

# 45th International Colloquium on Automata, Languages, and Programming

ICALP 2018, Prague, Czech Republic, July 9–13, 2018

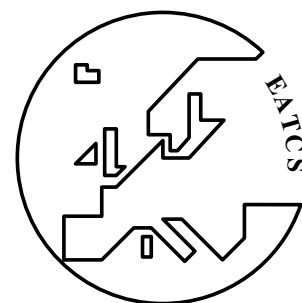
Edited by

Ioannis Chatzigiannakis

Christos Kaklamanis

Dániel Marx

Donald Sannella



### *Editors*

Ioannis Chatzigiannakis  
Department of Computer, Control,  
and Management Engineering  
Sapienza University of Rome  
ichatz@dis.uniroma1.it

Dániel Marx  
Institute for Computer Science and Control  
Hungarian Academy of Sciences  
dmarx@cs.bme.hu

Christos Kaklamanis  
Department of Computer Engineering and Informatics  
University of Patras and  
CTI "Diophantus"  
ckakl@cti.gr

Donald Sannella  
School of Informatics  
University of Edinburgh  
dts@inf.ed.ac.uk

*ACM Classification 2012*

Theory of computation

**ISBN 978-3-95977-076-7**

*Published online and open access by*

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at <http://www.dagstuhl.de/dagpub/978-3-95977-076-7>.

*Publication date*

July, 2018

*Bibliographic information published by the Deutsche Nationalbibliothek*

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

*License*

This work is licensed under a Creative Commons Attribution 3.0 Unported license (CC-BY 3.0): <http://creativecommons.org/licenses/by/3.0/legalcode>.



In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work under the following conditions, without impairing or restricting the authors' moral rights:

- Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/LIPIcs.ICALP.2018.0

**ISBN 978-3-95977-076-7**

**ISSN 1868-8969**

**<http://www.dagstuhl.de/lipics>**

## LIPICs – Leibniz International Proceedings in Informatics

LIPICs is a series of high-quality conference proceedings across all fields in informatics. LIPICs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

### *Editorial Board*

- Luca Aceto (*Chair*, Gran Sasso Science Institute and Reykjavik University)
- Susanne Albers (TU München)
- Chris Hankin (Imperial College London)
- Deepak Kapur (University of New Mexico)
- Michael Mitzenmacher (Harvard University)
- Madhavan Mukund (Chennai Mathematical Institute)
- Anca Muscholl (University Bordeaux)
- Catuscia Palamidessi (INRIA)
- Raimund Seidel (Saarland University and Schloss Dagstuhl – Leibniz-Zentrum für Informatik)
- Thomas Schwentick (TU Dortmund)
- Reinhard Wilhelm (Saarland University)

**ISSN 1868-8969**

**<http://www.dagstuhl.de/lipics>**



## ■ Contents

Preface	
<i>Ioannis Chatzigiannakis, Christos Kaklamanis, Dániel Marx, and Donald Sannella</i>	0:xv–0:xvi
Organization	
.....	0:xvii–0:xxv
List of Authors	
.....	0:xxvii–0:xlvii

### Invited Papers

Consistent Distributed Memory Services: Resilience and Efficiency	
<i>Theophanis Hadjistasi and Alexander A. Schwarzmann</i> .....	1:1–1:19
Sparsity – an Algorithmic Perspective	
<i>Jaroslav Nešetřil</i> .....	2:1–2:1
Probability Theory from a Programming Perspective	
<i>Sam Staton</i> .....	3:1–3:1
Lower Bounds by Algorithm Design: A Progress Report	
<i>Richard Ryan Williams</i> .....	4:1–4:1

### Track A: Algorithms, Complexity, and Games

Power of $d$ Choices with Simple Tabulation	
<i>Anders Aamand, Mathias Bæk Tejs Knudsen, and Mikkel Thorup</i> .....	5:1–5:14
One-Way Trail Orientations	
<i>Anders Aamand, Niklas Hjuler, Jacob Holm, and Eva Rotenberg</i> .....	6:1–6:13
Dynamic Matching: Reducing Integral Algorithms to Approximately-Maximal Fractional Algorithms	
<i>Moab Arar, Shiri Chechik, Sarel Cohen, Cliff Stein, and David Wajc</i> .....	7:1–7:16
Tighter Connections Between Formula-SAT and Shaving Logs	
<i>Amir Abboud and Karl Bringmann</i> .....	8:1–8:18
New Approximation Algorithms for (1,2)-TSP	
<i>Anna Adamaszek, Matthias Mnich, and Katarzyna Paluch</i> .....	9:1–9:14
Union of Hypercubes and 3D Minkowski Sums with Random Sizes	
<i>Pankaj K. Agarwal, Haim Kaplan, and Micha Sharir</i> .....	10:1–10:15
Noise-Tolerant Testing of High Entanglement of Formation	
<i>Rotem Arnon-Friedman and Henry Yuen</i> .....	11:1–11:12
A Complete Dichotomy for Complex-Valued Holant <sup>c</sup>	
<i>Miriam Backens</i> .....	12:1–12:14



Tight Bounds on Online Checkpointing Algorithms <i>Achiya Bar-On, Itai Dinur, Orr Dunkelman, Rani Hod, Nathan Keller, Eyal Ronen, and Adi Shamir</i> .....	13:1–13:13
Fast Reed-Solomon Interactive Oracle Proofs of Proximity <i>Eli Ben-Sasson, Iddo Bentov, Yinon Horesh, and Michael Riabzev</i> .....	14:1–14:17
NP-Hardness of Coloring 2-Colorable Hypergraph with Poly-Logarithmically Many Colors <i>Amey Bhangale</i> .....	15:1–15:11
Sublinear Algorithms for MAXCUT and Correlation Clustering <i>Aditya Bhaskara, Samira Daruki, and Suresh Venkatasubramanian</i> .....	16:1–16:14
Parameterized Intractability of Even Set and Shortest Vector Problem from Gap-ETH <i>Arnab Bhattacharyya, Suprovat Ghoshal, Karthik C. S., and Pasin Manurangsi</i> ..	17:1–17:15
Rollercoasters and Caterpillars <i>Therese Biedl, Ahmad Biniiaz, Robert Cummings, Anna Lubiw, Florin Manea, Dirk Nowotka, and Jeffrey Shallit</i> .....	18:1–18:15
New algorithms for Steiner tree reoptimization <i>Davide Bilò</i> .....	19:1–19:14
Efficient Shortest Paths in Scale-Free Networks with Underlying Hyperbolic Geometry <i>Thomas Bläsius, Cedric Freiberger, Tobias Friedrich, Maximilian Katzmann, Felix Montenegro-Retana, and Marianne Thieffry</i> .....	20:1–20:14
Approximate Convex Hull of Data Streams <i>Avrim Blum, Vladimir Braverman, Ananya Kumar, Harry Lang, and Lin F. Yang</i>	21:1–21:13
Small Bias Requires Large Formulas <i>Andrej Bogdanov</i> .....	22:1–22:12
Geodesic Obstacle Representation of Graphs <i>Prosenjit Bose, Paz Carmi, Vida Dujmovic, Saeed Mehrabi, Fabrizio Montecchiani, Pat Morin, and Luis Fernando Schultz Xavier da Silveira</i> .....	23:1–23:13
The Bottleneck Complexity of Secure Multiparty Computation <i>Elette Boyle, Abhishek Jain, Manoj Prabhakaran, and Ching-Hua Yu</i> .....	24:1–24:16
Revisiting Frequency Moment Estimation in Random Order Streams <i>Vladimir Braverman, Emanuele Viola, David P. Woodruff, and Lin F. Yang</i> .....	25:1–25:14
Proportional Approval Voting, Harmonic k-median, and Negative Association <i>Jarosław Byrka, Piotr Skowron, and Krzysztof Sornat</i> .....	26:1–26:14
Fine-Grained Derandomization: From Problem-Centric to Resource-Centric Complexity <i>Marco L. Carmosino, Russell Impagliazzo, and Manuel Sabin</i> .....	27:1–27:16
Ranking with Fairness Constraints <i>L. Elisa Celis, Damian Straszak, and Nisheeth K. Vishnoi</i> .....	28:1–28:15

Interpolating between $k$ -Median and $k$ -Center: Approximation Algorithms for Ordered $k$ -Median	
<i>Deeparnab Chakrabarty and Chaitanya Swamy</i> .....	29:1–29:14
Generalized Center Problems with Outliers	
<i>Deeparnab Chakrabarty and Maryam Negahbani</i> .....	30:1–30:14
Orthogonal Point Location and Rectangle Stabbing Queries in 3-d	
<i>Timothy M. Chan, Yakov Nekrich, Saladi Rahul, and Konstantinos Tsakalidis</i> ....	31:1–31:14
Spanning Tree Congestion and Computation of Generalized Gyóri-Lovász Partition	
<i>L. Sunil Chandran, Yun Kuen Cheung, and Davis Issac</i> .....	32:1–32:14
Fully Dynamic Almost-Maximal Matching: Breaking the Polynomial Worst-Case Time Barrier	
<i>Moses Charikar and Shay Solomon</i> .....	33:1–33:14
On Estimating Edit Distance: Alignment, Dimension Reduction, and Embeddings	
<i>Moses Charikar, Ofir Geri, Michael P. Kim, and William Kuszmaul</i> .....	34:1–34:14
How Hard Is It to Satisfy (Almost) All Roommates?	
<i>Jiehua Chen, Danny Hermelin, Manuel Sorge, and Harel Yedidsion</i> .....	35:1–35:15
A Quadratic Size-Hierarchy Theorem for Small-Depth Multilinear Formulas	
<i>Suryajith Chillara, Nutan Limaye, and Srikanth Srinivasan</i> .....	36:1–36:13
Restricted Max-Min Fair Allocation	
<i>Siu-Wing Cheng and Yuchen Mao</i> .....	37:1–37:13
Improved Approximation for Node-Disjoint Paths in Grids with Sources on the Boundary	
<i>Julia Chuzhoy, David H. K. Kim, and Rachit Nimavat</i> .....	38:1–38:14
Optimal Hashing in External Memory	
<i>Alex Conway, Martín Farach-Colton, and Philip Shilane</i> .....	39:1–39:14
Lovász Meets Weisfeiler and Leman	
<i>Holger Dell, Martin Grohe, and Gaurav Rattan</i> .....	40:1–40:14
Sample-Optimal Identity Testing with High Probability	
<i>Ilias Diakonikolas, Themis Gouleakis, John Peebles, and Eric Price</i> .....	41:1–41:14
Approximating All-Pair Bounded-Leg Shortest Path and APSP-AF in Truly-Subcubic Time	
<i>Ran Duan and Hanlin Ren</i> .....	42:1–42:12
Single-Source Bottleneck Path Algorithm Faster than Sorting for Sparse Graphs	
<i>Ran Duan, Kaifeng Lyu, and Yuanhang Xie</i> .....	43:1–43:14
Improved Time Bounds for All Pairs Non-decreasing Paths in General Digraphs	
<i>Ran Duan, Yong Gu, and Le Zhang</i> .....	44:1–44:14
Edit Distance between Unrooted Trees in Cubic Time	
<i>Bartłomiej Dudek and Paweł Gawrychowski</i> .....	45:1–45:14

A Note on Two-Colorability of Nonuniform Hypergraphs <i>Lech Duraj, Grzegorz Gutowski, and Jakub Kozik</i> .....	46:1–46:13
Additive Non-Approximability of Chromatic Number in Proper Minor-Closed Classes <i>Zdeněk Dvořák and Ken-ichi Kawarabayashi</i> .....	47:1–47:12
How to Navigate Through Obstacles? <i>Eduard Eiben and Iyad Kanj</i> .....	48:1–48:13
Faster Algorithms for Integer Programs with Block Structure <i>Friedrich Eisenbrand, Christoph Hunkenschroder, and Kim-Manuel Klein</i> .....	49:1–49:13
On the Probe Complexity of Local Computation Algorithms <i>Uriel Feige, Boaz Patt-Shamir, and Shai Vardi</i> .....	50:1–50:14
Fully-Dynamic Bin Packing with Little Repacking <i>Björn Feldkord, Matthias Feldotto, Anupam Gupta, Guru Guruganesh, Amit Kumar, Sören Riechers, and David Wajc</i> .....	51:1–51:24
A Sublinear Tester for Outerplanarity (and Other Forbidden Minors) With One-Sided Error <i>Hendrik Fichtenberger, Reut Levi, Yadu Vasudev, and Maximilian Wötzel</i> .....	52:1–52:14
Parameterized Low-Rank Binary Matrix Approximation <i>Fedor V. Fomin, Petr A. Golovach, and Fahad Panolan</i> .....	53:1–53:16
Towards Blackbox Identity Testing of Log-Variate Circuits <i>Michael A. Forbes, Sumanta Ghosh, and Nitin Saxena</i> .....	54:1–54:16
Finding Cliques in Social Networks: A New Distribution-Free Model <i>Jacob Fox, Tim Roughgarden, C. Seshadhri, Fan Wei, and Nicole Wein</i> .....	55:1–55:15
A PTAS for a Class of Stochastic Dynamic Programs <i>Hao Fu, Jian Li, and Pan Xu</i> .....	56:1–56:14
Semi-Supervised Algorithms for Approximately Optimal and Accurate Clustering <i>Buddhima Gamlath, Sangxia Huang, and Ola Svensson</i> .....	57:1–57:14
High Probability Frequency Moment Sketches <i>Sumit Ganguly and David P. Woodruff</i> .....	58:1–58:15
Quasi-PTAS for Scheduling with Precedences using LP Hierarchies <i>Shashwat Garg</i> .....	59:1–59:13
ARRIVAL: Next Stop in CLS <i>Bernd Gärtner, Thomas Dueholm Hansen, Pavel Hubáček, Karel Král, Hagar Mosaad, and Veronika Slívová</i> .....	60:1–60:13
Improved Bounds for Shortest Paths in Dense Distance Graphs <i>Paweł Gawrychowski and Adam Karczmarz</i> .....	61:1–61:15
Towards Unified Approximate Pattern Matching for Hamming and $L_1$ Distance <i>Paweł Gawrychowski and Przemysław Uznański</i> .....	62:1–62:13
A Faster Construction of Greedy Consensus Trees <i>Paweł Gawrychowski, Gad M. Landau, Wing-Kin Sung, and Oren Weimann</i> .....	63:1–63:14



A Faster FPTAS for #Knapsack <i>Paweł Gawrychowski, Liran Markin, and Oren Weimann</i> .....	64:1–64:13
Towards Optimal Approximate Streaming Pattern Matching by Matching Multiple Patterns in Multiple Streams <i>Shay Golan, Tsvi Kopelowitz, and Ely Porat</i> .....	65:1–65:16
Gray Codes and Symmetric Chains <i>Petr Gregor, Sven Jäger, Torsten Mütze, Joe Sawada, and Kaja Wille</i> .....	66:1–66:14
An Improved Isomorphism Test for Bounded-Tree-Width Graphs <i>Martin Grohe, Daniel Neuen, Pascal Schweitzer, and Daniel Wiebking</i> .....	67:1–67:14
A Polynomial-Time Approximation Algorithm for All-Terminal Network Reliability <i>Heng Guo and Mark Jerrum</i> .....	68:1–68:12
Perfect Simulation of the Hard Disks Model by Partial Rejection Sampling <i>Heng Guo and Mark Jerrum</i> .....	69:1–69:10
Non-Preemptive Flow-Time Minimization via Rejections <i>Anupam Gupta, Amit Kumar, and Jason Li</i> .....	70:1–70:13
Maximizing Profit with Convex Costs in the Random-order Model <i>Anupam Gupta, Ruta Mehta, and Marco Molinaro</i> .....	71:1–71:14
Generic Single Edge Fault Tolerant Exact Distance Oracle <i>Manoj Gupta and Aditi Singh</i> .....	72:1–72:15
An Exponential Separation Between MA and AM Proofs of Proximity <i>Tom Gur, Yang P. Liu, and Ron D. Rothblum</i> .....	73:1–73:15
Isolating a Vertex via Lattices: Polytopes with Totally Unimodular Faces <i>Rohit Gurjar, Thomas Thierauf, and Nisheeth K. Vishnoi</i> .....	74:1–74:14
Synchronization Strings: Channel Simulations and Interactive Coding for Insertions and Deletions <i>Bernhard Haeupler, Amirbehshad Shahrashbi, and Ellen Vitercik</i> .....	75:1–75:14
Synchronization Strings: List Decoding for Insertions and Deletions <i>Bernhard Haeupler, Amirbehshad Shahrashbi, and Madhu Sudan</i> .....	76:1–76:14
Approximate Sparse Linear Regression <i>Sariel Har-Peled, Piotr Indyk, and Sepideh Mahabadi</i> .....	77:1–77:14
A Polynomial Time Algorithm to Compute Geodesics in CAT(0) Cubical Complexes <i>Koyo Hayashi</i> .....	78:1–78:14
Online Vertex-Weighted Bipartite Matching: Beating $1 - \frac{1}{e}$ with Random Arrivals <i>Zhiyi Huang, Zhihao Gavin Tang, Xiaowei Wu, and Yuhao Zhang</i> .....	79:1–79:14
Finding Branch-Decompositions of Matroids, Hypergraphs, and More <i>Jisu Jeong, Eun Jung Kim, and Sang-il Oum</i> .....	80:1–80:14
Optimally Sorting Evolving Data <i>Juan Jose Besa, William E. Devanny, David Eppstein, Michael T. Goodrich, and Timothy Johnson</i> .....	81:1–81:13

Generalized Comparison Trees for Point-Location Problems <i>Daniel M. Kane, Shachar Lovett, and Shay Moran</i> .....	82:1–82:13
Stabilizing Weighted Graphs <i>Zhuan Khye Koh and Laura Sanità</i> .....	83:1–83:13
Spectrally Robust Graph Isomorphism <i>Alexandra Kolla, Ioannis Koutis, Vivek Madan, and Ali Kemal Sinop</i> .....	84:1–84:13
A Parameterized Strongly Polynomial Algorithm for Block Structured Integer Programs <i>Martin Koutecký, Asaf Levin, and Shmuel Onn</i> .....	85:1–85:14
Finer Tight Bounds for Coloring on Clique-Width <i>Michael Lampis</i> .....	86:1–86:14
A Centralized Local Algorithm for the Sparse Spanning Graph Problem <i>Christoph Lenzen and Reut Levi</i> .....	87:1–87:14
Chain, Generalization of Covering Code, and Deterministic Algorithm for k-SAT <i>Sixue Liu</i> .....	88:1–88:13
Stable-Matching Voronoi Diagrams: Combinatorial Complexity and Algorithms <i>Gill Barequet, David Eppstein, Michael T. Goodrich, and Nil Mamano</i> .....	89:1–89:14
Improved Algorithms for Adaptive Compressed Sensing <i>Vasileios Nakos, Xiaofei Shi, David P. Woodruff, and Hongyang Zhang</i> .....	90:1–90:14
Approximate Low-Weight Check Codes and Circuit Lower Bounds for Noisy Ground States <i>Chinmay Nirkhe, Umesh Vazirani, and Henry Yuen</i> .....	91:1–91:11
Fully Dynamic MIS in Uniformly Sparse Graphs <i>Krzysztof Onak, Baruch Schieber, Shay Solomon, and Nicole Wein</i> .....	92:1–92:14
Strictly Balancing Matrices in Polynomial Time Using Osborne’s Iteration <i>Rafail Ostrovsky, Yuval Rabani, and Arman Yousefi</i> .....	93:1–93:11
Parameterized Algorithms for Zero Extension and Metric Labelling Problems <i>Felix Reidl and Magnus Wahlström</i> .....	94:1–94:14
An Operational Characterization of Mutual Information in Algorithmic Information Theory <i>Andrei Romashchenko and Marius Zimand</i> .....	95:1–95:14
Privacy Preserving Clustering with Constraints <i>Clemens Rösner and Melanie Schmidt</i> .....	96:1–96:14
NC Algorithms for Weighted Planar Perfect Matching and Related Problems <i>Piotr Sankowski</i> .....	97:1–97:16
Computing Tutte Paths <i>Andreas Schmid and Jens M. Schmidt</i> .....	98:1–98:14
A New Approximation Guarantee for Monotone Submodular Function Maximization via Discrete Convexity <i>Tasuku Soma and Yuichi Yoshida</i> .....	99:1–99:14

Ring Packing and Amortized FHEW Bootstrapping <i>Daniele Miccianco and Jessica Sorrell</i> .....	100:1–100:14
Semi-random Graphs with Planted Sparse Vertex Cuts: Algorithms for Exact and Approximate Recovery <i>Anand Louis and Rakesh Venkat</i> .....	101:1–101:15
Load Thresholds for Cuckoo Hashing with Overlapping Blocks <i>Stefan Walzer</i> .....	102:1–102:10
Brief Announcement: On Secure $m$ -Party Computation, Commuting Permutation Systems and Unassisted Non-Interactive MPC <i>Navneet Agarwal, Sanat Anand, and Manoj Prabhakaran</i> .....	103:1–103:4
Brief Announcement: Characterizing Demand Graphs for (Fixed-Parameter) Shallow-Light Steiner Network <i>Amy Babay, Michael Dinitz, and Zeyu Zhang</i> .....	104:1–104:4
Brief Announcement: Zero-Knowledge Protocols for Search Problems <i>Ben Berger and Zvika Brakerski</i> .....	105:1–105:5
Brief Announcement: Relaxed Locally Correctable Codes in Computationally Bounded Channels <i>Jeremiah Blocki, Venkata Gandikota, Elena Grigorescu, and Samson Zhou</i> .....	106:1–106:4
Brief Announcement: Approximation Schemes for Geometric Coverage Problems <i>Steven Chaplick, Minati De, Alexander Ravsky, and Joachim Spoerhase</i> .....	107:1–107:4
Brief Announcement: Bayesian Auctions with Efficient Queries <i>Jing Chen, Bo Li, Yingkai Li, and Pinyan Lu</i> .....	108:1–108:4
Brief Announcement: Hamming Distance Completeness and Sparse Matrix Multiplication <i>Daniel Graf, Karim Labib, and Przemysław Uznański</i> .....	109:1–109:4
Brief Announcement: Treewidth Modulator: Emergency Exit for DFVS <i>Daniel Lokshantov, M. S. Ramanujan, Saket Saurabh, Roohani Sharma, and Meirav Zehavi</i> .....	110:1–110:4
Brief Announcement: Erasure-Resilience Versus Tolerance to Errors <i>Sofya Raskhodnikova and Nithin Varma</i> .....	111:1–111:3
Brief Announcement: Bounded-Degree Cut is Fixed-Parameter Tractable <i>Mingyu Xiao and Hiroshi Nagamochi</i> .....	112:1–112:6

## Track B: Logic, Semantics, Automata and Theory of Programming

Almost Sure Productivity <i>Alejandro Aquirre, Gilles Barthe, Justin Hsu, and Alexandra Silva</i> .....	113:1–113:15
O-Minimal Invariants for Linear Loops <i>Shaul Almagor, Dmitry Chistikov, Joël Ouaknine, and James Worrell</i> .....	114:1–114:14
Topological Sorting with Regular Constraints <i>Antoine Amarilli and Charles Paperman</i> .....	115:1–115:14

On Zero-One and Convergence Laws for Graphs Embeddable on a Fixed Surface <i>Albert Atserias, Stephan Kreutzer, and Marc Noy</i> .....	116:1–116:14
Bisimulation Invariant Monadic-Second Order Logic in the Finite <i>Achim Blumensath and Felix Wolf</i> .....	117:1–117:13
Binary Reachability of Timed Pushdown Automata via Quantifier Elimination and Cyclic Order Atoms <i>Lorenzo Clemente and Sławomir Lasota</i> .....	118:1–118:14
Unboundedness Problems for Languages of Vector Addition Systems <i>Wojciech Czerwiński, Piotr Hofman, and Georg Zetsche</i> .....	119:1–119:15
Reachability and Distances under Multiple Changes <i>Samir Datta, Anish Mukherjee, Nils Vortmeier, and Thomas Zeume</i> .....	120:1–120:14
When is Containment Decidable for Probabilistic Automata? <i>Laure Daviaud, Marcin Jurdziński, Ranko Lazić, Filip Mazowiecki, Guillermo A. Pérez, and James Worrell</i> .....	121:1–121:14
On the Complexity of Infinite Advice Strings <i>Gaëtan Douéneau-Tabot</i> .....	122:1–122:13
Resynchronizing Classes of Word Relations <i>María Emilia Descotte, Diego Figueira, and Gabriele Puppis</i> .....	123:1–123:13
Reachability Switching Games <i>John Fearnley, Martin Gairing, Matthias Mnich, and Rahul Savani</i> .....	124:1–124:14
Costs and Rewards in Priced Timed Automata <i>Martin Fränzle, Mahsa Shirmohammadi, Mani Swaminathan, and James Worrell</i>	125:1–125:14
First-Order Interpretations of Bounded Expansion Classes <i>Jakub Gajarský, Stephan Kreutzer, Jaroslav Nešetřil, Patrice Ossona de Mendez, Michał Pilipczuk, Sebastian Siebertz, and Szymon Toruńczyk</i> .....	126:1–126:14
Randomized Sliding Window Algorithms for Regular Languages <i>Moses Ganardi, Danny Hucke, and Markus Lohrey</i> .....	127:1–127:13
Aperiodic points in $\mathbb{Z}^2$ -subshifts <i>Anael Grandjean, Benjamin Hellouin de Menibus, and Pascal Vanier</i> .....	128:1–128:13
Semicomputable Geometry <i>Mathieu Hoyrup, Diego Nava Saucedo, and Don M. Stull</i> .....	129:1–129:13
On Computing the Total Variation Distance of Hidden Markov Models <i>Stefan Kiefer</i> .....	130:1–130:13
To Infinity and Beyond <i>Ines Klimann</i> .....	131:1–131:12
On the Identity Problem for the Special Linear Group and the Heisenberg Group <i>Sang-Ki Ko, Reino Niskanen, and Igor Potapov</i> .....	132:1–132:15
Gaifman Normal Forms for Counting Extensions of First-Order Logic <i>Dietrich Kuske and Nicole Schweikardt</i> .....	133:1–133:14

Polynomial Vector Addition Systems With States <i>Jérôme Leroux</i> .....	134:1–134:13
Reducing CMSO Model Checking to Highly Connected Graphs <i>Daniel Lokshтанov, M. S. Ramanujan, Saket Saurabh, and Meirav Zehavi</i> .....	135:1–135:14
An Optimal Bound on the Solution Sets of One-Variable Word Equations and its Consequences <i>Dirk Nowotka and Aleksi Saarela</i> .....	136:1–136:13
Separating Without Any Ambiguity <i>Thomas Place and Marc Zeitoun</i> .....	137:1–137:14
A Superpolynomial Lower Bound for the Size of Non-Deterministic Complement of an Unambiguous Automaton <i>Mikhail Raskin</i> .....	138:1–138:11
The Isomorphism Problem for Finite Extensions of Free Groups Is In PSPACE <i>Géraud Sénizergues and Armin Weiß</i> .....	139:1–139:14
Unambiguous Languages Exhaust the Index Hierarchy <i>Michał Skrzypczak</i> .....	140:1–140:14
The Beta-Bernoulli process and algebraic effects <i>Sam Staton, Dario Stein, Hongseok Yang, Nathanael L. Ackerman, Cameron E. Freer, and Daniel M. Roy</i> .....	141:1–141:15
Uniformization Problems for Synchronizations of Automatic Relations on Words <i>Sarah Winter</i> .....	142:1–142:13

## Track C: Foundations of Networked Computation: Models, Algorithms, and Information Management

Congestion-Free Rerouting of Flows on DAGs <i>Saeed Akhondian Amiri, Szymon Dudycz, Stefan Schmid, and Sebastian Wiederrecht</i> .....	143:1–143:13
Practical and Provably Secure Onion Routing <i>Megumi Ando, Anna Lysyanskaya, and Eli Upfal</i> .....	144:1–144:14
Resolving SINR Queries in a Dynamic Setting <i>Boris Aronov, Gali Bar-On, and Matthew J. Katz</i> .....	145:1–145:13
Uniform Mixed Equilibria in Network Congestion Games with Link Failures <i>Vittorio Bilò, Luca Moscardelli, and Cosimo Vinci</i> .....	146:1–146:14
Byzantine Gathering in Polynomial Time <i>Sébastien Bouchard, Yoann Dieudonné, and Anissa Lamani</i> .....	147:1–147:15
Temporal Vertex Cover with a Sliding Time Window <i>Eleni C. Akrida, George B. Mertzios, Paul G. Spirakis, and Viktor Zamaraev</i> ....	148:1–148:14
On the Complexity of Sampling Vertices Uniformly from a Graph <i>Flavio Chierichetti and Shahrzad Haddadan</i> .....	149:1–149:13

The Price of Stability of Weighted Congestion Games <i>George Christodoulou, Martin Gairing, Yiannis Giannakopoulos, and Paul G. Spirakis</i> .....	150:1–150:16
Demand-Independent Optimal Tolls <i>Riccardo Colini-Baldeschi, Max Klimm, and Marco Scarsini</i> .....	151:1–151:14
Greedy Algorithms for Online Survivable Network Design <i>Sina Dehghani, Soheil Ehsani, MohammadTaghi Hajiaghayi, Vahid Liaghat, and Saeed Seddighin</i> .....	152:1–152:14
Algorithms for Noisy Broadcast with Erasures <i>Ofer Grossman, Bernhard Haeupler, and Sidhanth Mohanty</i> .....	153:1–153:12
Efficient Black-Box Reductions for Separable Cost Sharing <i>Tobias Harks, Martin Hoefer, Anja Huber, and Manuel Surek</i> .....	154:1–154:15
Price of Anarchy for Mechanisms with Risk-Averse Agents <i>Thomas Kesselheim and Bojana Kodric</i> .....	155:1–155:14
Polynomial Counting in Anonymous Dynamic Networks with Applications to Anonymous Dynamic Algebraic Computations <i>Dariusz R. Kowalski and Miguel A. Mosteiro</i> .....	156:1–156:14
The Unfortunate-Flow Problem <i>Orna Kupferman and Gal Vardi</i> .....	157:1–157:14
Spanning Trees With Edge Conflicts and Wireless Connectivity <i>Magnús M. Halldórsson, Guy Kortsarz, Pradipta Mitra, and Tigran Tonoyan</i> ...	158:1–158:15
Eigenvector Computation and Community Detection in Asynchronous Gossip Models <i>Frederik Mallmann-Trenn, Cameron Musco, and Christopher Musco</i> .....	159:1–159:14
$(\Delta + 1)$ Coloring in the Congested Clique Model <i>Merav Parter</i> .....	160:1–160:14
CacheShuffle: A Family of Oblivious Shuffles <i>Sarvar Patel, Giuseppe Persiano, and Kevin Yeo</i> .....	161:1–161:13
Brief Announcement: MapReduce Algorithms for Massive Trees <i>MohammadHossein Bateni, Soheil Behnezhad, Mahsa Derakhshan, MohammadTaghi Hajiaghayi, and Vahab Mirrokni</i> .....	162:1–162:4
Brief Announcement: Give Me Some Slack: Efficient Network Measurements <i>Ran Ben Basat, Gil Einziger, and Roy Friedman</i> .....	163:1–163:5
Brief Announcement: Towards an Abstract Model of User Retention Dynamics <i>Eli Ben-Sasson and Eden Saig</i> .....	164:1–164:4
Brief Announcement: Energy Constrained Depth First Search <i>Shantanu Das, Dariusz Dereniowski, and Przemysław Uznański</i> .....	165:1–165:5

## ■ Preface

This volume contains the papers presented at ICALP 2018, the 45th edition of the International Colloquium on Automata, Languages and Programming, held in Prague, Czech Republic during July 9–13, 2018. ICALP is a series of annual conferences of the European Association for Theoretical Computer Science (EATCS), which first took place in 1972. This year, the ICALP program consisted of three tracks:

- Track A: Algorithms, Complexity, and Games,
- Track B: Logic, Semantics, Automata and Theory of Programming,
- Track C: Foundations of Networked Computation: Models, Algorithms, and Information Management.

In response to the call for papers, a total 502 submissions were received: 346 for track A, 96 for track B, and 60 for track C. Each submission was assigned to at least three Program Committee members, aided by many subreviewers. Out of these, the committee decided to accept 147 papers for inclusion in the scientific program: 98 papers for Track A, 30 for Track B, and 19 for Track C. The selection was made by the Program Committees based on originality, quality, and relevance to theoretical computer science. The quality of the manuscripts was very high, and many deserving papers could not be selected.

This year ICALP also solicited brief announcements of work in progress with substantial interest for the community. In total 14 brief announcements were accepted for publication: 10 for Track A and 4 for Track C. The selection of the brief announcements was made by the Program Committees.

The EATCS sponsored awards for both a best paper and a best student paper for each of the three tracks, selected by the Program Committees.

The best paper awards were given to the following papers:

- Track A: Heng Guo and Mark Jerrum. “A polynomial-time approximation algorithm for all-terminal network reliability”.
- Track B: Dirk Nowotka and Aleksi Saarela. “An optimal bound on the solution sets of one-variable word equations and its consequences”.
- Track C: Dariusz Kowalski and Miguel A. Mosteiro. “Polynomial Counting in Anonymous Dynamic Networks with Applications to Anonymous Dynamic Algebraic Computations”.

The best student paper awards, for papers that are solely authored by students, were given to the following papers:

- Track A: Shashwat Garg. “Quasi-PTAS for Scheduling with Precedences using LP Hierarchies”.
- Track B: Sarah Winter. “Uniformization problems for synchronizations of automatic relations on words”.

Apart from the contributed talks and the brief announcements, ICALP 2018 included invited presentations by Jaroslav Nešetřil, Alexander Schwarzmann, Sam Staton and Ryan Williams. This volume of the proceedings contains all contributed papers and brief announcements presented at the conference together with the papers and abstracts of the invited speakers.

The program of ICALP 2018 also included presentation of the EATCS Award 2018 to Noam Nisan, the Gödel Prize 2018 to Oded Regev, the Presburger Award 2018 to Aleksander

Mađry, and the EATCS Distinguished Dissertation Award to Bas Ketsman, Ilya Razenshteyn and Aviad Rubinstein.

The program also included a memorial session for Maurice Nivat, the founder of ICALP and EATCS, who passed away in September 2017.

Six satellite events of ICALP were held on 9 July, 2018:

- Modern Online Algorithms (MOLI)
- Game Solving: Theory and Practice
- Parameterized Approximation Algorithms Workshop (PAAW)
- Infinity
- Algorithmic Aspects of Temporal Graphs
- Constrained Recognition Problems

The Summer School on Algorithms and Lower Bounds was organized immediately before ICALP during 6-9 July, 2018, with a follow-up workshop on Monday afternoon. The workshop was a satellite ICALP workshop devoted to presentations by selected participants of the school.

The Summer School on Discrete Mathematics was organized after the conference during 16-20 July, 2018. The event was organized by the Institute of Mathematics of the Czech Academy of Sciences and the Computer Science Institute of Charles University.

We wish to thank all authors who submitted extended abstracts for consideration, the Program Committees for their scholarly effort, and all referees who assisted the Program Committees in the evaluation process. We are also grateful to Anna Kotěšovcová from CONFORG and to Jiří Sgall, Andreas Emil Feldmann, Tomáš Masařík, Michal Opler, Jiří Fiala and Jan Musílek and all the support staff of the Organizing Committee from Charles University for organizing ICALP 2018.

We are grateful for generous support from AVAST and RSJ companies which included both travel grants for young women researchers and students and a direct support of the conference. We thank the School of Computer Science (Charles University, Faculty of Mathematics and Physics) and Center of Excellence - Institute for Theoretical Computer Science (project P202/12/G061 of Czech Science Foundation) for their support.

We would like to thank Jiří Sgall for his continuous support and Paul Spirakis, the president of EATCS, for his generous advice on the organization of the conference.

July 2018

Ioannis Chatzigiannakis  
Christos Kaklamanis  
Dániel Marx  
Donald Sannella



## ■ Organization

### Program Committee

#### Track A

Dániel Marx	Hungarian Academy of Sciences, Chair
Alexandr Andoni	Columbia University, USA
Nikhil Bansal	Eindhoven University of Technology, Netherlands
Markus Bläser	Saarland University, Germany
Glencora Borradaile	Oregon State University, USA
Sergio Cabello	University of Ljubljana, Slovenia
Joseph Cheriyan	University of Waterloo, Canada
Leah Epstein	University of Haifa, Israel
Samuel Fiorini	Université libre de Bruxelles, Belgium
Craig Gentry	IBM Research, USA
Kasper Green Larsen	Aarhus University, Denmark
Giuseppe F. Italiano	Università di Roma “Tor Vergata”, Italy
Bart M.P. Jansen	Eindhoven University of Technology, Netherlands
Petteri Kaski	Aalto University, Finland
Michal Koucký	Charles University, Czech Republic
Elias Koutsoupias	Oxford, UK
Robert Krauthgamer	Weizmann Institute, Israel
Stephan Kreutzer	TU Berlin, Germany
Troy Lee	Nanyang Technological University, Singapore
Moshe Lewenstein	Bar-Ilan University, Israel
Monaldo Mastrolilli	IDSIA, Switzerland
Ankur Moitra	MIT, USA
Seffi Naor	Technion, Israel
Seth Pettie	University of Michigan, USA
Michał Pilipczuk	University of Warsaw, Poland
Alon Rosen	Herzliya Interdisciplinary Center, Israel
Günter Rote	Freie Universität Berlin, Germany
Barna Saha	University of Massachusetts Amherst, USA
Anastasios Sidiropoulos	University of Illinois at Chicago, USA
Daniel Štefankovič	University of Rochester, USA
Maxim Sviridenko	Yahoo Research, USA
Virginia Vassilevska Williams	MIT, USA
Gerhard Woeginger	RWTH Aachen, Germany
Ronald de Wolf	CWI and University of Amsterdam, Netherlands
Stanislav Živný	Oxford, UK

#### Track B

Donald Sannella	Univ of Edinburgh, UK, Chair
Nathalie Bertrand	IRISA/INRIA Rennes, France
Mikołaj Bojańczyk	Warsaw University, Poland
Udi Boker	Interdisciplinary Center Herzliya, Israel

45th International Colloquium on Automata, Languages, and Programming (ICALP 2018).  
Editors: Ioannis Chatzigiannakis, Christos Kaklamanis, Dániel Marx, and Donald Sannella



LIPIC Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany



## 107:xviii Organization

Yuxin Deng	East China Normal University, China
Floris Geerts	Univ Antwerp, Belgium
Dan Ghica	Univ Birmingham, UK
Alexey Gotsman	IMDEA, Spain
Jan Hoffmann	CMU, USA
Naoki Kobayashi	Univ Tokyo, Japan
Martin Lange	Univ Kassel, Germany
Dirk Pattinson	Australian National Univ, Australia
Femke van Raamsdonk	VU Amsterdam, Netherlands
Jean-François Raskin	Univ libre de Bruxelles, Belgium
Vladimiro Sassone	Univ Southampton, UK
Thomas Schwentick	TU Dortmund, Germany
Alex Simpson	Univ Ljubljana, Slovenia
Jiří Srba	Aalborg Univ, Denmark
Mirco Tribastone	IMT Lucca, Italy
Tomáš Vojnar	Brno Univ of Technology, Czech Republic
Igor Walukiewicz	CNRS and Univ Bordeaux, France
Scott Weinstein	Univ Pennsylvania, USA

## Track C

Christos Kaklamanis	CTI “Diophantus” and University of Patras, Greece, Chair
Susanne Albers	TU Munich, Germany
Luca Becchetti	Sapienza University of Rome, Italy
Ioannis Caragiannis	University of Patras, Greece
Andrea Clementi	University of Rome “Tor Vergata”, Italy
Michele Flammini	Gran Sasso Sci Inst and Univ of L’Aquila, Italy
Pierre Fraigniaud	CNRS and Université Paris Diderot, France
Aristides Gionis	Aalto University, Finland
Sudipto Guha	University of Pennsylvania, USA
Tomasz Jurdzinski	University of Wroclaw, Poland
Evangelos Kranakis	Carleton University, Canada
Danny Krizanc	Wesleyan University, USA
Katrina Ligett	California Institute of Technology, USA and Hebrew University, Israel
Marios Mavronicolas	University of Cyprus, Cyprus
Kobbi Nissim	Georgetown University, USA
Marina Papatriantafilou	Chalmers University of Technology, Sweden
Andrzej Pelc	Université du Québec en Outaouais, Canada
David Peleg	Weizmann Institute of Science, Israel
Geppino Pucci	University of Padova, Italy
Christian Scheideler	Paderborn University, Germany
Roger Wattenhofer	ETH Zurich, Switzerland

**Organizing Committee**

Jiří Sgall	Charles University, Czech Republic, Conference Chair
Anna Kotěšovcová	CONFORG, Czech Republic
Andreas Emil Feldmann	Charles University, Czech Republic
Tomáš Masařík	Charles University, Czech Republic
Michal Opler	Charles University, Czech Republic
Jiří Fiala	Charles University, Czech Republic
Jan Musílek	Charles University, Czech Republic

**Financial Sponsors**



### Additional Reviewers

Anders Aamand	Mohammad Ali Abam	Amir Abboud
Rupam Acharyya	Anil Ada	Raghavendra Addanki
Peyman Afshani	Divesh Aggarwal	Manindra Agrawal
Saba Ahmadi	S. Akshay	Xavier Allamigeon
Shaull Almagor	Josh Alman	Noga Alon
Helmut Alt	Joel Alwen	Andris Ambainis
Nima Anari	Leonardo Aniello	Simon Apers
Itai Arad	Myrto Arapinis	Srinivasan Arunachalam
Kazuyuki Asada	Gilad Asharov	Andrei Asinowski
Cigdem Aslay	Sepehr Assadi	Chen Attias
Chen Avin	Yossi Azar	Haris Aziz
Yakov Babichenko	Arturs Backurs	Saikrishna Badrinarayanan
Eric Balkanski	Marshall Ball	Alkida Balliu
János Balogh	Stephanie Balzer	Jørgen Bang-Jensen
Bahareh Banyassady	Amotz Bar-Noy	Ran Ben Basat
Felix Baschenis	Mohammadhossein Bateni	Tugkan Batu
Paul Beame	Djamal Belazzougui	Paul Bell
Alexander Belov	Omri Ben-Eliezer	Souha Ben-Rayana
Nikola Benes	Iddo Bentov	Suman Kalyan Bera
Sebastian Berndt	Aaron Bernstein	Ivona Bezakova
Aditya Bhaskara	Sayan Bhattacharya	Marcin Bienkowski
Philip Bille	Davide Bilò	Vittorio Bilò
Ahmad Biniaz	Nir Bitansky	Henrik Björklund
Jaroslav Blasiok	Ivan Bliznets	Achim Blumensath
Hans L. Bodlaender	Greg Bodwin	Magnus Bordewich
Ralph Bottesch	Patricia Bouyer	Zvika Brakerski
Cornelius Brand	Vladimir Braverman	Thomas Brihaye
Karl Bringmann	Sabine Broda	Gerth Stølting Brodal
Joshua Brody	Vaclav Brozek	Kevin Buchin
Boris Bukh	Sam Buss	Jaroslav Byrka
Karthik C. S.	Yang Cai	Clément Canonne
Arnaud Carayol	Clément Carbonnel	Timothy Carpenter
Matteo Ceccareello	Keren Censor-Hillel	Amit Chakrabarti
Deeparnab Chakrabarty	Diptarka Chakraborty	Sourav Chakraborty
Parinya Chalermsook	Jeremie Chalopin	T-H. Hubert Chan
Timothy M. Chan	Karthekeyan Chandrasekaran	Hsien-Chih Chang
Yi-Jun Chang	Melissa Chase	Arkadev Chattopadhyay
Shiri Chechik	Jiecao Chen	Sitan Chen
Xi Chen	Yijia Chen	Yu-Fang Chen
Siu-Wing Cheng	Victor Chepoi	Dmitry Chistikov
Rajesh Chitnis	Eden Chlamtac	Keerti Choudhary
George Christodoulou	Lorenzo Clemente	Jonas Cleve
Raphaël Clifford	Adrien Le Coënt	Avi Cohen
Edith Cohen	Ilan Cohen	Vincent Cohen-Addad
Thomas Colcombet	Denis Cornaz	Ágnes Cseh

Radu Curticapean	Lukasz Czajka	Artur Czumaj
Dana Dachman-Soled	Hadassa Daltrophe	Ankush Das
Anupam Das	Laure Daviaud	Anuj Dawar
Anindya De	Éric Colin de Verdière	Giorgio Delzanno
Stéphane Demri	Michael Dinitz	Michael Gene Dobbins
David Doty	Ran Duan	Vida Dujmovic
Adrian Dumitrescu	Romaric Dunignau	Martin Dyer
Rüdiger Ehlers	Eduard Eiben	Friedrich Eisenbrand
David Eisenstat	Khaled Elbassioni	Lior Eldar
Jörg Endrullis	Matthias Englert	Hossein Esfandiari
Guy Even	Esther Ezra	Yuri Faenza
Yaron Fairstein	Jittat Fakcharoenphol	Carlo Fantozzi
Bill Fefferman	Uriel Feige	Moran Feldman
Andreas Emil Feldmann	Michael Feldmann	Stefan Felsner
Henning Fernau	Diego Figueira	Nathanaël Fijalkow
Emmanuel Filiot	Aris Filos-Ratsikas	Arnold Filtser
Francesca Fiorenzi	Johannes Fischer	Orr Fischer
Tamás Fleiner	Krzysztof Fleszar	Till Fluschnik
Fedor Fomin	Casper Benjamin Freksen	Dominik D. Freydenberger
Tobias Friedrich	Alan Frieze	Zachary Friggstad
Vincent Froese	Radoslav Fulek	Peter Fulla
Benjamin Fuller	Peter Gacs	Travis Gagie
Andreas Galanis	Nicolas Gama	Venkata Gandikota
Pierre Ganty	Sumegha Garg	Paul Gastin
Olivier Gauwin	Pawel Gawrychowski	Gilles Geeraerts
Samir Genaim	Georgios Georgiadis	Loukas Georgiadis
Shayan Oveis Gharan	Panos Giannopoulos	Hugo Gimbert
Alex Gittens	Vasilis Gkatzelis	Shay Golan
Leslie Ann Goldberg	Paul Goldberg	Elazar Goldenberg
Isaac Goldstein	Stefan Göller	Petr Golovach
Alexander Golovnev	Michael T. Goodrich	Sivakanth Gopi
Thorsten Götte	Lee-Ad Gottlieb	Themis Gouleakis
Fabrizio Grandoni	Roland Grappe	Alexander Grigoriev
Alex Bredariol Grilo	Martin Grohe	Allan Grønlund
Roberto Grossi	Luciano Gualà	Bruno Guillon
Heng Guo	Jiong Guo	Krystal Guo
Anupam Gupta	Manoj Gupta	Sushmita Gupta
Tom Gur	Venkatesan Guruswami	Julian Gutierrez
Torben Hagerup	Mohammadtaghi Hajiaghayi	Nir Halman
Samuel Haney	Kristoffer Arnsfelt Hansen	Thomas Dueholm Hansen
Nicolas Hanusse	Sariel Har-Peled	Tero Harju
Tobias Harks	David Harris	Prahladh Harsha
Tim Hartmann	Carmit Hazay	Brett Hemenway
Jacob Hendricks	Frédéric Herbreteau	Kieran Herley
Danny Hermelin	John Hershberger	Hiroshi Hirai
Denis Hirschfeldt	Petr Hlineny	Rebecca Hoberg
Dorit Hochbaum	Martin Hoefler	Frank Hoffmann
Michael Hoffmann	Stepan Holub	Stefan Hougardy
Mathieu Hoyrup	Justin Hsu	Chien-Chung Huang
Dawei Huang	Zhiyi Huang	Pavel Hubáček

## 107:xxii Organization

Vincent Hugot	Norbert Hundeshagen	Christoph Hunkenschroder
Thore Husfeldt	Tony Huynh	John Iacono
Zvonko Iljazovic	Neil Immerman	Piotr Indyk
Vincenzo Iovino	Zahra Jafargholi	Ragesh Jaiswal
David Janin	David N. Jansen	T.S. Jayram
Mark Jerrum	Artur Jeż	Łukasz Jeż
Shaofeng Jiang	Adrian Johnstone	Peter Jonsson
Hossein Jowhari	Chiraag Juvekar	Volker Kaibel
Christos Kalaitzis	Sagar Kale	Gautam Kamath
Lior Kamma	Frank Kammer	Daniel Kane
Iyad Kanj	Erez Kantor	Michael Kapralov
Aikaterini Karanasiou	Jarkko Kari	Juha Kärkkäinen
Zohar Karnin	Takashi Katoh	Isabella Kaufmann
Telikepalli Kavitha	Ken-Ichi Kawarabayashi	Steven Kelk
Marcel Keller	Hans Kellerer	Dominik Kempa
Daniel Kernberger	Thomas Kesselheim	Shahbaz Khan
Samir Khuller	Stefan Kiefer	Daniel Kifer
Eunjung Kim	Sándor Kisfaludi-Bak	Kim-Manuel Klein
Philip Klein	Robert Kleinberg	Boris Klemz
Max Klimm	Jan Willem Klop	Katharina Klost
Jens Knoop	Dušan Knop	Yusuke Kobayashi
Tomasz Kociumaka	Ioannis Kokkinis	Sudeshna Kolay
Christina Kolb	Balagopal Komarath	Christian Konrad
Spyros Kontogiannis	Tsvi Kopelowitz	Swastik Kopparty
Guy Kortsarz	Yiannis Koutis	Karel Král
Jan Kratochvil	Klaus Kriegel	S Krishna
Jean Krivine	Robert Kübler	Oliver Kullmann
Amit Kumar	Mrinal Kumar	Ravi Kumar
Marvin Künnemann	Denis Kuperberg	Salvatore La Torre
Thijs Laarhoven	Anthony Labarre	Arnaud Labourel
Bundit Laekhanukit	Michael Lampis	Patrick Landwehr
Julien Lange	Stefan Langerman	Elmar Langetepe
Sophie Laplante	Kim S. Larsen	Ślawomir Lasota
Silvio Lattanzi	Philip Lazos	Hung Le
Euiwoong Lee	Karoliina Lehtinen	Steffen Lemp
Ondrej Lengal	Jérôme Leroux	Stefano Leucci
Peter Leupold	Reut Levi	Asaf Levin
Maxwell Levit	Avivit Levy	Nathan Lhote
Jason Li	Jerry Li	Jian Li
Ray Li	Yuanzhi Li	Nutan Limaye
Didier Lime	Andrea Lincoln	Steven Lindell
Nathan Lindzey	Andre Linhares	Quanquan Liu
Christof Löding	Maarten Löffler	Markus Lohrey
Daniel Lokshtanov	Federico Lombardi	Julian Loss
Anand Louis	Shachar Lovett	Hsueh-I Lu
Pinyan Lu	Jack H Lutz	James F. Lynch
Vladimir Lysikov	Ramanujan M. S.	Mohammad Mahdian
Michael Mahoney	Hemanta Maji	Konstantin Makarychev
Yury Makarychev	Pasquale Malacaria	Andreas Maletti
David Manlove	Giovanni Manzini	Andrea Margheri

Nicolas Markey	Euripides Markou	Francisco Martins
Tomas Masopust	Antonis Matakos	Bastien Maubert
Manuel Mauro	Richard Mayr	Arya Mazumdar
Andrew McGregor	Moti Medina	Mohammad Syed Meesum
Kurt Mehlhorn	Ruta Mehta	Manor Mendel
Massimo Merro	Julian Mestre	Pierre-étienne Meunier
Tom Meyerovitch	Theresa Migler-Vondollen	Matúš Mihalák
Marius Mikučionis	Martin Milanič	Kevin Milans
Carl Miller	Tillmann Miltzow	Pranabendu Misra
Joseph Mitchell	Matthias Mnich	Ali Mohades
Rolf H. Möhring	Tobias Mömke	Benjamin Moore
Cris Moore	Pat Morin	Ben Moseley
Dana Moshkovitz	Elchanan Mossel	Shay Mozes
Wolfgang Mulzer	Kamesh Munagala	Ian Munro
Cameron Musco	Christopher Musco	Torsten Mütze
Daniel Nagaj	Viswanath Nagarajan	Anand Natarajan
Guyslain Naves	Amir Nayyeri	Amir Nayyeri
Mark-Jan Nederhof	Jesper Nederlof	Joe Neeman
Ofer Neiman	Adrian Neumann	Ilan Newman
Van Chan Ngo	Huy Nguyen	Denis Nicole
Matthias Niewerth	Filip Niksic	Gali Noti
Krzysztof Nowicki	Marc Noy	Timm Oertel
Alexander Okhotin	Igor Carboni Oliveira	Rafael Oliveira
Dennis Olivetti	Feyishayo Olukoya	Krzysztof Onak
Aurélien Ooms	Sebastian Ordyniak	Mikhail Ostrovskii
Yota Otachi	Joël Ouaknine	Youssef Oualhadj
Sang-Il Oum	Megan Owen	Kenta Ozeki
Rasmus Pagh	Linda Pagli	Dominik Pajak
Igor Pak	Konstantinos Panagiotou	Anurag Pandey
Gopal Pandurangan	Debmalya Panigrahi	Periklis Papakonstantinou
Nikos Parotsidis	Merav Parter	Anat Paskin-Cherniavsky
Francesco Pasquale	Erik Paul	Subhabrata Paul
Lehilton L. C. Pedrosa	Chris Peikert	Pan Peng
Richard Peng	Guillermo Perez	Pablo Pérez-Lantero
Will Perkins	Jeff Phillips	Astrid Pieterse
Andrea Pietracaprina	Oleg Pikhurko	Marcin Pilipczuk
Jean-Eric Pin	Thomas Place	Wojciech Plandowski
Vladimir Podolskii	Ely Porat	Gustavo Posta
M. Praveen	Eric Price	Kirk Pruhs
Pavel Pudlak	Simon Puglisi	Manish Purohit
Youming Qiao	Daowen Qiu	Karin Quaas
Balaji Raghavachari	Ajitha Rajan	Rajmohan Rajaraman
Govind Ramnarayan	Narad Rampersad	Sofya Raskhodnikova
Julian Rathke	Gaurav Rattan	Malin Rau
Dror Rawitz	Jean-Florent Raymond	Ilya Razenshteyn
Vojtech Rehak	Daniel Reichman	Ahmed Rezine
Bruce Richter	Havana Rika	Andrej Risteski
Liam Roditty	Heiko Röglin	Lars Rohwedder
Dana Ron	Adi Rosén	Peter Rossmanith
Jurriaan Rot	Marc Roth	Ron Rothblum

## 107:xxiv Organization

Thomas Rothvoss	Reuben Rowe	Eric Rowland
Michał Róžański	Polina Rozenshtein	Atri Rudra
Aleksi Saarela	Sushant Sachdeva	S. Cenk Sahinalp
Ken Sakayori	Michael Saks	Ario Salmasi
Laura Sanita	Piotr Sankowski	Ocan Sankur
Rahul Santhanam	Ramprasad Saptarishi	Thatchaphol Saranurak
Jayalal Sarma	Kanthi Sarpatwar	Tetsuya Sato
Srinivasa Rao Satti	Ignasi Sau	Thomas Sauerwald
Nitin Saurabh	Saket Saurabh	Zdenek Sawa
Raghuvansh Saxena	Guillaume Scerri	Michael Schapira
Nadja Scharf	Sven Schewe	Stefan Schmid
Georg Schnitger	Tselil Schramm	Dominique Schroeder
Roy Schwartz	Chris Schwegelshohn	Giacomo Scornavacca
Elizabeth Scott	Adam Sealfon	Erel Segal-Halevi
Danny Segev	Ilya Sergey	C. Seshadhri
Alexander Setzer	Asaf Shapira	Micha Sharir
Don Sheehy	Tetsuo Shibuya	Igor Shinkar
Tong-Wook Shinn	Aaron Sidford	Sebastian Siebertz
Rodrigo Silveira	Francesco Silvestri	Ryoma Sin'Ya
Alistair Sinclair	Kritika Singhal	Rene Sitters
Alexander Skopalik	Michał Skrzypczak	Shay Solomon
Christian Sommer	Fu Song	Aikaterini Sotiraki
Christopher Spinrath	Sophie Spirkl	Joachim Spoerhase
Vijay Sridhar	Akshayaram Srinivasan	Aravind Srinivasan
Nikhil Srivastava	B Srivathsan	Tatiana Starikovskaya
Damien Stehle	Fabian Stehn	Florian Steinberg
Noah Stephens-Davidowitz	Sebastian Stiller	Thomas Sturm
Martin Sulzmann	Scott Summers	Aarthi Sundaram
Toshio Suzuki	Ola Svensson	Avishay Tal
Navid Talebanfard	Ohad Talmon	Suguru Tamaki
Li-Yang Tan	Jakub Tarnawski	Yael Tauman Kalai
Justin Thaler	Sharma V. Thankachan	Johan Thapper
Dimitrios Thilikos	Dilys Thomas	Francesco Tiezzi
Simone Tini	Andreas Tönnis	Tigran Tonoyan
Patrick Totzke	Henry Towsner	Ohad Trabelsi
Elias Tsakas	Max Tschaikowski	Philippas Tsigas
Takeshi Tsukada	Iddo Tzameret	Marc Uetz
Yuya Uezato	Seeun William Umboh	Rohit Vaish
Ali Vakilian	Leo van Iersel	Erik Jan van Leeuwen
Rob van Stee	Anke van Zuylen	Shai Vardi
Prashant Vasudevan	Yann Vaxès	Rahul Vaze
László A. Végh	Santosh Vempala	Carmine Ventre
Nikolay Vereshchagin	José Verschae	Aravindan Vijayaraghavan
Cosimo Vinci	Sundar Vishwanathan	Jan Vondrak
Nils Vortmeier	Satyanarayana Vusirikala	Nikhil Vyas
Magnus Wahlström	Erik Waingarten	David Wajc
Johannes Waldmann	Erik Walsberg	Di Wang
Yuyi Wang	Justin Ward	Pascal Weil
Oren Weimann	Omri Weinstein	Mathias Weller
Stefan Weltge	Anthony Widjaja Lin	Andreas Wiese



Max Willert  
Karl Wimmer  
Dominik Wojtczak  
James Worrell  
Pei Wu  
Ning Xie  
Grigory Yaroslavtsev  
Neal Young  
Meirav Zehavi  
Hanmeng Zhan  
Baigong Zheng

Jack Williams  
Sarah Winter  
Bruno Woltzenlogel Paleo  
Marcin Wrochna  
Zhilin Wu  
Lin F. Yang  
Yitong Yin  
Huacheng Yu  
Marc Zeitoun  
Hantao Zhang  
Vassilis Zikas

Ryan Williams  
Philipp Woelfel  
David P. Woodruff  
David Wu  
Christian Wulff-Nilsen  
Mu Yang  
Yuichi Yoshida  
Or Zamir  
Georg Zetsche  
Jie Zhang  
Charilaos Zisopoulos



## ■ List of Authors

Anders Aamand  
BARC, University of Copenhagen,  
Universitetsparken 1, Copenhagen, Denmark  
aa@di.ku.dk  
<https://orcid.org/0000-0002-0402-0514>

Amir Abboud  
IBM Almaden Research Center, San Jose,  
USA  
amir.abboud@ibm.com

Nathanael L. Ackerman  
Harvard Univ

Anna Adamaszek  
University of Copenhagen, Denmark  
anad@di.ku.dk

Navneet Agarwal  
Indian Institute of Technology Bombay  
navneet@cse.iitb.ac.in

Pankaj K. Agarwal  
Department of Computer Science, Duke  
University, Durham, NC 27708, USA  
pankaj@cs.duke.edu

Alejandro Aguirre  
IMDEA Software Institute, Madrid, Spain

Saeed Akhoondian Amiri  
Max-Planck Institute of Informatics,  
Germany  
samiri@mpi-inf.mpg.de

Eleni C. Akrida  
Department of Computer Science, University  
of Liverpool, UK  
Eleni.Akrida@liverpool.ac.uk  
<https://orcid.org/0000-0002-1126-1623>

Shaul Almagor  
Department of Computer Science, Oxford  
University, UK  
shaull.almagor@cs.ox.ac.uk

Antoine Amarilli  
LTCI, Télécom ParisTech, Université  
Paris-Saclay

Sanat Anand  
Indian Institute of Technology Bombay  
sanat@cse.iitb.ac.in

Megumi Ando  
Computer Science Department, Brown  
University, Providence, RI 02912 USA  
mando@cs.brown.edu

Moab Arar  
Tel Aviv University, Tel Aviv, Israel

Rotem Arnon-Friedman  
ETH Zürich, Switzerland  
rotema@itp.phys.ethz.ch

Boris Aronov  
Department of Computer Science and  
Engineering, Tandon School of Engineering,  
New York University, Brooklyn, NY 11201,  
USA  
boris.aronov@nyu.edu

Albert Atserias  
Universitat Politècnica de Catalunya,  
Barcelona, atserias@cs.upc.edu

Amy Babay  
Johns Hopkins University, Baltimore, MD,  
USA  
babay@cs.jhu.edu

Miriam Backens  
Department of Computer Science, University  
of Oxford, UK  
miriam.backens@cs.ox.ac.uk

Achiya Bar-On  
Department of Mathematics, Bar-Ilan  
University, Ramat Gan, Israel  
abo1000@gmail.com

Gali Bar-On  
Department of Computer Science,  
Ben-Gurion University of the Negev,  
Beer-Sheva 84105, Israel  
galibar@post.bgu.ac.il

## 107:xxviii Authors

- Gill Barequet  
Technion - Israel Inst. of Technology, Haifa, Israel  
barequet@cs.technion.ac.il
- Gilles Barthe  
IMDEA Software Institute, Madrid, Spain
- MohammadHossein Bateni  
Google Research, New York
- Soheil Behnezhad  
University of Maryland
- Ran Ben Basat  
Technion, Haifa, Israel  
sran@cs.technion.ac.il
- Eli Ben-Sasson  
Department of Computer Science, Technion, Haifa, Israel  
eli@cs.technion.ac.il  
<https://orcid.org/0000-0002-0708-0483>
- Iddo Bentov  
Cornell University, Ithaca, NY, USA  
iddo333@gmail.com
- Ben Berger  
Weizmann Institute of Science, Rehovot, Israel  
ben.berger@weizmann.ac.il
- Juan Jose Besa  
Dept. of Computer Science, Univ. of California, Irvine, Irvine, CA 92697 USA  
jjbesavi@uci.edu  
<https://orcid.org/0000-0002-5676-7011>
- Amey Bhangale  
Weizmann Institute of Science, Rehovot, Israel  
amey.bhangale@weizmann.ac.il
- Aditya Bhaskara  
School of Computing, University of Utah, USA  
bhaskara@cs.utah.edu
- Arnab Bhattacharyya  
Indian Institute of Science, Bangalore, India  
arnabb@iisc.ac.in
- Therese Biedl  
School of Computer Science, University of Waterloo, Canada  
biedl@uwaterloo.ca
- Davide Bilò  
Department of Humanities and Social Sciences, University of Sassari, Via Roma 151, 07100 Sassari (SS), Italy  
davide.bilo@uniss.it  
<https://orcid.org/0000-0003-3169-4300>
- Vittorio Bilò  
Department of Mathematics and Physics, University of Salento, Lecce, Italy  
vittorio.bilo@unisalento.it
- Ahmad Biniiaz  
School of Computer Science, University of Waterloo, Canada  
ahmad.biniiaz@gmail.com
- Jeremiah Blocki  
Department of Computer Science, Purdue University, West Lafayette, Indiana, USA  
jblocki@purdue.edu
- Avrim Blum  
TTI-Chicago, Chicago, United States  
avrim@ttic.edu
- Achim Blumensath  
Masaryk University Brno  
blumens@fi.muni.cz
- Thomas Bläsius  
Hasso Plattner Institute, University of Potsdam, Potsdam, Germany  
thomas.blaesius@hpi.de
- Andrej Bogdanov  
Department of Computer Science and Engineering and , Institute of Theoretical Computer Science and Communications, Chinese University of Hong Kong  
andrejb@cse.cuhk.edu.hk
- Prosenjit Bose  
School of Computer Science, Carleton University, Ottawa, Canada  
jit@scs.carleton.ca

Sébastien Bouchard  
Sorbonne Universités, UPMC Univ Paris 06,  
CNRS, INRIA, LIP6 UMR 7606, Paris,  
France  
sebastien.bouchard@lip6.fr

Elette Boyle  
IDC Herzliya  
elette.boyle@idc.ac.il

Zvika Brakerski  
Weizmann Institute of Science, Rehovot,  
Israel  
zvika.brakerski@weizmann.ac.il

Vladimir Braverman  
Johns Hopkins University, Baltimore, United  
States  
vova@cs.jhu.edu

Karl Bringmann  
Max Planck Institute for Informatics,  
Saarland Informatics Campus, Saarbrücken,  
Germany  
kbringma@mpi-inf.mpg.de

Jarosław Byrka  
University of Wrocław, Wrocław, Poland  
jby@cs.uni.wroc.pl

Mathias Bæk Tejs Knudsen  
University of Copenhagen and Supwiz,  
Copenhagen, Denmark  
mathias@tejs.dk  
<https://orcid.org/0000-0001-5308-9609>

Karthik C. S.  
Weizmann Institute of Science, Rehovot,  
Israel  
karthik.srikanta@weizmann.ac.il

Paz Carmi  
Department of Computer Science,  
Ben-Gurion University of the Negev,  
Beer-Sheva, Israel  
carmip@cs.bgu.ac.il

Marco L. Carosino  
Department of Computer Science, University  
of California San Diego, La Jolla, CA, USA  
marco@ntime.org

L. Elisa Celis  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland

Deeparnab Chakrabarty  
Department of Computer Science,  
Dartmouth College, 9 Maynard St, Hanover,  
NH, USA  
deeparnab@dartmouth.edu

Timothy M. Chan  
Dept. of Computer Science, University of  
Illinois at Urbana-Champaign, USA  
tmc@illinois.edu

L. Sunil Chandran  
Department of Computer Science and  
Automation, Indian Institute of Science,  
India  
sunil@csa.iisc.ernet.in

Steven Chaplick  
Lehrstuhl für Informatik I, Universität  
Würzburg, Germany  
steven.chaplick@uni-wuerzburg.de  
<https://orcid.org/0000-0003-3501-4608>

Moses Charikar  
Department of Computer Science, Stanford  
University, Stanford, CA, USA  
moses@cs.stanford.edu

Shiri Chechik  
Tel Aviv University, Tel Aviv, Israel

Jiehua Chen  
Ben-Gurion University of the Negev, Beer  
Sheva, Israel  
jiehua.chen2@gmail.com

Jing Chen  
Department of Computer Science, Stony  
Brook University, Stony Brook, NY 11794,  
USA  
jingchen@cs.stonybrook.edu

Siu-Wing Cheng  
Department of Computer Science and  
Engineering, HKUST, Hong Kong  
scheng@cse.ust.hk  
<https://orcid.org/0000-0002-3557-9935>

Yun Kuen Cheung  
 Max Planck Institute for Informatics,  
 Saarland Informatics Campus, Germany  
 ycheung@mpi-inf.mpg.de  
<https://orcid.org/0000-0002-9280-0149>

Flavio Chierichetti  
 Dipartimento di Informatica, Sapienza  
 University, Rome, Italy  
 flavio@di.uniroma1.it  
<https://orcid.org/0000-0001-8261-9058>

Suryajith Chillara  
 Department of CSE, IIT Bombay, Mumbai,  
 India  
 suryajith@cse.iitb.ac.in

Dmitry Chistikov  
 Centre for Discrete Mathematics and its  
 Applications (DIMAP) & , Department of  
 Computer Science, University of Warwick,  
 UK  
 d.chistikov@warwick.ac.uk

George Christodoulou  
 Department of Computer Science, University  
 of Liverpool, Liverpool, UK  
 G.Christodoulou@liverpool.ac.uk

Julia Chuzhoy  
 Toyota Technological Institute at Chicago,  
 6045 S. Kenwood Ave., Chicago, Illinois  
 60637, USA  
 cjulia@ttic.edu

Lorenzo Clemente  
 University of Warsaw  
 clementelorenzo@gmail.com  
<https://orcid.org/0000-0003-0578-9103>

Sarel Cohen  
 Tel Aviv University, Tel Aviv, Israel

Riccardo Colini-Baldeschi  
 Core Data Science Group, Facebook Inc., 1  
 Rathbone Place, London, W1T 1FB, UK  
 rickuz@fb.com  
<https://orcid.org/0000-0001-5739-1178>

Alex Conway  
 Rutgers University, New Brunswick, NJ,  
 USA  
 alexander.conway@rutgers.edu

Robert Cummings  
 School of Computer Science, University of  
 Waterloo, Canada  
 rcummings000@gmail.com

Wojciech Czerwiński  
 University of Warsaw, Poland  
<https://orcid.org/0000-0002-6169-868X>

Samira Daruki  
 Expedia Research, USA  
 sdaruki@expedia.com

Shantanu Das  
 LIS, Aix-Marseille University, University of  
 Toulon, CNRS, Marseille, France  
 shantanu.das@lif.univ-mrs.fr

Samir Datta  
 Chennai Mathematical Institute & UMI  
 ReLaX, Chennai, India  
 sdatta@cmi.ac.in

Laure Daviaud  
 University of Warwick, Coventry, UK  
 L.Daviaud@warwick.ac.uk

Minati De  
 Department of Mathematics, Indian  
 Institute of Technology Delhi, India  
 minati@maths.iitd.ac.in

Sina Dehghani  
 University of Maryland, College Park, MD  
 20742, USA

Holger Dell  
 Saarland University and Cluster of  
 Excellence (MMCI), Saarbrücken, Germany  
 hdell@mmci.uni-saarland.de  
<https://orcid.org/0000-0001-8955-0786>

Mahsa Derakhshan  
 University of Maryland

Dariusz Dereniowski  
 Faculty of Electronics, Telecommunications  
 and Informatics, Gdańsk University of  
 Technology, Gdańsk, Poland  
 deren@eti.pg.edu.pl  
<https://orcid.org/0000-0003-4000-4818>

María Emilia Descotte  
 LaBRI, Université de Bordeaux

William E. Devanny  
Dept. of Computer Science, Univ. of  
California, Irvine, Irvine, CA 92697 USA  
wdevanny@uci.edu

Ilias Diakonikolas  
USC, Los Angeles, CA, USA  
diakonik@usc.edu

Yoann Dieudonné  
Laboratoire MIS & Université de Picardie  
Jules Verne, Amiens, France  
yoann.dieudonne@u-picardie.fr

Michael Dinitz  
Johns Hopkins University, Baltimore, MD,  
USA  
mdinitz@cs.jhu.edu

Itai Dinur  
Computer Science Department, Ben-Gurion  
University, Beer Sheva, Israel  
dinuri@cs.bgu.ac.il

Gaëtan Douéneau-Tabot  
École Normale Supérieure Paris-Saclay,  
Université Paris-Saclay, Cachan, France  
gaetan.doueneau@ens-paris-saclay.fr

Ran Duan  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, China  
duanran@mail.tsinghua.edu.cn

Bartłomiej Dudek  
Institute of Computer Science, University of  
Wrocław, Poland  
bartlomiej.dudek@cs.uni.wroc.pl

Szymon Dudycz  
University of Wrocław, Poland  
szymon.dudycz@gmail.com

Vida Dujmovic  
School of Computer Science and Electrical  
Engineering, University of Ottawa, Ottawa,  
Canada  
vida.dujmovic@uottawa.ca

Orr Dunkelman  
Computer Science Department, University of  
Haifa, Haifa, Israel  
orrd@cs.haifa.ac.il  
<https://orcid.org/0000-0001-5799-2635>

Lech Duraj  
Theoretical Computer Science Department,  
Faculty of Mathematics and Computer  
Science, Jagiellonian University, Kraków,  
Poland  
lech.duraj@uj.edu.pl

Zdeněk Dvořák  
Charles University, Malostranske namesti 25,  
11800 Prague, Czech Republic  
rakdver@iuuk.mff.cuni.cz  
<https://orcid.org/0000-0002-8308-9746>

Soheil Ehsani  
University of Maryland, College Park, MD  
20742, USA

Eduard Eiben  
Department of Informatics, University of  
Bergen, Bergen, Norway  
eduard.eiben@uib.no  
<https://orcid.org/0000-0003-2628-3435>

Gil Einziger  
Nokia Bell Labs, Kfar Saba, Israel  
gil.einziger@nokia.com

Friedrich Eisenbrand  
EPFL, 1015 Lausanne, Switzerland  
friedrich.eisenbrand@epfl.ch

David Eppstein  
Dept. of Computer Science, Univ. of  
California, Irvine, Irvine, CA 92697 USA  
eppstein@uci.edu

Martín Farach-Colton  
Rutgers University, New Brunswick, NJ,  
USA  
farach@rutgers.edu

John Fearnley  
University of Liverpool, UK  
john.fearnley@liverpool.ac.uk

Uriel Feige  
Weizmann Institute of Science, Rehovot,  
Israel  
uriel.feige@weizmann.ac.il

Björn Feldkord  
Paderborn University, Paderborn, Germany

## 107:xxxii Authors

- Matthias Feldotto  
Paderborn University, Paderborn, Germany
- Hendrik Fichtenberger  
TU Dortmund, Dortmund, Germany  
hendrik.fichtenberger@tu-dortmund.de  
<https://orcid.org/0000-0003-3246-5323>
- Diego Figueira  
CNRS, LaBRI, Université de Bordeaux
- Fedor V. Fomin  
Department of Informatics, University of Bergen, Norway  
Fedor.Fomin@uib.no  
<https://orcid.org/0000-0003-1955-4612>
- Michael A. Forbes  
University of Illinois at Urbana-Champaign, USA  
miforbes@illinois.edu
- Jacob Fox  
Department of Mathematics, Stanford University, Stanford, CA 94305, USA  
jacobfox@stanford.edu
- Cameron E. Freer  
Borelian
- Cedric Freiburger  
Hasso Plattner Institute, University of Potsdam, Potsdam, Germany  
cedric.freiburger@student.hpi.de
- Roy Friedman  
Technion, Haifa, Israel  
roy@cs.technion.ac.il
- Tobias Friedrich  
Hasso Plattner Institute, University of Potsdam, Potsdam, Germany  
tobias.friedrich@hpi.de
- Martin Fränzle  
Department of Computing Science, University of Oldenburg, Germany  
martin.fraenzle@informatik.uni-oldenburg.de
- Hao Fu  
Institute for Interdisciplinary Information Sciences, Tsinghua University, Beijing, China  
fu-h13@mails.tsinghua.edu.cn
- Martin Gairing  
Department of Computer Science, University of Liverpool, Liverpool, UK  
gairing@liverpool.ac.uk
- Jakub Gajarský  
Technical University Berlin, Germany
- Buddhima Gamlath  
École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland  
buddhima.gamlath@epfl.ch
- Moses Ganardi  
Universität Siegen, Germany  
ganardi@eti.uni-siegen.de
- Venkata Gandikota  
Department of Computer Science, Johns Hopkins University, Baltimore, Maryland, USA  
gv@jhu.edu
- Sumit Ganguly  
Indian Institute of Technology, Kanpur, India  
sganguly@cse.iitk.ac.in
- Shashwat Garg  
Eindhoven University of Technology, Netherlands  
s.garg@tue.nl
- Paweł Gawrychowski  
Institute of Computer Science, University of Wrocław, Poland  
gawry@cs.uni.wroc.pl
- Ofir Geri  
Department of Computer Science, Stanford University, Stanford, CA, USA  
ofirgeri@cs.stanford.edu
- Sumanta Ghosh  
Department of Computer Science, IIT Kanpur, India  
sumghosh@cse.iitk.ac.in
- Suprovat Ghoshal  
Indian Institute of Science, Bangalore, India  
suprovat@iisc.ac.in



Yiannis Giannakopoulos  
 Department of Mathematics, TU Munich,  
 Munich, Germany  
 Yiannis.Giannakopoulos@tum.de  
<https://orcid.org/0000-0003-2382-1779>

Shay Golan  
 Bar Ilan University, Ramat Gan, Israel  
 golansh1@cs.biu.ac.il

Petr A. Golovach  
 Department of Informatics, University of  
 Bergen, Norway  
 Petr.Golovach@uib.no  
<https://orcid.org/0000-0002-2619-2990>

Michael T. Goodrich  
 Dept. of Computer Science, Univ. of  
 California, Irvine, Irvine, CA 92697 USA  
 goodrich@uci.edu

Themis Gouleakis  
 CSAIL, MIT, Cambridge, MA, USA  
 tgoule@mit.edu

Daniel Graf  
 Department of Computer Science, ETH  
 Zürich, Switzerland  
 daniel.graf@inf.ethz.ch

Anael Grandjean  
 Laboratoire d'Algorithmique, Complexité et  
 Logique, Université Paris-Est Créteil, France  
 anael.grandjean@u-pec.fr

Petr Gregor  
 Department of Theoretical Computer  
 Science and Mathematical Logic, Charles  
 University, Prague, Czech Republic  
 gregor@ktiml.mff.cuni.cz

Elena Grigorescu  
 Department of Computer Science, Purdue  
 University, West Lafayette, Indiana, USA  
 elena-g@purdue.edu

Martin Grohe  
 RWTH Aachen University, Aachen, Germany  
 grohe@informatik.rwth-aachen.de  
<https://orcid.org/0000-0002-0292-9142>

Ofer Grossman  
 EECS Department, MIT, Cambridge, MA,  
 USA  
 ofer.grossman@gmail.com

Yong Gu  
 Institute for Interdisciplinary Information  
 Sciences, Tsinghua University, Beijing, China  
 guyong12@mails.tsinghua.edu.cn

Heng Guo  
 School of Informatics, University of  
 Edinburgh, Informatics Forum, Edinburgh,  
 EH8 9AB, United Kingdom  
 hguo@inf.ed.ac.uk  
<https://orcid.org/0000-0001-8199-5596>

Anupam Gupta  
 Carnegie Mellon University, Pittsburgh, USA  
 anupamg@cs.cmu.edu

Manoj Gupta  
 IIT Gandhinagar, Gandhinagar, India  
 gmanoj@iitgn.ac.in

Tom Gur  
 UC Berkeley, Berkeley, USA  
 tom.gur@berkeley.edu

Rohit Gurjar  
 California Institute of Technology, USA

Guru Guruganesh  
 Carnegie Mellon University, Pittsburgh, USA

Grzegorz Gutowski  
 Theoretical Computer Science Department,  
 Faculty of Mathematics and Computer  
 Science, Jagiellonian University, Kraków,  
 Poland  
 grzegorz.gutowski@uj.edu.pl  
<https://orcid.org/0000-0003-3313-1237>

Bernd Gärtner  
 Department of Computer Science, ETH  
 Zürich, Switzerland  
 gaertner@inf.ethz.ch

Shahrazad Haddadan  
 Dipartimento di Informatica, Sapienza  
 University, Rome, Italy  
 shahrazad.haddadan@uniroma1.it  
<https://orcid.org/0000-0002-7702-8250>

- Theophanis Hadjistasi  
University of Connecticut, Storrs CT, USA  
theo@uconn.edu
- Bernhard Haeupler  
Computer Science Department, Carnegie Mellon University, Pittsburgh, PA, USA  
haeupler@cs.cmu.edu
- MohammadTaghi Hajiaghayi  
University of Maryland, College Park, MD 20742, USA
- Magnús M. Halldórsson  
School of Computer Science, Reykjavik University, Iceland  
mmh@ru.is
- Thomas Dueholm Hansen  
Department of Computer Science, University of Copenhagen, Denmark  
dueholm@di.ku.dk
- Sariel Har-Peled  
Department of Computer Science, University of Illinois, Urbana, IL, USA  
sariel@illinois.edu
- Tobias Harks  
Universität Augsburg, Institut für Mathematik, Augsburg, Germany  
tobias.harks@math.uni-augsburg.de
- Koyo Hayashi  
Department of Mathematical Informatics, University of Tokyo, Tokyo 113-8656, Japan  
koyo\_hayashi@mist.i.u-tokyo.ac.jp
- Benjamin Hellouin de Menibus  
Laboratoire de Recherche en Informatique, Université Paris-Sud, CNRS, CentraleSupélec, Université Paris-Saclay, France  
hellouin@lri.fr  
<https://orcid.org/0000-0001-5194-929X>
- Danny Hermelin  
Ben-Gurion University of the Negev, Beer Sheva, Israel  
hermelin@bgu.ac.il
- Niklas Hjuler  
University of Copenhagen, Copenhagen, Denmark  
niklashjuler@gmail.com  
<https://orcid.org/0000-0002-0815-670X>
- Rani Hod  
Department of Mathematics, Bar-Ilan University, Ramat Gan, Israel  
rani.hod@math.biu.ac.il
- Martin Hofer  
Goethe-Universität Frankfurt am Main, Institut für Informatik, Frankfurt am Main, Germany  
mhofer@cs.uni-frankfurt.de
- Piotr Hofman  
University of Warsaw, Poland  
<https://orcid.org/0000-0001-9866-3723>
- Jacob Holm  
University of Copenhagen, Copenhagen, Denmark  
jaho@di.ku.dk  
<https://orcid.org/0000-0001-6997-9251>
- Yinon Horesh  
Technion - Israel Institute of Technology, Haifa, Israel  
ynon980@gmail.com
- Mathieu Hoyrup  
Université de Lorraine, CNRS, Inria, LORIA, F-54000 Nancy, France  
mathieu.hoyrup@inria.fr
- Justin Hsu  
University College London, London, UK
- Sangxia Huang  
Sony Mobile Communications, Lund, Sweden  
huang.sangxia@gmail.com
- Zhiyi Huang  
Department of Computer Science, The University of Hong Kong, Hong Kong  
zhiyi@cs.hku.hk
- Anja Huber  
Universität Augsburg, Institut für Mathematik, Augsburg, Germany  
anja.huber@math.uni-augsburg.de

Pavel Hubáček  
Computer Science Institute, Charles  
University, Prague, Czech Republic  
hubacek@iuuk.mff.cuni.cz

Danny Hucce  
Universität Siegen, Germany  
hucce@eti.uni-siegen.de

Christoph Hunkenschroder  
EPFL, 1015 Lausanne, Switzerland  
christoph.hunkenschroder@epfl.ch

Russell Impagliazzo  
Department of Computer Science, University  
of California San Diego, La Jolla, CA, USA  
russell@cs.ucsd.edu

Piotr Indyk  
Department of Computer Science, MIT,  
Cambridge, MA, USA  
indyk@mit.edu

Davis Issac  
Max Planck Institute for Informatics,  
Saarland Informatics Campus, Germany  
dissac@mpi-inf.mpg.de  
<https://orcid.org/0000-0001-5559-7471>

Abhishek Jain  
Johns Hopkins University  
abhishek@cs.jhu.edu

Jisu Jeong  
Department of Mathematical Sciences,  
KAIST, Daejeon, Korea  
jisujeong89@gmail.com

Mark Jerrum  
School of Mathematical Sciences, Queen  
Mary, University of London, Mile End Road,  
London, E1 4NS, United Kingdom  
m.jerrum@qmul.ac.uk  
<https://orcid.org/0000-0003-0863-7279>

Timothy Johnson  
Dept. of Computer Science, Univ. of  
California, Irvine, Irvine, CA 92697 USA  
tujohnso@uci.edu

Marcin Jurdziński  
University of Warwick, Coventry, UK  
Marcin.Jurdzinski@warwick.ac.uk

Sven Jäger  
Institut für Mathematik, Technische  
Universität Berlin, Germany  
jaeger@math.tu-berlin.de

Daniel M. Kane  
Department of Computer Science and  
Engineering/Department of Mathematics,  
University of California, San Diego  
dakane@ucsd.edu  
<https://orcid.org/0000-0002-5884-3487>

Iyad Kanj  
School of Computing, DePaul University,  
Chicago, USA  
ikanj@cs.depaul.edu

Haim Kaplan  
School of Computer Science, Tel Aviv  
University, Tel Aviv 69978, Israel  
haimk@tau.ac.il

Adam Karczmarz  
University of Warsaw, Poland  
a.karczmarz@mimuw.edu.pl

Matthew J. Katz  
Department of Computer Science,  
Ben-Gurion University of the Negev,  
Beer-Sheva 84105, Israel  
matya@cs.bgu.ac.il

Maximilian Katzmann  
Hasso Plattner Institute, University of  
Potsdam, Potsdam, Germany  
maximilian.katzmann@hpi.de

Ken-ichi Kawarabayashi  
National Institute of Informatics, 2-1-2  
Hitotsubashi, Chiyoda-ku, Tokyo 101-8430,  
Japan  
k\_keniti@nii.ac.jp  
<https://orcid.org/0000-0001-6056-4287>

Nathan Keller  
Department of Mathematics, Bar-Ilan  
University, Ramat Gan, Israel  
nkeller@math.biu.ac.il

Thomas Kesselheim  
University of Bonn, Institute of Computer  
Science, Bonn, Germany  
thomas.kesselheim@uni-bonn.de

Stefan Kiefer  
University of Oxford, United Kingdom

David H. K. Kim  
Computer Science Department, University of  
Chicago, 1100 East 58th Street, Chicago,  
Illinois 60637, USA  
hongk@cs.uchicago.edu

Eun Jung Kim  
Université Paris-Dauphine, PSL Research  
University, CNRS, Paris, France  
eun-jung.kim@dauphine.fr

Michael P. Kim  
Department of Computer Science, Stanford  
University, Stanford, CA, USA  
mpk@cs.stanford.edu

Kim-Manuel Klein  
EPFL, 1015 Lausanne, Switzerland  
kim-manuel.klein@epfl.ch

Ines Klimann  
Univ Paris Diderot, Sorbonne Paris Cité,  
IRIF, UMR 8243 CNRS, F-75013 Paris,  
France  
klimann@irif.fr

Max Klimm  
School of Business and Economics, HU  
Berlin, Spandauer Str. 1, 10099 Berlin,  
Germany  
max.klimm@hu-berlin.de  
<https://orcid.org/0000-0002-9061-2267>

Sang-Ki Ko  
Korea Electronics Technology Institute,  
South Korea  
sangkiko@keti.re.kr

Bojana Kodric  
MPI for Informatics and Saarland University,  
Saarbrücken, Germany  
bojana@mpi-inf.mpg.de

Zhuan Khye Koh  
Department of Combinatorics and  
Optimization, University of Waterloo,  
Waterloo, Canada  
zkkoh@uwaterloo.ca

Alexandra Kolla  
Department of Computer Science, University  
of Colorado at Boulder  
alexandra.kolla@colorado.edu

Tsvi Kopelowitz  
Bar Ilan University, Ramat Gan, Israel  
kopelot@gmail.com

Guy Kortsarz  
Rutgers University, Camden, NJ, USA  
guyk@camden.rutgers.edu

Martin Koutecký  
Technion - Israel Institute of Technology,  
Haifa, Israel, and , Charles University,  
Prague, Czech Republic  
koutecky@technion.ac.il  
<https://orcid.org/0000-0002-7846-0053>

Ioannis Koutis  
Department of Computer Science, New  
Jersey Institute of Technology  
ioannis.koutis@njit.edu

Dariusz R. Kowalski  
Computer Science Department, University of  
Liverpool, Liverpool, UK  
D.Kowalski@liverpool.ac.uk

Jakub Kozik  
Theoretical Computer Science Department,  
Faculty of Mathematics and Computer  
Science, Jagiellonian University, Kraków,  
Poland  
jakub.kozik@uj.edu.pl

Stephan Kreutzer  
Technical University Berlin  
stephan.kreutzer@tu-berlin.de

Karel Král  
Computer Science Institute, Charles  
University, Prague, Czech Republic  
kralka@iuuk.mff.cuni.cz

Amit Kumar  
IIT Delhi, New Delhi, India

Ananya Kumar  
Carnegie Mellon University, Pittsburgh,  
United States  
skywalker94@gmail.com

- Orna Kupferman  
School of Computer Science and Engineering,  
The Hebrew University, Israel
- Dietrich Kuske  
Technische Universität Ilmenau, Germany  
dietrich.kuske@tu-ilmenau.de
- William Kuszmaul  
Department of Computer Science, Stanford  
University, Stanford, CA, USA  
kuszmaul@cs.stanford.edu
- Karim Labib  
Department of Computer Science, ETH  
Zürich, Switzerland  
labibk@student.ethz.ch
- Anissa Lamani  
Laboratoire MIS & Université de Picardie  
Jules Verne, Amiens, France  
anissa.lamani@u-picardie.fr
- Michael Lampis  
Université Paris-Dauphine, PSL Research  
University, CNRS, UMR 7243 , LAMSADE,  
75016, Paris, France  
michail.lampis@dauphine.fr
- Gad M. Landau  
University of Haifa, Israel  
landau@cs.haifa.ac.il
- Harry Lang  
Johns Hopkins University, Baltimore, United  
States  
hlang8@math.jhu.edu
- Sławomir Lasota  
University of Warsaw  
sl@mimuw.edu.pl  
<https://orcid.org/0000-0001-8674-4470>
- Ranko Lazić  
University of Warwick, Coventry, UK  
R.S.Lazic@warwick.ac.uk
- Christoph Lenzen  
Max Planck Institute for Informatics,  
Saarbrücken, Germany  
clenzen@mpi-inf.mpg.de
- Jérôme Leroux  
Univ.Bordeaux, CNRS, Bordeaux-INP,  
Talence, France  
jerome.leroux@labri.fr
- Reut Levi  
Weizmann Institute of Science, Rehovot,  
Israel  
reut.levi@weizmann.ac.il  
<https://orcid.org/0000-0003-3167-1766>
- Asaf Levin  
Technion - Israel Institute of Technology,  
Haifa, Israel  
levinas@ie.technion.ac.il
- Bo Li  
Department of Computer Science, Stony  
Brook University, Stony Brook, NY 11794,  
USA  
boli2@cs.stonybrook.edu
- Jason Li  
Carnegie Mellon University
- Jian Li  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, Beijing, China  
Correspondingauthorlijian83@mail.  
tsinghua.edu.cn
- Yingkai Li  
Department of Computer Science, Stony  
Brook University, Stony Brook, NY 11794,  
USA  
yingkli@cs.stonybrook.edu
- Vahid Liaghat  
Facebook, Building 25, 190 Jefferson Dr,  
Menlo Park, CA 94025, USA
- Nutan Limaye  
Department of CSE, IIT Bombay, Mumbai,  
India  
nutan@cse.iitb.ac.in
- Sixue Liu  
Department of Computer Science, Princeton  
University , 35 Olden Street, Princeton, NJ  
08540, USA  
sixuel@cs.princeton.edu

Yang P. Liu  
MIT, Cambridge, MA  
yangpatil@gmail.com

Markus Lohrey  
Universität Siegen, Germany  
lohrey@eti.uni-siegen.de

Daniel Lokshtanov  
Department of Informatics, University of  
Bergen, Norway  
daniello@uib.no

Anand Louis  
Indian Institute of Science, Bangalore, India  
anandl@iisc.ac.in

Shachar Lovett  
Department of Computer Science and  
Engineering, University of California, San  
Diego  
slovett@cs.ucsd.edu  
<https://orcid.org/0000-0003-4552-1443>

Pinyan Lu  
Institute for Theoretical Computer Science,  
Shanghai University of Finance and  
Economics, Shanghai 200433, China  
lu.pinyan@mail.shufe.edu.cn

Anna Lubiw  
School of Computer Science, University of  
Waterloo, Canada  
alubiw@uwaterloo.ca

Anna Lysyanskaya  
Computer Science Department, Brown  
University, Providence, RI 02912 USA  
anna@cs.brown.edu

Kaifeng Lyu  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, Beijing, China  
lkf15@mails.tsinghua.edu.cn

Vivek Madan  
Department of Computer Science, University  
of Illinois, Urbana-Champaign  
vmadan2@illinois.edu

Sepideh Mahabadi  
Data Science Institute, Columbia University,  
New York, NY, USA  
mahabadi@mit.edu

Frederik Mallmann-Trenn  
CSAIL, MIT, US  
mallmann@mit.edu

Nil Mamano  
University of California, Irvine, U.S  
nmamano@uci.edu

Florin Manea  
Department of Computer Science, Kiel  
University, D-24098 Kiel, Germany  
flm@zs.uni-kiel.de

Pasin Manurangsi  
University of California, Berkeley, USA  
pasin@berkeley.edu

Yuchen Mao  
Department of Computer Science and  
Engineering, HKUST, Hong Kong  
ymaad@cs.eust.hk  
<https://orcid.org/0000-0002-1075-344X>

Liran Markin  
University of Haifa, Israel  
liran.markin@gmail.com

Filip Mazowiecki  
Université de Bordeaux, Bordeaux, France  
filip.mazowiecki@u-bordeaux.fr

Saeed Mehrabi  
School of Computer Science, Carleton  
University, Ottawa, Canada  
saeed.mehrabi@carleton.ca

Ruta Mehta  
University of Illinois Urbana-Champaign,  
Champaign, USA  
rutameht@illinois.edu

George B. Mertzios  
Department of Computer Science, Durham  
University, UK  
George.Mertzios@durham.ac.uk  
<https://orcid.org/0000-0001-7182-585X>

Daniele Micciancio  
Department of Computer Science and  
Engineering, University of California - San  
Diego, CA, USA  
daniele@cs.ucsd.edu

Vahab Mirrokni  
Google Research, New York

Pradipta Mitra  
Google Research, New York, USA  
ppmitra@gmail.com

Matthias Mnich  
Universität Bonn, Germany, and Maastricht  
University, The Netherlands  
mmnich@uni-bonn.de  
<https://orcid.org/0000-0002-4721-5354>

Sidhanth Mohanty  
Computer Science Department, Carnegie  
Mellon University, Pittsburgh, PA, USA  
sidhanth@cmu.edu

Marco Molinaro  
PUC-Rio, Rio de Janeiro, Brazil  
mmolinaro@inf.puc-rio.br

Fabrizio Montecchiani  
Department of Engineering, University of  
Perugia, Perugia, Italy  
fabrizio.montecchiani@unipg.it

Felix Montenegro-Retana  
Hasso Plattner Institute, University of  
Potsdam, Potsdam, Germany  
felix.montenegro-retana@student.hpi.  
de

Shay Moran  
Institute for Advanced Study, Princeton  
shaymoran@ias.edu  
<https://orcid.org/0000-0002-8662-2737>

Pat Morin  
School of Computer Science, Carleton  
University, Ottawa, Canada  
morin@scs.carleton.ca

Hagar Mosaad  
Department of Computer Science and  
Engineering, German University in Cairo,  
Egypt  
hagar.omar@student.guc.edu.eg

Luca Moscardelli  
Department of Economic Studies, University  
of Chieti-Pescara, Pescara, Italy  
luca.moscardelli@unich.it

Miguel A. Mosteiro  
Computer Science Department, Pace  
University, New York, NY, USA  
mmosteiro@pace.edu

Anish Mukherjee  
Chennai Mathematical Institute, Chennai,  
India  
anish@cmi.ac.in

Cameron Musco  
CSAIL, MIT, US  
cnmusco@mit.edu

Christopher Musco  
CSAIL, MIT, US  
cpmusco@mit.edu

Torsten Mütze  
Institut für Mathematik, Technische  
Universität Berlin, Germany  
muetze@math.tu-berlin.de

Hiroshi Nagamochi  
Department of Applied Mathematics and  
Physics, Graduate School of Informatics,  
Kyoto University, Japan  
nag@amp.i.kyoto-u.ac.jp

Vasileios Nakos  
Harvard University, Cambridge, USA  
vasileiosnakos@g.harvard.edu

Maryam Negahbani  
Department of Computer Science,  
Dartmouth College, 9 Maynard St, Hanover,  
NH, USA  
maryam@cs.dartmouth.edu

Yakov Nekrich  
Cheriton School of Computer Science,  
University of Waterloo, Canada  
yakov.nekrich@googlemail.com

Daniel Neuen  
RWTH Aachen University, Aachen, Germany  
neuen@informatik.rwth-aachen.de

Jaroslav Nešetřil  
Computer Science Institute, Charles  
University, Prague, Czech Republic  
nesetril@iuuk.mff.cuni.cz

- Rachit Nimavat  
Toyota Technological Institute at Chicago,  
6045 S. Kenwood Ave., Chicago, Illinois  
60637, USA  
nimavat@ttic.edu
- Chinmay Nirkhe  
Electrical Engineering and Computer  
Sciences, University of California, Berkeley ,  
387 Soda Hall Berkeley, CA 94720, U.S.A  
nirkhe@cs.berkeley.edu
- Reino Niskanen  
Department of Computer Science, University  
of Liverpool, UK  
r.niskanen@liverpool.ac.uk
- Dirk Nowotka  
Department of Computer Science, Kiel  
University, D-24098 Kiel, Germany  
dn@zs.uni-kiel.de
- Marc Noy  
Universitat Politècnica de Catalunya,  
Barcelona, marc.noy@upc.edu
- Krzysztof Onak  
IBM Research, TJ Watson Research Center,  
Yorktown Heights, New York, USA
- Shmuel Onn  
Technion - Israel Institute of Technology,  
Haifa, Israel  
onn@ie.technion.ac.il
- Patrice Ossona de Mendez  
CAMS (CNRS, UMR 8557), Paris, France
- Rafail Ostrovsky  
Department of Computer Science, University  
of California Los Angeles, USA  
rafail@cs.ucla.edu
- Joël Ouaknine  
Max Planck Institute for Software Systems,  
Germany & , Department of Computer  
Science, Oxford University, UK  
joel@mpi-sws.org
- Sang-il Oum  
Department of Mathematical Sciences,  
KAIST, Daejeon, Korea  
sangil@kaist.edu
- Katarzyna Paluch  
Wroclaw University, Poland  
abraka@cs.uni.wroc.pl  
<https://orcid.org/0000-0002-7504-6340>
- Fahad Panolan  
Department of Informatics, University of  
Bergen, Norway  
Fahad.Panolan@uib.no  
<https://orcid.org/0000-0001-6213-8687>
- Charles Paperman  
Université de Lille
- Merav Parter  
Weizmann IS, Rehovot, Israel  
merav.parter@weizmann.ac.il
- Sarvar Patel  
Google LLC, Mountain View, USA  
sarvar@google.com
- Boaz Patt-Shamir  
Tel Aviv University, Tel Aviv, Israel  
boaz@tau.ac.il
- John Peebles  
CSAIL, MIT, Cambridge, MA, USA  
jpeebles@mit.edu
- Giuseppe Persiano  
Google LLC, Mountain View, USA and  
Università di Salerno, Salerno, Italy  
giuper@gmail.com
- Michał Pilipczuk  
University of Warsaw, Warsaw, Poland
- Thomas Place  
LaBRI, University of Bordeaux and IUF,  
France
- Ely Porat  
Bar Ilan University, Ramat Gan, Israel  
porately@cs.biu.ac.il
- Igor Potapov  
Department of Computer Science, University  
of Liverpool, UK  
potapov@liverpool.ac.uk
- Manoj Prabhakaran  
Indian Institute of Technology Bombay  
mp@cse.iitb.ac.in



Eric Price  
UT Austin, Austin, TX, USA  
ecprice@cs.utexas.edu

Gabriele Puppis  
CNRS, LaBRI, Université de Bordeaux

Guillermo A. Pérez  
Université libre de Bruxelles, Brussels,  
Belgium  
gperezme@ulb.ac.be  
<https://orcid.org/0000-0002-1200-4952>

Yuval Rabani  
The Rachel and Selim Benin School of  
Computer Science and Engineering, The  
Hebrew University of Jerusalem, Israel  
yrabani@cs.huji.ac.il

Saladi Rahul  
Dept. of Computer Science, University of  
Illinois at Urbana-Champaign, USA  
saladi@uiuc.edu

M. S. Ramanujan  
Algorithms and Complexity Group, TU  
Wien, Austria  
ramanujan@ac.tuwien.ac.at

M. S. Ramanujan  
University of Warwick, United Kingdom  
R.Maadapuzhi-Sridharan@warwick.ac.uk

Sofya Raskhodnikova  
Boston University, Boston, USA  
sofya@bu.edu

Mikhail Raskin  
LaBRI, University of Bordeaux, 351, cours  
de la Libération F-33405 Talence cedex,  
France  
raskin@mccme.ru  
<https://orcid.org/0000-0002-6660-5673>

Gaurav Rattan  
RWTH Aachen University, Aachen, Germany  
grohe@informatik.rwth-aachen.de  
<https://orcid.org/0000-0002-5095-860X>

Alexander Ravsky  
Pidstryhach Institute for Applied Problems  
of Mechanics and Mathematics, National  
Academy of Science of Ukraine, Lviv,  
Ukraine  
oravsky@mail.ru

Felix Reidl  
Royal Holloway, University of London,  
TW20 0EX, UK  
Felix.Reidl@rhul.ac.uk

Hanlin Ren  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, China  
rh116@mails.tsinghua.edu.cn

Michael Riabzev  
Technion - Israel Institute of Technology,  
Haifa, Israel  
riabzevmichael@gmail.com

Sören Riechers  
Paderborn University, Paderborn, Germany

Andrei Romashchenko  
LIRMM, Univ Montpellier, CNRS,  
Montpellier, France; on leave from IITP RAS  
andrei.romashchenko@lirmm.fr

Eyal Ronen  
Computer Science Department, The  
Weizmann Institute, Rehovot, Israel  
eyal.ronen@weizmann.ac.il

Eva Rotenberg  
Technical University of Denmark, Lyngby,  
Denmark  
erot@dtu.dk  
<https://orcid.org/0000-0001-5853-7909>

Ron D. Rothblum  
MIT and Northeastern University,  
Cambridge, MA  
ronr@mit.edu

Tim Roughgarden  
Department of Computer Science, Stanford  
University, Stanford, CA 94305, USA

Daniel M. Roy  
Univ. Toronto

Clemens Rösner  
Department of Theoretical Computer  
Science, University of Bonn, Germany  
roesner@cs.uni-bonn.de

Aleksi Saarela  
Department of Mathematics and Statistics,  
University of Turku, 20014 Turku, Finland  
amsaar@utu.fi  
<https://orcid.org/0000-0002-6636-2317>

Manuel Sabin  
Computer Science Division, University of  
California Berkeley, Berkeley, CA, USA  
msabin@berkeley.edu

Eden Saig  
Department of Computer Science, Technion,  
Haifa, Israel  
edens@cs.technion.ac.il  
<https://orcid.org/0000-0002-0810-2218>

Laura Sanità  
Department of Combinatorics and  
Optimization, University of Waterloo,  
Waterloo, Canada  
lsanita@uwaterloo.ca

Piotr Sankowski  
Institute of Informatics, University of  
Warsaw  
sank@mimuw.edu.pl

Diego Nava Saucedo  
Université de Lorraine, CNRS, Inria, LORIA,  
F-54000 Nancy, France  
diego.nava-saucedo@wanadoo.fr

Saket Saurabh  
Institute of Mathematical Sciences, HBNI,  
India and UMI ReLax  
saket@imsc.res.in

Rahul Savani  
University of Liverpool, UK  
rahul.savani@liverpool.ac.uk

Joe Sawada  
School of Computer Science, University of  
Guelph, Canada  
jsawada@uoguelph.ca

Nitin Saxena  
Department of Computer Science, IIT  
Kanpur, India  
nitin@cse.iitk.ac.in

Marco Scarsini  
Dipartimento di Economia e Finanza, LUISS,  
Viale Romania 32, 00197 Roma, Italy  
marco.scarsini@luiss.it  
<https://orcid.org/0000-0001-6473-794X>

Baruch Schieber  
IBM Research, TJ Watson Research Center,  
Yorktown Heights, New York, USA

Andreas Schmid  
Max Planck Institute for Informatics,  
Saarbrücken, Germany  
aschmid@mpi-inf.mpg.de

Stefan Schmid  
University of Vienna, Austria  
stefan\_schmid@univie.ac.at

Jens M. Schmidt  
Technische Universität Ilmenau, Ilmenau,  
Germany  
jens.schmidt@tu-ilmenau.de

Melanie Schmidt  
Department of Theoretical Computer  
Science, University of Bonn, Germany  
melanieschmidt@uni-bonn.de

Alexander A. Schwarzmann  
University of Connecticut, Storrs CT, USA  
ass@uconn.edu

Nicole Schweikardt  
Humboldt-Universität zu Berlin, Germany  
schweikn@informatik.hu-berlin.de

Pascal Schweitzer  
Technische Universität Kaiserslautern,  
Kaiserslautern, Germany  
schweitzer@cs.uni-kl.de

Saeed Seddighin  
University of Maryland, College Park, MD  
20742, USA

C. Seshadhri  
Department of Computer Science, University  
of California, Santa Cruz, CA 95064, USA

Amirbehshad Shahrasbi  
Carnegie Mellon University, Pittsburgh, PA,  
USA  
shahrasbi@cs.cmu.edu

Jeffrey Shallit  
School of Computer Science, University of  
Waterloo, Canada  
shallit@cs.uwaterloo.ca

Adi Shamir  
Computer Science Department, The  
Weizmann Institute, Rehovot, Israel  
adi.shamir@weizmann.ac.il

Micha Sharir  
School of Computer Science, Tel Aviv  
University, Tel Aviv 69978, Israel  
michas@tau.ac.il

Roohani Sharma  
Institute of Mathematical Sciences, HBNI,  
India and UMI ReLax  
roohani@imsc.res.in

Xiaofei Shi  
Carnegie Mellon University, Pittsburgh, USA  
xiaofeis@andrew.cmu.edu

Philip Shilane  
Dell EMC, Newtown, PA, USA  
shilane@dell.com

Mahsa Shirmohammadi  
CNRS & LIS, France  
mahsa.shirmohammadi@lis-lab.fr

Sebastian Siebertz  
University of Warsaw, Warsaw, Poland

Alexandra Silva  
University College London, London, UK

Luis Fernando Schultz Xavier da Silveira  
School of Computer Science and Electrical  
Engineering, University of Ottawa, Ottawa,  
Canada  
schultz@ime.usp.br

Aditi Singh  
IIT Gandhinagar, Gandhinagar, India  
aditi.singh@iitgn.ac.in

Ali Kemal Sinop  
TOBB University of Economics and  
Technology, Ankara, Turkey  
asinop@gmail.com

Piotr Skowron  
University of Warsaw, Warsaw, Poland  
p.skowron@mimuw.edu.pl

Michał Skrzypczak  
University of Warsaw, Banacha 2, 02-097  
Warsaw, Poland  
mskrzypczak@mimuw.edu.pl  
<https://orcid.org/0000-0002-9647-4993>

Veronika Slívová  
Computer Science Institute, Charles  
University, Prague, Czech Republic  
slivova@iuuk.mff.cuni.cz

Shay Solomon  
IBM Research, T. J. Watson Research  
Center, Yorktown Heights, New York, USA

Tasuku Soma  
The University of Tokyo, Tokyo, Japan  
tasuku\_soma@mist.i.u-tokyo.ac.jp  
<https://orcid.org/0000-0001-9519-2487>

Manuel Sorge  
Ben-Gurion University of the Negev, Beer  
Sheva, Israel  
sorge@post.bgu.ac.il

Krzysztof Sornat  
University of Wrocław, Wrocław, Poland  
krzysztof.sornat@cs.uni.wroc.pl

Jessica Sorrell  
Department of Computer Science and  
Engineering, University of California, San  
Diego, CA, USA  
jlsorrel@cs.ucsd.edu

Paul G. Spirakis  
Department of Computer Science, University  
of Liverpool, UK, Department of Computer  
Engineering & Informatics, University of  
Patras, Greece  
P.Spirakis@liverpool.ac.uk  
<https://orcid.org/0000-0001-5396-3749>

Joachim Spoerhase  
Lehrstuhl für Informatik I, Universität  
Würzburg, Germany and Institute of  
Computer Science, University of Wrocław,  
Poland  
joachim.spoerhase@uni-wuerzburg  
<https://orcid.org/0000-0002-2601-6452>

Srikanth Srinivasan  
Department of Mathematics, IIT Bombay,  
Mumbai, India  
srikanth@math.iitb.ac.in

Sam Staton  
Department of Computer Science, University  
of Oxford, Oxford OX1 3QD UK  
sam.staton@cs.ox.ac.uk

Cliff Stein  
Columbia University, New York, USA

Dario Stein  
Univ. Oxford

Damian Straszak  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland

Don M. Stull  
Université de Lorraine, CNRS, Inria, LORIA,  
F-54000 Nancy, France  
donald.stull@inria.fr

Madhu Sudan  
Harvard University, Cambridge, MA, USA  
madhu@cs.harvard.edu

Wing-Kin Sung  
National University of Singapore, Singapore  
ksung@comp.nus.edu.sg

Manuel Surek  
Universität Augsburg, Institut für  
Mathematik, Augsburg, Germany  
manuel.surek@math.uni-augsburg.de

Ola Svensson  
École Polytechnique Fédérale de Lausanne,  
Lausanne, Switzerland  
ola.svensson@epfl.ch

Mani Swaminathan  
Department of Computing Science,  
University of Oldenburg, Germany  
mani.swaminathan@informatik.  
uni-oldenburg.de

Chaitanya Swamy  
Dept. of Combinatorics and Optimization,  
Univ. Waterloo, Waterloo, ON N2L 3G1,  
Canada  
cswamy@uwaterloo.ca

Géraud Sénizergues  
LABRI, Bordeaux, France  
geraud.senizergues@u-bordeaux.fr

Zhihao Gavin Tang  
Department of Computer Science, The  
University of Hong Kong, Hong Kong  
zhtang@cs.hku.hk

Marianne Thieffry  
Hasso Plattner Institute, University of  
Potsdam, Potsdam, Germany  
marianne.thieffry@student.hpi.de

Thomas Thierauf  
Aalen University, Germany

Mikkel Thorup  
BARC, University of Copenhagen,  
Universitetsparken 1, Copenhagen, Denmark  
mikkel2thorup@gmail.com  
<https://orcid.org/0000-0001-5237-1709>

Tigran Tonoyan  
School of Computer Science, Reykjavik  
University, Iceland  
ttonoyan@gmail.com

Szymon Toruńczyk  
University of Warsaw, Warsaw, Poland

Konstantinos Tsakalidis  
Dept. of Computer and Information Science,  
Tandon School of Engineering, New York  
University, USA  
kt79@nyu.edu

Eli Upfal  
Computer Science Department, Brown  
University, Providence, RI 02912 USA  
eli@cs.brown.edu

Przemysław Uznański  
Department of Computer Science, ETH  
Zürich, Switzerland  
przemyslaw.uznanski@inf.ethz.ch

Pascal Vanier  
Laboratoire d'Algorithmique, Complexité et  
Logique, Université Paris-Est Créteil, France  
pascal.vanier@lacl.fr

Gal Vardi  
School of Computer Science and Engineering,  
The Hebrew University, Israel

Shai Vardi  
California Institute of Technology, Pasadena,  
CA, USA  
svardi@caltech.edu

Nithin Varma  
Boston University, Boston, USA  
nvarma@bu.edu

Yadu Vasudev  
Indian Institute of Technology Madras,  
Chennai, India  
yadu@cse.iitm.ac.in  
<https://orcid.org/0000-0001-7918-7194>

Umesh Vazirani  
Electrical Engineering and Computer  
Sciences, University of California, Berkeley ,  
387 Soda Hall Berkeley, CA 94720, U.S.A  
vazirani@cs.berkeley.edu

Rakesh Venkat  
Hebrew University of Jerusalem, Israel  
rakesh@cs.huji.ac.il

Suresh Venkatasubramanian  
School of Computing, University of Utah,  
USA  
suresh@cs.utah.edu

Cosimo Vinci  
Department of Information Engineering  
Computer Science and Mathematics,  
University of L'Aquila, L'Aquila, Italy -  
Gran Sasso Science Institute, L'Aquila, Italy  
cosimo.vinci@univaq.it

Emanuele Viola  
Northeastern University  
viola@ccs.neu.edu

Nisheeth K. Vishnoi  
École Polytechnique Fédérale de Lausanne  
(EPFL), Switzerland

Ellen Vitercik  
Carnegie Mellon University, Pittsburgh, PA,  
USA  
vitercik@cs.cmu.edu

Nils Vortmeier  
TU Dortmund University, Dortmund,  
Germany  
nils.vortmeier@tu-dortmund.de

Magnus Wahlström  
Royal Holloway, University of London,  
TW20 0EX, UK  
Magnus.Wahlstrom@rhul.ac.uk

David Wajc  
Carnegie Mellon University, Pittsburgh, USA

Stefan Walzer  
Technische Universität Ilmenau, Germany  
stefan.walzer@tu-ilmenau.de  
<https://orcid.org/0000-0002-6477-0106>

Fan Wei  
Department of Mathematics, Stanford  
University, Stanford, CA 94305, USA

Oren Weimann  
University of Haifa, Israel  
oren@cs.haifa.ac.il

Nicole Wein  
EECS, Massachusetts Institute of  
Technology, Cambridge, MA 02139, USA

Armin Weiß  
Universität Stuttgart, FMI, Germany  
armin.weiss@fmi.uni-stuttgart.de

Daniel Wiebking  
RWTH Aachen University, Aachen, Germany  
wiebking@informatik.rwth-aachen.de

Sebastian Wiederrecht  
TU Berlin, Germany  
sebastian.wiederrecht@tu-berlin.de

- Kaja Wille  
Institut für Mathematik, Technische  
Universität Berlin, Germany  
wille@math.tu-berlin.de
- Richard Ryan Williams  
MIT EECS and CSAIL, 32 Vassar St,  
Cambridge, MA 02139 USA  
rrw@mit.edu  
<https://orcid.org/0000-0003-2326-2233>
- Sarah Winter  
RWTH Aachen University, Germany  
winter@cs.rwth-aachen.de
- Felix Wolf  
Technische Universität Darmstadt, Institute  
TEMF, Graduate School of Excellence  
Computational Engineering  
wolf@gsc.tu-darmstadt.de
- David P. Woodruff  
Carnegie Mellon University, School of  
Computing, Pittsburg, USA  
dwoodruf@cs.cmu.edu
- James Worrell  
University of Oxford, Oxford, UK  
James.Worrell@cs.ox.ac.uk  
<https://orcid.org/0000-0001-8151-2443>
- Xiaowei Wu  
Department of Computing, The Hong Kong  
Polytechnic University, Hong Kong  
wxw0711@gmail.com
- Maximilian Wötzel  
BGSMATH and UPC Barcelona, Barcelona,  
Spain  
maximilian.wotzel@upc.edu  
<https://orcid.org/0000-0001-7591-0998>
- Mingyu Xiao  
School of Computer Science and Engineering,  
University of Electronic Science and  
Technology of China, Chengdu, China  
myxiao@gmail.com  
<https://orcid.org/0000-0002-1012-2373>
- Yuanhang Xie  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, Beijing, China  
xieyh15@mails.tsinghua.edu.cn
- Pan Xu  
Department of Computer Science, University  
of Maryland, College Park, USA  
panxu@cs.umd.edu
- Hongseok Yang  
KAIST
- Lin F. Yang  
Princeton University, Princeton, United  
States  
lin.yang@princeton.edu
- Harel Yedidsion  
Ben-Gurion University of the Negev, Beer  
Sheva, Israel  
yedidsio@post.bgu.ac.il
- Kevin Yeo  
Google LLC, Mountain View, USA  
kwlyeo@google.com
- Yuichi Yoshida  
National Institute of Informatics, Preferred  
Infrastructure, Tokyo, Japan  
yyoshida@nii.ac.jp  
<https://orcid.org/0000-0001-8919-8479>
- Arman Yousefi  
Department of Computer Science, University  
of California Los Angeles, USA  
armany@cs.ucla.edu
- Ching-Hua Yu  
University of Illinois at Urbana-Champaign  
cyu17@illinois.edu
- Henry Yuen  
Electrical Engineering and Computer  
Sciences, University of California, Berkeley ,  
387 Soda Hall Berkeley, CA 94720, U.S.A  
hyuen@cs.berkeley.edu
- Viktor Zamaraev  
Department of Computer Science, Durham  
University, UK  
Viktor.Zamaraev@durham.ac.uk  
<https://orcid.org/0000-0001-5755-4141>
- Meirav Zehavi  
Department of Computer Science,  
Ben-Gurion University, Israel  
meiravze@bgu.ac.il

Marc Zeitoun  
LaBRI, University of Bordeaux, France

Georg Zetsche  
IRIF (Université Paris-Diderot & CNRS),  
France  
<https://orcid.org/0000-0002-6421-4388>

Thomas Zeume  
TU Dortmund University, Dortmund,  
Germany  
[thomas.zeume@tu-dortmund.de](mailto:thomas.zeume@tu-dortmund.de)

Hongyang Zhang  
Carnegie Mellon University, Pittsburgh, USA  
[hongyanz@cs.cmu.edu](mailto:hongyanz@cs.cmu.edu)

Le Zhang  
Institute for Interdisciplinary Information  
Sciences, Tsinghua University, Beijing, China  
[le-zhang12@mails.tsinghua.edu.cn](mailto:le-zhang12@mails.tsinghua.edu.cn)

Yuhao Zhang  
Department of Computer Science, The  
University of Hong Kong, Hong Kong  
[yhzhang2@cs.hku.hk](mailto:yhzhang2@cs.hku.hk)

Zeyu Zhang  
Johns Hopkins University, Baltimore, MD,  
USA  
[zyzhang92@gmail.com](mailto:zyzhang92@gmail.com)

Samson Zhou  
Department of Computer Science, Purdue  
University, West Lafayette, Indiana, USA  
[samsonzhou@gmail.com](mailto:samsonzhou@gmail.com)

Marius Zimand  
Department of Computer and Information  
Sciences, Towson University, Baltimore, MD

