



STACS 2017

March 8-11, Hanover

34th International Symposium on
Theoretical Aspects of Computer Science

Program and Information

DFG Deutsche
Forschungsgemeinschaft



Institut für
Theoretische
Informatik

Conference Information

Venue

The conference is located in the Leibnizhaus. To reach the conference site, take the subway line 3, 7 or 9 from *Kröpcke* or *Hauptbahnhof* in the direction *Wettbergen* or *Empelde*. Leave at one stop behind Kröpcke at *Markthalle / Landtag*. By foot, the conference site is about 5 minutes away from there.

Wifi Access

The **eduroam** wireless network is available in the Leibnizhaus. A guest network will be provided as well.

Coffee breaks and Dinner

Between the sessions there are breaks for coffee and snacks. Lunch will not be provided.

On Friday 10th, we invite you to dinner in the *Gartensaal* restaurant in the new townhall (star symbol at the bottom of the map), which is included in the conference fee. In case you want to switch your dinner status from the registration form please come to the conference desk! **If you attend the dinner, please bring your badge with you!**

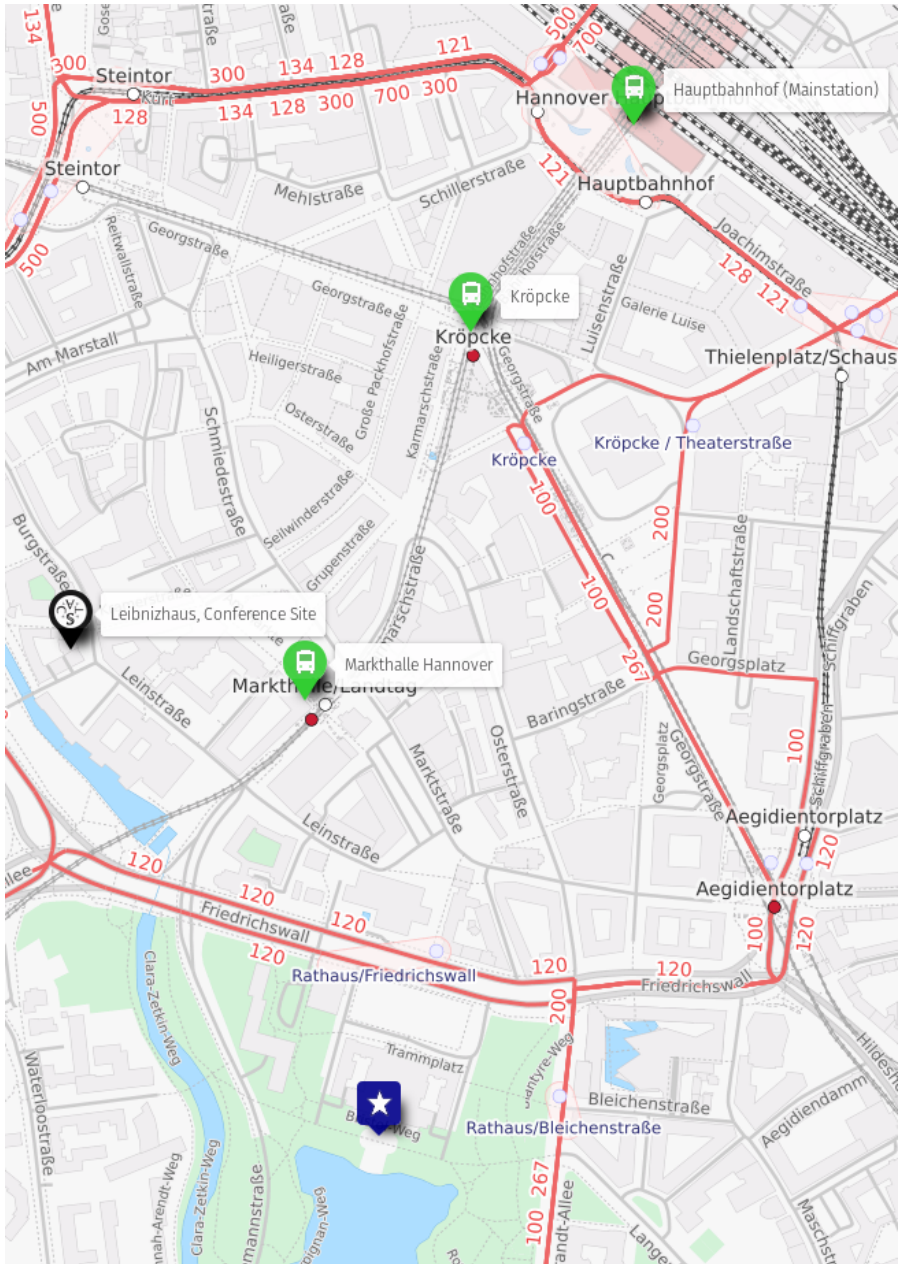
Excursion and Reception

We would like to welcome you at the reception in the Leibnizhaus on Wednesday, March 8th, which starts at 18:30, and is included in the conference fee.

We also invite you to free city tour through the historic city center of Hanover on Thursday, March 9th. The guided tour will both start and end directly in front of the Leibnizhaus, and will begin at 18:00.

Satellite workshop: AIMoTh 2017

The *Algorithmic Model Theory Meeting* (AIMoTh) will be held on March 7–8. You can find the workshop in the Faculty of Electrical Engineering and Computer Science in Hanover, Appelstraße 4. The talks will be held in room 023.



Program

Wednesday, March 8

chair: Heribert Vollmer

- 14:00–17:00 **Tutorial.** Juha Kontinen: *Computational Aspects of Logics in Team Semantics.*
- 18:30 Reception

Thursday, March 9

chair: Brigitte Vallée

- 9:00 **Invited talk.** Antoine Joux: *Discrete logarithms in small characteristic finite fields: A survey of recent advances.*
- 10:00 Coffee break
- | | Session A | chair: Till Tantau | Session B | chair: Artur Jež |
|-------|---|--------------------|--|------------------|
| 10:20 | Vikraman Arvind, Johannes Köbler, Sebastian Kuhnert and Jacobo Torán:
<i>Parameterized complexity of small weight automorphisms.</i> | | Markus Lohrey and Georg Zetsche:
<i>The Complexity of Knapsack in Graph Groups.</i> | |
| 10:45 | Stanislav Böhm, Stefan Göller, Simon Halfon and Piotr Hofman:
<i>On Büchi one-counter automata.</i> | | Tillmann Miltzow, Édouard Bonnet and Paweł Rzażewski:
<i>Complexity of Token Swapping and its Variants.</i> | |
| 11:10 | Mikołaj Bojańczyk and Michał Pilipczuk:
<i>Optimizing tree decompositions in MSO.</i> | | Jack H. Lutz and Neil Lutz:
<i>Algorithmic information, plane Kakeya sets, and conditional dimension.</i> | |
| 11:30 | <u>Coffee break</u> | | | |

- | | | |
|-------|--|--|
| | Session A chair: Henning Fernau | Session B chair: Florin Manea |
| 11:50 | Piotr Sankowski and Karol Węgrzycki:
<i>Improved Distance Queries and Cycle Counting by Frobenius Normal Form.</i> | Juha Kärkkäinen, Dominik Kempa, Yuto Nakashima, Simon Puglisi and Arseny Shur:
<i>On the Size of Lempel-Ziv and Lyndon Factorizations.</i> |
| 12:15 | Lin Chen, Dániel Marx, Deshi Ye and Guochuan Zhang:
<i>Parameterized and approximation results for scheduling with a low rank processing time matrix.</i> | Bahareh Banyassady, Matias Korman, Wolfgang Mulzer, André van Renssen, Marcel Roeloffzen, Paul Seiferth and Yannik Stein:
<i>Improved Time-Space Trade-offs for Computing Voronoi Diagrams.</i> |
| | Session A chair: Dietrich Kuske | Session B chair: Rolf Niedermeier |
| 14:40 | Moses Ganardi, Markus Lohrey, Danny Hucce and Daniel König:
<i>Circuit Evaluation for Finite Semirings.</i> | Qian Li and Xiaoming Sun:
<i>On the Sensitivity Complexity of k-Uniform Hypergraph Properties.</i> |
| 15:05 | Stephane Le Roux, Arno Pauly and Jean-Francois Raskin:
<i>Minkowski games.</i> | Bernd Finkbeiner and Martin Zimmermann:
<i>Algorithmic information, plane Minkowski sets, and conditional dimension.</i> |
| 15:30 | Gaétan Richard:
<i>On the synchronisation problem over cellular automata.</i> | Marianne Akian, Stephane Gaubert, Julien Grand-Clement and Jeremie Guillaud:
<i>The operator approach to entropy games.</i> |
| 16:00 | <u>Coffee break</u> | |

-
- | | Session A <i>chair: Jacobo Torán</i> | Session B <i>chair: Antoine Joux</i> |
|-------|--|--|
| 16:15 | Dmitry Chistikov, Szabolcs Ivan, Anna Lubiw and Jeffrey Shallit:
<i>Fractional coverings, greedy coverings, and rectifier networks.</i> | Yann Disser and Stefan Kratsch:
<i>Robust and adaptive search.</i> |
| 16:40 | Abhishek Bhrushundi, Prahladh Harsha and Srikanth Srinivasan:
<i>On polynomial approximations over $\mathbb{Z}/2^k\mathbb{Z}$.</i> | Lorenzo Clemente, Wojciech Czerwinski, Sławomir Lasota and Charles Paperman:
<i>Separability of Reachability Sets of Vector Addition Systems.</i> |
| 17:05 | Zdenek Dvorak, Daniel Kral and Bojan Mohar:
<i>Graphic TSP in cubic graphs.</i> | Samuel J. V. Gool and Benjamin Steinberg:
<i>Pro-aperiodic monoids via saturated models.</i> |
| 18:00 | <u>Excursion: guided city walk</u> | |

Friday, March 10

chair: Heribert Vollmer

9:00 **Invited talk.** Artur Jež: *Recompression: new approach to word equations and context unification.*

10:00 Coffee break

Session A chair: Rüdiger Reischuk **Session B** chair: Markus Lohrey

10:20 Fedor Fomin, Daniel Lokshantov, S. M. Meesum, Saket Saurabh and Meirav Zehavi: *Matrix Rigidity from the Viewpoint of Parameterized Complexity.* Suman Kalyan Bera and Amit Chakrabarti: *Towards Tighter Space Bounds for Counting Triangles and Other Substructures in Graph Streams.*

10:45 Eldar Fischer, Oded Lachish and Yadu Vasudev: *Improving and extending the testing of distributions for shape-restricted properties.* Shahrzad Haddadan and Peter Winkler: *Mixing of Permutations by Biased Transposition.*

11:10 Zdenek Dvorak and Bernard Lidicky: *Independent sets near the lower bound in bounded degree graphs.* Michael Kompatscher and Trung Van Pham: *A complexity dichotomy for poset constraint satisfaction.*

11:30 Coffee break

- | | | |
|-------|---|--|
| | Session A <i>chair: Jack Lutz</i> | Session B <i>chair: Juha Kontinen</i> |
| 11:50 | Titouan Carette, Mathieu Lauriere and Frederic Magniez:
<i>Extended Learning Graphs for Tri-angle Finding.</i> | Alexander Kulikov and Vladimir Podolskii:
<i>Computing Majority by Constant Depth Majority Circuits with Low Fan-in Gates.</i> |
| 12:15 | Petr Gregor and Torsten Mütze:
<i>Trimming and gluing Gray codes.</i> | Vittorio Bilò and Marios Mavronicolas:
$\exists\mathbb{R}$ -Complete Decision Problems about Symmetric Nash Equilibria in Symmetric Multi-Player Games. |
| | Session A <i>chair: Andreas Krebs</i> | Session B <i>Olaf Beyersdorff</i> |
| 14:40 | Benjamin Burton, Sergio Cabello, Stefan Kratsch and William Pettersson:
<i>The parameterized complexity of finding a 2-sphere in a simplicial complex.</i> | Maciej Skorski:
<i>Lower Bounds on Key Derivation for Square-Friendly Applications.</i> |
| 15:05 | Vasco Brattka, Rupert Hölzl and Rutger Kuyper:
<i>Monte Carlo Computability.</i> | Arkadev Chattopadhyay, Pavel Dvorač, Michal Koucký, Bruno Loff and Sagnik Mukhopadhyay:
<i>Lower Bounds for Elimination via Weak Regularity.</i> |
| 15:30 | Dominik D. Freydenberger and Markus L. Schmid:
<i>Deterministic Regular Expressions With Back-References.</i> | Robert Ganian, Ramanujan M. S. and Stefan Szeider:
<i>Combining Treewidth and Backdoors for CSP.</i> |
| 16:00 | <u>Coffee break</u> | |

-
- | | Session A <i>chair: Arne Meier</i> | Session B <i>chair: Christophe Paul</i> |
|-------|--|--|
| 16:15 | Stephan Kreutzer, Roman Rabinovich, Sebastian Siebertz and Grisha Weberstädt:
<i>Structural Properties and Constant Factor-Approximation of Strong Distance-r Dominating Sets in Sparse Directed Graphs.</i> | Paul Gallot, Anca Muscholl, Gabriele Puppis and Sylvain Salvati:
<i>On the decomposition of finite-valued streaming string transducers.</i> |
| 16:40 | Martin Koutecky, Dušan Knop and Matthias Mnich:
<i>Voting and Bribing in Single-Exponential Time.</i> | Alkida Balliu, Gianlorenzo D'Angelo, Pierre Fraigniaud and Dennis Olivetti:
<i>Local Distributed Verification.</i> |
| 17:05 | Arnaud Carayol and Stefan Göller:
<i>On long words avoiding Zimin patterns.</i> | Marius Zimand:
<i>List approximation for increasing Kolmogorov complexity.</i> |
| 18:00 | <u>Conference Dinner in the <i>Gartensaal</i></u> | |

Saturday, March 11

chair: Arne Meier

- 9:00 **Invited talk.** Till Tantau: *Applications of Algorithmic Metatheorems to Space Complexity and Parallelism.*
- 10:00 Coffee break
- Session A** chair: Henning Fernau **Session B** chair: Stefan Göller
- 10:20 Aleksi Saarela: *Word equations where a power equals a product of powers.* Peter Høyer and Mojtaba Komeili: *Efficient quantum walk on the grid with multiple marked elements.*
- 10:45 Andrej Ivaskovic, Adrian Kosowski, Dominik Pajak and Thomas Sauerwald: *Multiple Random Walks on Paths and Grids.* Nathanaël Fijalkow, Pierre Ohlmann, Joël Ouaknine, Amaury Pouly and James Worrell: *Semialgebraic Invariant Synthesis for the Kannan-Lipton Orbit Problem.*
- 11:10 Alexander Knop, Dmitry Itsykson, Dmitry Sokolov and Andrei Romashchenko: *On OBDD based algorithms and proof systems that dynamically change order of variables.* Pascal Koiran, Ignacio Garcia-Marco, Timothée Pecatte and Stéphan Thomassé: *On the complexity of partial derivatives.*
- 11:30 Coffee break
- Session A** chair: Martin Dietzfelbinger **Session B** chair: Christoph Dürr
- 11:50 Radu Curticapean, Holger Dell and Marc Roth: *Counting edge-injective homomorphisms and matchings on restricted graph classes.* Andreas Bärttschi, Jérémie Chalopin, Shantanu Das, Yann Disser, Daniel Graf, Jan Hackfeld and Paolo Penna: *Energy-efficient Delivery by Heterogenous Mobile Agents.*
- 12:15 Akanksha Agrawal, Daniel Lokshтанov, Saket Saurabh and Meirav Zehavi: *Split Contraction: The Untold Story.* Mohit Garg and Jaikumar Radhakrishnan: *Set membership with non-adaptive bit probes.*

Invited Talks & Tutorial

Tutorial: Computational Aspects of Logics in Team Semantics

Juha Kontinen, University of Helsinki

Team Semantics is a logical framework for the study of various dependency notions that are important in many areas of science. The starting point of this research is marked by the publication of the monograph *Dependence Logic* (Jouko Väänänen, 2007) in which first-order dependence logic is developed and studied. Since then team semantics has evolved into a flexible framework in which numerous logics have been studied.

Much of the work in team semantics has so far focused on results concerning either axiomatic characterizations or the expressive power and computational aspects of various logics. This tutorial provides an introduction to team semantics with a focus on results regarding expressivity and computational aspects of the most prominent logics of the area. In particular, we discuss dependence, independence and inclusion logics in first-order, propositional, and modal team semantics. We show that first-order dependence and independence logic are equivalent with existential second-order logic and inclusion logic with greatest fixed point logic. In the propositional and modal settings we characterize the expressive power of these logics by so-called team bisimulations and determine the complexity of their model checking and satisfiability problems.

Discrete logarithms in small characteristic finite fields: A survey of recent advances

Antoine Joux, Sorbonne Universités

The discrete logarithm problem is one of the few hard problems on which public-key cryptography can be based. It was introduced in the field by the famous Diffie–Hellman key exchange protocol. Initially, the cryptographic use of the problem was considered in prime fields, but was readily generalized to arbitrary finite fields and, later, to elliptic or higher genus curves.

In this talk, we survey the key technical ideas that can be used to compute discrete logarithms, especially in the case of small characteristic finite fields. These ideas stem from about 40 years of research on the topic. They appeared along the long road that leads from the initial belief that this problem was hard enough for cryptographic purpose to the current state of the art where it can no longer be considered for cryptographic use. Indeed, after the recent developments started in 2012, we now have some very efficient practical algorithms to solve this problem. Unfortunately, these algorithms remain heuristic and one important direction for future research is to lift the remaining heuristic assumptions.

Recompression: new approach to word equations and context unification.

Artur Jeż, University of Wrocław

Word equations is given by two strings over disjoint alphabets of letters and variables and we ask whether there is a substitution that satisfies this equation. Recently, a new PSPACE solution to this problem was proposed, it is based on compressing simple substrings of the equation and modifying the equation so that such operations are sound. The analysis focuses on the way the equation is stored and changed rather than on the combinatorics of words. This approach greatly simplified many existing proofs and algorithms. In particular, unlike the previous solutions, it generalises to equations over contexts (known for historical reasons as context unification): contexts are terms with one special symbol that represent a missing argument and they can be applied on terms, in which case their argument replaces the special constant.

Applications of Algorithmic Metatheorems to Space Complexity and Parallelism

Till Tantau, Universität zu Lübeck

Algorithmic metatheorems state that if a problem can be described in a certain *logic* and the inputs are *structured* in a certain way, then the problem can be solved with a certain *amount of resources*. As an example, by Courcelle's Theorem all monadic second-order ("in a certain logic") properties of graphs of bounded tree width ("structured in a certain way") can be solved in linear time ("with a certain amount of resources"). Such theorems have become a valuable tool in algorithmics: If a problem happens to have the right structure and can be described in the right logic, they immediately yield a (typically tight) upper bound on the time complexity of the problem. Perhaps even more importantly, several complex algorithms rely on algorithmic metatheorems internally to solve subproblems, which considerably broadens the range of applications of these theorems. The talk is intended as a gentle introduction to the ideas behind algorithmic metatheorems, especially behind some recent results concerning space classes and parallel computation, and tries to give a flavor of the range of their applications.

Notes

