases.

Parameterized Complexity Essay Contest

Computer Science PhD students are invited to enter the Parameterized Complexity Essay Contest.

Most school students have some idea about programming. They are beginning to learn about algorithms. Computational complexity or parameterized complexity are absent from school learning. This essay contest is inaugurated in the interest of providing school students and educators early-on with information. It may sharpen communication skills of PhD students.

Essay Theme: What is Parameterized Complexity, who uses it, and how has it changed the world?

Audience: The essay must be aimed at a 7th grade student (approximately 12 13 years old).

Prizes: Win $100, $75, $50 and be published in the *Parameterized Complexity Newsletter*. Authors will receive free registration to the **5th Creative Mathematical Sciences Communication Conference (CMSC)** which takes place 2020 in Poznan, Poland.

Format and Eligibility: The essay contest is open to all Computer Science PhD students at the time of submission. Essays can be authored by one or more students but each student can (co-) author only one essay.

Essays should be submitted as pdf documents of any style with at most 500 words using font size 12 point or larger. Submit via email to PC_Essay@mail.com. (There is an underscore between PC and Essay).

Dates: Submissions are due by 15 June 2019. Winners will be announced in August.

Winning essays will be selected based on clarity and correctness of the information, and whether the essay captures the interest of the audience (7th graders and their teachers).

Entries will be judged by a panel consisting of a parameterized complexity researcher, a non-science author, a school teacher, and two 7th grade students.

Contact: Frances.Rosamond@uib.no

PACE Register your team now

JOIN THE CHALLENGE. The two problems in 2019 are Vertex Cover and Hypertree Width.
Dates:
• tba / May 2nd, 2019 (AOE) or 2 weeks prior to IPEC Deadline1 Deadline (DS) Submission of the final version of the solver
• tba / IPEC Deadline (tba) Deadline (DD) Submission of a solver description / short abstract (via Easychair)
• tba / Award Ceremony and notification about the solver performance, September 11-13, IPEC 2019, Munich, Germany.
• A Poster Session (tbd).
Old website: https://pacechallenge.wordpress.com/pace-2018/
New website: https://pacechallenge.org/2019/

Polynomial Planar Directed Grid Theorem

Authors: Meike Hatzel (TU Berlin) meike.hatzel@tu-berlin.de, Ken-ichi Kawarabayashi (NII) k_keniti@nii.ac.jp and Stephan Kreutzer (TU Berlin) stephan.kreutzer@tu-berlin.de

The undirected grid theorem by Robertson and Seymour is an important tool for the structural theory of undirected graphs.

In 2015, Kawarabayashi and Kreutzer proved the directed version of the grid theorem, i.e. the existence of a function f such that every digraph of directed treewidth at least $f(k)$ contains a cylindrical grid of order k. Unfortunately, while the bounds on the function for undirected graphs have now been reduced to polynomials, the upper bound on f in the directed setting is exponential.

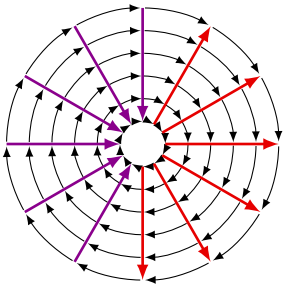
Directed treewidth and its dual concepts of well-linked sets, brambles and cylindrical grids, have found several applications already, e.g. for routing algorithms or in the study of the Erdős-Pósa property for directed graphs. Similar to the undirected case, a particularly striking application is the use in the study of approximation algorithms for low-congestion routing on planar digraphs. There are some important results by Chekuri, Ene and others crucially relying on some form of directed grid minors. However, these can not use the cylindrical grids of the directed grid theorem as the known upper bounds on the function f are far from being polynomial and are much higher than required by these applications.

The combination of planarity and treewidth has been extremely fruitful for undirected graphs. We believe that a tight relationship between directed treewidth and planar directed grid minors will lead to many interesting algorithmic applications similar to the undirected case. In the undirected case a treewidth of $6k$ suffices to ensure the existence of a grid minor of order k in planar graphs [RST94]. In our work we prove that the bound in the directed setting also is much better (polynomial) on planar graphs, and we do not expect that there is a linear one.

Our main objective therefore is to study upper and lower bounds on the function f relating directed treewidth and grid minors in planar digraphs. The main result of this paper is to close the k-fold exponential gap for planar graphs and reduce it to a merely low-degree polynomial bound. More precisely, we show the following statement [HKK19].

Theorem 1 *There exists a polynomial function $f : \mathbb{N} \to \mathbb{N}$ such that every planar digraph D with directed treewidth at least $f(k)$ has a cylindrical grid of order k as a butterfly minor.*

A *butterfly minor* of a digraph D is a graph obtained from a subgraph of D by contracting edges that are either the only ingoing edge to their head or the only outgoing edge from their tail. *Linkages* are a families of disjoint paths. A *cylindrical grid* of order k consists of k concentric, directed cycles of length $2k$ all going in the same direction and two linkages each intersecting all cycles. One of them starts on the outer most cycle and the other one on the innermost cycle and the two linkages do not intersect each other.



In this abstract we cannot hope to prove the theorem, but we want to give a rough overview on the procedures and the ideas used. The proof starts on the given digraph D with high directed treewidth and constructs a cylindrical grid butterfly minor step by step. Having the digraph D to be *Eulerian* would be very convenient, as this would allow us to assume that every strong separation is a weak separation as well. To this end, our paper introduces a new procedure called *sparsification*. This procedure takes a given graph and obtains an Eulerian subgraph of bounded degree in D that still has high directed treewidth. (There already are results yielding better bounds, special about ours is, that it also works

on non-planar directed graphs. So it is of independent interest for structural graph theory.)

The next step is to construct the form of a relaxed version of a cylindrical grid which consists of concentric cycles and linkages intersecting them inwards and outwards (but still intersecting the cycles and each other quite randomly) using results from Johnson et al. and Chekuri et al. [JRST01, CEP16], who work with a similar construction called crossbar.

One may think that this is very close to a cylindrical grid butterfly minor, but the problem is that the linkages we obtained may still go back and forth between the concentric cycles and also intersect each other in a very complicated way.

The third step then is to construct a cylindrical grid within the relaxed cylindrical grid. The most involved part is to find a structure called a *linked acyclic grid*.

We borrow a "minimality" property condition from the proof of the general directed grid theorem [KK15]. This property allows us to choose our paths so that they intersect in a very "clean" way.

Then we divide the relaxed cylindrical grid into zones with different purposes. One zone we use to construct the acyclic grid, others we use to find the linkages. We repeatedly remove paths that misbehave and distinguish cases to have enough paths with similar behaviour.

Having a linked acyclic grid the last step concluding the proof is to find a cylindrical grid minor in it, which is a fairly simple step compared to the preceding constructions and case distinctions.

[CEP16] C. Chekuri and A. Ene and Ma. Pilipczuk. *Constant Congestion Routing of Symmetric Demands in Planar Directed Graphs*. ICALP 2016.

[HKK19] M. Hatzel and K. Kawarabayashi and S. Kreutzer. *Polynomial Planar Directed Grid Theorem*. SODA 2019.

[JRST15] T. Johnson and N. Robertson and P.D. Seymour and R. Thomas. *Excluding A Grid Minor In Planar Digraphs*. arXiv preprint arXiv:1510.00473, 2015.

[JRST01] T. Johnson and N. Robertson and P.D. Seymour and R. Thomas. *Directed Tree-Width*. JCTB Vol. 82, 2001.

[KK15] K. Kawarabayashi and S. Kreutzer. *The Directed Grid Theorem*. STOC 2015.

[RST94] N. Robertson and P.D. Seymour and R. Thomas. *Quickly excluding a planar graph*. JCTB Vol. 62, 1994.

Fine-Grained Complexity of Program Verification Tasks

by Peter Chini, Roland Meyer, and Prakash Saivasan (TU Braunschweig). E-Mail: {p.chini, roland.meyer, p.saivasan}@tu-bs.de. Based on [CKKMS17, CMS18].

Introduction

Tool-based approaches to program verification have seen great success in recent years [CHVB18]. Although verification tasks are computationally hard, tools perform well. In fact, this led to a gap between practice and theory. Worst-case complexity often relies on made-up instances that do not occur in practice while tools exploit structural properties of practical instances. Parameterized Complexity comes into the picture as a theory for closing the gap. It provides fine-grained complexity judgments by identifying the influence of practical parameters. In our work [CKKMS17, CMS18], we conducted parameterized complexity analyses of typical verification tasks. The results show that techniques from both fields, Parameterized Complexity and Program Verification work well together and yield new efficient verification algorithms and unknown lower bounds.

From Programs to Decision Problems

Given a program $\mathcal{P}$ and a specification φ, verification is the task of proving that $\mathcal{P}$ satisfies the specification: $\mathcal{P} \models \varphi$. Since most programming languages are Turing complete, the problem is typically undecidable. It is therefore common to model programs by automata. These provide an abstraction which is fine enough to approximate well the program's behavior, and coarse enough to yield decidability results.

We consider the setting where $\mathcal{P}$ is a concurrent program with shared memory. To define it properly, we first fix the *data domain* D to be a finite set and denote by $a^0 \in D$ its initial value. We let $\mathcal{P}$'s threads operate over the alphabet $Op(D) = \{!a, ?a \mid a \in D\}$ to make visible the interaction with the memory. Here, $!a$ indicates a write of a to the memory and $?a$ a read of a. Each thread is a non-deterministic finite automaton (NFA) P_{id} over $Op(D)$. Then, $\mathcal{P}$ is given by the tuple $(D, a^0, (P_i)_{i\in[1..t]})$.

The satisfaction relation $\models$ is defined in terms of *configurations* of $\mathcal{P}$. These are tuples (pc, a), consisting of the *program counter* pc and the current memory value a. The former is a vector, $pc(i)$ shows the current state of P_i. Configurations are changed during a *computation*. For example, if P_i executes transition $(q, !b, q')$, the configuration (pc, a) gets updated to (pc', b), where $pc'(j) = pc(j)$ for $j \neq i$ and $pc'(i) = q'$. Read transitions can only be executed if the memory value provides the correct symbol.

Specification φ formulates properties of computations. Then, $\mathcal{P} \models \varphi$ holds if each computation of $\mathcal{P}$ satisfies φ. We consider Safety Verification. This is, we annotate the program code with assertions like `assert x=0`. Then,

φ forbids computations leading to *unsafe configurations* that break these assertions. Hence, reachability of an unsafe configuration via a computation proves non-safety: $\mathcal{P} \not\models \varphi$. Since such configurations can be modeled by final states of the P_i, (Non-) Safety Verification is equivalent to simultaneous reachability on $\mathcal{P}$: Is there a computation in $\mathcal{P}$ to (pc, a) such that $pc(i)$ is final for all $i \in [1..t]$?

The problem is PSPACE-complete. But for practical purpose, it is often sufficient to consider approximations. These make assumptions on threads or their behavior and trim the problem towards the intended type of program.

Bounded Context Switching

In the concurrent setting, a popular approximation is *Bounded Context Switching* (BCS). A *context* is a period during a computation where only one thread has the processor. BCS restricts (Non-) Safety Verification to *cs-context computations*, where $cs \in \mathbb{N}$. Such a computation can be split into $\sigma_1 \dots \sigma_{cs}$, where σ_i is a context. Given $\mathcal{P}$ and cs, BCS asks whether (pc, a) with $pc(i)$ final is reachable via a cs-context computation. Introducing a bound on the contexts has shown to be useful in experiments: Concurrency bugs in $\mathcal{P}$ can already be detected within few contexts [MQ07]. Moreover, BCS is NP-complete.

In [CKKMS17], we explored FPT-algorithms for parameterizations of BCS. Important parameters are the number of contexts cs and the size of the data domain $m = |D|$. While introducing the context bound lets the complexity drop to NP, a parameterization in cs is not likely to be FPT. We have shown that BCS(cs) is W[1]-complete.

A parameterization in both, cs and m admits an algorithm running in time $\mathcal{O}^*(m^{cs} \cdot 2^{cs})$, showing that BCS$(cs, m)$ is FPT. We elaborate on the main ideas.

First, we derive a compact way of representing computations. We suppress the interior behavior of the contexts and make visible the changes on the memory. Let $\sigma = \sigma_1 \dots \sigma_{cs}$ be a *witness*, a cs-context computation of $\mathcal{P}$ showing reachability of (pc, a). Each context σ_i induces a memory transformation $(a_{i-1}, a_i) \in D^2$, meaning that executing σ_i changes the memory value from a_{i-1} to a_i. Hence, any witness σ induces a sequence of transformations $(a_0, a_1).(a_1, a_2) \dots (a_{cs-1}, a_{cs})$. Note that different witnesses may induce the same sequence.

We consider a sequence as a word $a_0 \dots a_{cs} \in D^{cs+1}$. The words induced by witnesses form the *interface language* $IL(\mathcal{P}) \subseteq D^{cs+1}$. We have $IL(\mathcal{P}) \neq \emptyset$ if and only if (pc, a) is reachable. To check non-emptiness, we compute in polynomial time NFAs B_i such that $L(B_i)$ is the interface language $IL(P_i)$. The language contains all words in $D^{\leq cs+1}$ that contexts of P_i induce on the memory. We get that $IL(\mathcal{P}) = (\text{⧢}L(B_i)) \cap D^{cs+1}$. The shuffle symbol ⧢ indicates that the B_i take turns during a computation.

Our algorithm iterates over all words w in D^{cs+1} and tests whether $w \in \text{⧢}L(B_i)$. The iteration contributes the factor m^{cs} to the complexity. Deciding the latter is called *Shuffle Membership* (Shuff). We solve it in $\mathcal{O}^*(2^{cs})$.

Consider the positions of word w as set $U = [0..cs]$. If w lies in the shuffle, each B_i reads a subword of w, ranging over a set of positions $U_i \subseteq U$. Together these sets constitute a partition of U. We use fast subset convolution to reason over all such partitions. The behavior of B_i is captured by $f_i : \mathbb{P}(U) \to \{0, 1\}$. The function takes a set of positions and constructs the corresponding subword of w. It yields 1 if the word is in $L(B_i)$ and 0 otherwise. Then we have $(f_1 * \dots * f_t)(U) = \sum f_1(U_1) \cdots f_t(U_t) > 0$ if and only if w lies in ⧢$L(B_i)$. Constructing the f_i and computing the convolution takes $\mathcal{O}^*(2^{cs})$ time.

In [CKKMS17], we also presented lower bounds. We gave a reduction from *Set Cover* and showed that Shuff is unlikely to be solved in $\mathcal{O}^*((2-\varepsilon)^{cs})$ time, for an $\varepsilon > 0$. For BCS, we reduced from *Subgraph Isomorphism*, showing that an $\mathcal{O}^*(m^{cs/\log cs})$-time algorithm is unlikely. Moreover, we proved that BCS does not admit a polynomial kernel.

Other Approximations

In [CMS18], we considered other NP-complete approximations of (Non-) Safety Verification. We give a brief overview.

Leader Contributor Reachability (LCR). The problem assumes that there is a designated *leader* thread P_L and an unbounded number of identical *contributors* P_C. LCR asks whether there is a number $t \in \mathbb{N}$ of contributors such that P_L can reach a final state while interacting with them. Parameters of interest are $m = |D|$, the size of the leader L, and the size of the contributors C.

We found two algorithms for LCR, running roughly in time $\mathcal{O}^*((L \cdot m)^{(L \cdot m)})$ and $\mathcal{O}^*(2^C)$. The latter result is available in [CMS18A] and will shortly appear in the Journal of Automated Reasoning. The algorithms are based on compact representations of computations and dynamic programming. We also gave lower bounds for LCR, relying on ETH, *Set Cover*, and cross-compositions.

Bounded Stage Restriction (BSR). The problem generalizes BCS. Instead of bounding contexts, it introduces a bound s on the number of *stages*. A stage is a period during a computation where only writing is restricted to a single thread. BSR is the problem of deciding (Non-) Safety Verification restricted to s-stage computations.

The results show that BSR is computationally hard. We have proven by a reduction from $k \times k$-*Clique* that one cannot avoid the expensive *product construction*. Moreover, we gave a technically involved cross-composition from 3-SAT ruling out a polynomial kernel for BSR.

[CHVB18] E.M.Clarke and T.A.Henzinger and H.Veith and R.Bloem. *Handbook of Model Checking*. Springer, 2018.

[CKKMS17] P. Chini and J. Kolberg and A. Krebs and R.

Meyer and P. Saivasan. *On the Complexity of Bounded Context Switching*. ESA 2017.

[CMS18] P. Chini and R. Meyer and P. Saivasan. *Fine-Grained Complexity of Safety Verification*. TACAS 2018.

[CMS18A] P. Chini and R. Meyer and P. Saivasan. *Fine-Grained Complexity of Safety Verification*. CoRR, abs/1802.05559, 2018.

[MQ07] M. Musuvathi and S. Qadeer. *Iterative context bounding for systematic testing of multithreaded programs*. In: PLDI, 446–455, 2007, ACM.

Workshops and Conferences

Latin and American Algorithms, Graphs and Optimization Symposium LAGOS 2019

June 2nd 7th, 2019, Belo Horizonte, Brazil

Conference themes include parameterized complexity. Confirmed Invited Speakers:
Karen Aardal (Delft University of Technology, Netherlands) Sebastian Cioab (University of Delaware, USA) Michael Fellows (University of Bergen, Norway) Fabio Protti (UFF, Brazil) Ignasi Sau (CNRS, LIRMM, Universit de Montpellier, France) Maya Stein (Universidad de Chile, Chile) Vilmar Trevisan (UFRGS, Brazil) Mario Valencia-Pabon (Universit Paris-13, France)

Conference: June 2nd 7th, 2019

http://lagos2019.dcc.ufmg.br

WorKer 2019 in Bergen

The Workshop on Kernelization (Worker) is the biennial meeting of the kernelization community. Worker 2019 is to be held on June 3-7, 2019 in Norway and is by invitation only.

Invited tutorials: Christian Sohler (Google Switzerland and Technische Universitt Dortmund, Germany) and TBA.

Invited talks: Rajesh Chitnis (University of Warwick, England), Yoichi Iwata (National Institute of Informatics, Japan), Bart Jansen (Eindhoven University of Technology, The Netherlands), Stefan Kratsch (Humboldt-Universitt zu Berlin, Germany), Pranabendu Misra (University of Bergen, Norway), Marcin Pilipczuk (University of Warsaw, Poland), Sebastian Siebertz (Humboldt-Universitt zu Berlin, Germany)

Organisers: Fedor Fomin (Univ. of Bergen, Norway), Daniel Lokshtanov (UCSB, USA), Marcin Pilipczuk (Univ. of Warsaw, Poland), Saket Saurabh (Univ. of Bergen, Norway and Institute of Mathematical Sciences, Chennai, India), Eduard Eiben (Univ. of Bergen, Norway), Torstein Strmme (Univ. of Bergen, Norway), Erlend Raa Vgset (Univ. of Bergen, Norway), Manuel Sorge (Univ. of Warsaw, Poland).

http://worker2019.mimuw.edu.pl

Computer Science Symposium in Russia (CSR 2019) July 1-5, 2019, Novosibirsk, Russia.

CSR covers a broad range of TCS topics. CSR'19 will be part of the Computer Science Summer in Russia (http://cssr.nsu.ru) which will also include the Ershov Informatics Conference (PSI'19) and Summer School in Computer Science for students.

Conference dates: July 1-5, 2019

Yandex Awards for the best paper and for the best student paper will be given by the PC.

Distinguished Lecture by Andrew Yao (Tsinghua U, China)

Invited Speakers: Michael Fellows (U Bergen, Norway), Giuseppe Italiano (LUISS U, Italy), Meena Mahajan (IMSC, India), Petros Petrosyan (Erevan State U, Armenia), David Woodruff (Carnegie Mellon U, USA), Dmitry Zhuk (Moscow U, Russia).

Conference Chair: Renè van Bevern (Novosibirsk State U)

https://logic.pdmi.ras.ru/csr2019/

Computability in Europe 2019

JULY 15th - 19th, 2019, Durham UK.

Daniel Paulusma, Durham University (co-chair) Daniela Petrisan, Paris Diderot University Giuseppe Primiero, University of Milan (co-chair)

Dates: Informal Presentations: 1st May 2019 Notification for Informal Presentations: within a few days of submission.

PC and Optimization

There will be an informal workshop in Bergen from August 5 – 9, 2019. It will be similar to that held in 2018. Contact Michael.fellows@uib.no for additional information and to register participation interest.

14th IPEC (2019)

14th IPEC 2019 will take place with ALGO 2019, Munich, Germany, September 1113, 2019. The PC chairs are **Bart Jansen** (TU Eindhoven), **Jan Arne Telle** (Bergen U).

IPEC 2020 will take place December 2020 in Hong Kong, Co-located with ISAAC 2020. The Local organizer is Yixin Cao. The PC chairs will be determined by the new SC.

Moving Around – Congratulations to all

CONGRATULATIONS to **Prof. Dr. Tobias Friedrich** (Hasso Plattner Institute, Univ Pottsdam)

who has been made Academic Dean. Tobias has been the Head of the Algorithm Engineering group, which currently hosts six Post-Docs and thirteen PhD Students, with invitations for more to join.

CONGRATULATIONS to **Prof. Dr. Rolf Niedermeier** who has become Research Dean for the Computer Science Department at TU Berlin.