

13th Innovations in Theoretical Computer Science Conference

ITCS 2022, January 31–February 3, 2022, Berkeley, CA, USA

Edited by

Mark Braverman

Part 1 of 3



Editor

Mark Braverman

Princeton University, USA

mbraverm@gmail.com

ACM Classification 2012

Mathematics of computing; Theory of computation

ISBN 978-3-95977-217-4

PRINT ISBN: 978-1-7138-4384-9

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at <https://www.dagstuhl.de/dagpub/978-3-95977-217-4>.

Publication date

January, 2022

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 <https://portal.dnb.de>.

License

This work is licensed under a Creative Commons Attribution 4.0 International license (CC-BY 4.0):

<https://creativecommons.org/licenses/by/4.0/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.ITCS.2022.0

ISBN 978-3-95977-217-4

ISSN 1868-8969

<https://www.dagstuhl.de/lipics>

■ Contents

Preface	
<i>Mark Braverman</i>	0:xiii
List of Authors	
.....	0:xv–0:xxiv

Papers

Maximizing Revenue in the Presence of Intermediaries	
<i>Gagan Aggarwal, Kshipra Bhawalkar, Guru Guruganesh, and Andres Perbroth</i>	1:1–1:22
Algebraic Restriction Codes and Their Applications	
<i>Divesh Aggarwal, Nico Döttling, Jesko Dujmovic, Mohammad Hajiabadi, Giulio Malavolta, and Maciej Obremski</i>	2:1–2:15
Improved Merlin-Arthur Protocols for Central Problems in Fine-Grained Complexity	
<i>Shyan Akmal, Lijie Chen, Ce Jin, Malvika Raj, and Ryan Williams</i>	3:1–3:25
Pre-Constrained Encryption	
<i>Prabhanjan Ananth, Abhishek Jain, Zhengzhong Jin, and Giulio Malavolta</i>	4:1–4:20
Domain Sparsification of Discrete Distributions Using Entropic Independence	
<i>Nima Anari, Michał Dereżiński, Thuy-Duong Vuong, and Elizabeth Yang</i>	5:1–5:23
Circuit Lower Bounds for Low-Energy States of Quantum Code Hamiltonians	
<i>Anurag Anshu and Chinmay Nirkhe</i>	6:1–6:22
Near-Optimal Distributed Implementations of Dynamic Algorithms for Symmetry Breaking Problems	
<i>Shiri Antaki, Quanquan C. Liu, and Shay Solomon</i>	7:1–7:25
Secret Sharing, Slice Formulas, and Monotone Real Circuits	
<i>Benny Applebaum, Amos Beimel, Oded Nir, Naty Peter, and Toniann Pitassi</i>	8:1–8:23
An Asymptotically Optimal Algorithm for Maximum Matching in Dynamic Streams	
<i>Sepehr Assadi and Vihan Shah</i>	9:1–9:23
Sublinear Time and Space Algorithms for Correlation Clustering via Sparse-Dense Decompositions	
<i>Sepehr Assadi and Chen Wang</i>	10:1–10:20
Multi-Channel Bayesian Persuasion	
<i>Yakov Babichenko, Inbal Talgam-Cohen, Haifeng Xu, and Konstantin Zabarnyi</i> ...	11:1–11:2
Randomness Extraction from Somewhat Dependent Sources	
<i>Marshall Ball, Oded Goldreich, and Tal Malkin</i>	12:1–12:14
Prefix Discrepancy, Smoothed Analysis, and Combinatorial Vector Balancing	
<i>Nikhil Bansal, Haotian Jiang, Raghu Meka, Sahil Singla, and Makrand Sinha</i>	13:1–13:22

13th Innovations in Theoretical Computer Science Conference (ITCS 2022).

Editor: Mark Braverman



Leibniz International Proceedings in Informatics
Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

Classical Algorithms and Quantum Limitations for Maximum Cut on High-Girth Graphs	
<i>Boaz Barak and Kunal Marwaha</i>	14:1–14:21
Indistinguishability Obfuscation of Null Quantum Circuits and Applications	
<i>James Bartusek and Giulio Malavolta</i>	15:1–15:13
An Efficient Semi-Streaming PTAS for Tournament Feedback Arc Set with Few Passes	
<i>Anubhav Baweja, Justin Jia, and David P. Woodruff</i>	16:1–16:23
FPT Algorithms for Finding Near-Cliques in c -Closed Graphs	
<i>Balaram Behera, Edin Husić, Shweta Jain, Tim Roughgarden, and C. Seshadhri</i> .	17:1–17:24
What Does Dynamic Optimality Mean in External Memory?	
<i>Michael A. Bender, Martín Farach-Colton, and William Kuszmaul</i>	18:1–18:23
Improved Hardness of BDD and SVP Under Gap-(S)ETH	
<i>Huck Bennett, Chris Peikert, and Yi Tang</i>	19:1–19:12
Mixing of 3-Term Progressions in Quasirandom Groups	
<i>Amey Bhangale, Prahladh Harsha, and Sourya Roy</i>	20:1–20:9
Max-3-Lin over Non-Abelian Groups with Universal Factor Graphs	
<i>Amey Bhangale and Aleksa Stanković</i>	21:1–21:21
Separating the NP-Hardness of the Grothendieck Problem from the Little-Grothendieck Problem	
<i>Vijay Bhattiprolu, Euiwoong Lee, and Madhur Tulsiani</i>	22:1–22:17
Fixed-Parameter Sensitivity Oracles	
<i>Davide Bilò, Katrin Casel, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, J.A. Gregor Lagodzinski, Martin Schirneck, and Simon Wietheger</i>	23:1–23:18
Local Access to Random Walks	
<i>Amartya Shankha Biswas, Edward Pyne, and Ronitt Rubinfeld</i>	24:1–24:22
Vertex Fault-Tolerant Emulators	
<i>Greg Bodwin, Michael Dinitz, and Yasamin Nazari</i>	25:1–25:22
Bounded Indistinguishability for Simple Sources	
<i>Andrej Bogdanov, Krishnamoorthy Dinesh, Yuval Filmus, Yuval Ishai, Avi Kaplan, and Akshayaram Srinivasan</i>	26:1–26:18
Locality-Preserving Hashing for Shifts with Connections to Cryptography	
<i>Elette Boyle, Itai Dinur, Niv Gilboa, Yuval Ishai, Nathan Keller, and Ohad Klein</i>	27:1–27:24
Lattice-Inspired Broadcast Encryption and Succinct Ciphertext-Policy ABE	
<i>Zvika Brakerski and Vinod Vaikuntanathan</i>	28:1–28:20
Local Problems on Trees from the Perspectives of Distributed Algorithms, Finitary Factors, and Descriptive Combinatorics	
<i>Sebastian Brandt, Yi-Jun Chang, Jan Grebík, Christoph Grunau, Václav Rozhoň, and Zoltán Vidnyánszky</i>	29:1–29:26
PCPs and Instance Compression from a Cryptographic Lens	
<i>Liron Bronfman and Ron D. Rothblum</i>	30:1–30:19

Limits of Quantum Speed-Ups for Computational Geometry and Other Problems: Fine-Grained Complexity via Quantum Walks <i>Harry Buhrman, Bruno Loff, Subhasree Patro, and Florian Speelman</i>	31:1–31:12
Small Hazard-Free Transducers <i>Johannes Bund, Christoph Lenzen, and Moti Medina</i>	32:1–32:24
Faster Sparse Matrix Inversion and Rank Computation in Finite Fields <i>Silvia Casacuberta and Rasmus Kyng</i>	33:1–33:24
Algorithms and Lower Bounds for Comparator Circuits from Shrinkage <i>Bruno P. Cavalari and Zhenjian Lu</i>	34:1–34:21
Quantum Distributed Algorithms for Detection of Cliques <i>Keren Censor-Hillel, Orr Fischer, François Le Gall, Dean Leitersdorf, and Rotem Oshman</i>	35:1–35:25
Distributed Vertex Cover Reconfiguration <i>Keren Censor-Hillel, Yannic Maus, Shahar Romem-Peled, and Tigran Tonoyan</i> ..	36:1–36:23
Adversarially Robust Coloring for Graph Streams <i>Amit Chakrabarti, Prantar Ghosh, and Manuel Stoeckl</i>	37:1–37:23
Smaller ACC0 Circuits for Symmetric Functions <i>Brynmor Chapman and R. Ryan Williams</i>	38:1–38:19
Monotone Complexity of Spanning Tree Polynomial Re-Visited <i>Arkadev Chattopadhyay, Rajit Datta, Utsab Ghosal, and Partha Mukhopadhyay</i> ...	39:1–39:21
The Space Complexity of Sampling <i>Eshan Chattopadhyay, Jesse Goodman, and David Zuckerman</i>	40:1–40:23
On the Existence of Competitive Equilibrium with Chores <i>Bhaskar Ray Chaudhury, Jugal Garg, Peter McGlaughlin, and Ruta Mehta</i>	41:1–41:13
Individual Fairness in Advertising Auctions Through Inverse Proportionality <i>Shuchi Chawla and Meena Jagadeesan</i>	42:1–42:21
Improved Decoding of Expander Codes <i>Xue Chen, Kuan Cheng, Xin Li, and Minghui Ouyang</i>	43:1–43:3
Cursed yet Satisfied Agents <i>Yiling Chen, Alon Eden, and Juntao Wang</i>	44:1–44:1
Average-Case Hardness of NP and PH from Worst-Case Fine-Grained Assumptions <i>Lijie Chen, Shuichi Hirahara, and Neekon Vafa</i>	45:1–45:16
Symmetric Sparse Boolean Matrix Factorization and Applications <i>Sitan Chen, Zhao Song, Runzhou Tao, and Ruizhe Zhang</i>	46:1–46:25
Quantum Meets the Minimum Circuit Size Problem <i>Nai-Hui Chia, Chi-Ning Chou, Jiayu Zhang, and Ruizhe Zhang</i>	47:1–47:16
Larger Corner-Free Sets from Combinatorial Degenerations <i>Matthias Christandl, Omar Fawzi, Hoang Ta, and Jeroen Zuiddam</i>	48:1–48:20
Optimal Deterministic Clock Auctions and Beyond <i>Giorgos Christodoulou, Vasilis Gkatzelis, and Daniel Schoepflin</i>	49:1–49:23

Nonlinear Repair Schemes of Reed-Solomon Codes. <i>Roni Con and Itzhak Tamo</i>	50:1–50:1
A Complete Linear Programming Hierarchy for Linear Codes <i>Leonardo Nagami Coregliano, Fernando Granha Jeronimo, and Chris Jones</i>	51:1–51:22
Lower Bounds for Symmetric Circuits for the Determinant <i>Anuj Dawar and Gregory Wilsenach</i>	52:1–52:22
Convex Influences <i>Anindya De, Shivam Nadimpalli, and Rocco A. Servedio</i>	53:1–53:21
The Importance of the Spectral Gap in Estimating Ground-State Energies <i>Abhinav Deshpande, Alexey V. Gorshkov, and Bill Fefferman</i>	54:1–54:6
Mechanism Design with Moral Bidders <i>Shahar Dobzinski and Sigal Oren</i>	55:1–55:17
Small-Box Cryptography <i>Yevgeniy Dodis, Harish Karthikeyan, and Daniel Wichs</i>	56:1–56:25
Interaction-Preserving Compilers for Secure Computation <i>Nico Döttling, Vipul Goyal, Giulio Malavolta, and Justin Raizes</i>	57:1–57:18
Matroid Secretary Is Equivalent to Contention Resolution <i>Shaddin Dughmi</i>	58:1–58:23
Uniform Brackets, Containers, and Combinatorial Macbeath Regions <i>Kunal Dutta, Arijit Ghosh, and Shay Moran</i>	59:1–59:10
Multiscale Entropic Regularization for MTS on General Metric Spaces <i>Farzam Ebrahimejad and James R. Lee</i>	60:1–60:21
Counting and Sampling Perfect Matchings in Regular Expanding Non-Bipartite Graphs <i>Farzam Ebrahimejad, Ansh Nagda, and Shayan Oveis Gharan</i>	61:1–61:12
Embeddings and Labeling Schemes for A^* <i>Talya Eden, Piotr Indyk, and Haike Xu</i>	62:1–62:19
A Unifying Framework for Characterizing and Computing Width Measures <i>Eduard Eiben, Robert Ganian, Thekla Hamm, Lars Jaffke, and O-joung Kwon</i> ...	63:1–63:23
Reduction from Non-Unique Games to Boolean Unique Games <i>Ronen Eldan and Dana Moshkovitz</i>	64:1–64:25
Pseudorandom Self-Reductions for NP-Complete Problems <i>Reyad Abed Elrazik, Robert Robere, Assaf Schuster, and Gal Yehuda</i>	65:1–65:12
Credible, Strategyproof, Optimal, and Bounded Expected-Round Single-Item Auctions for All Distributions <i>Meryem Essaidi, Matheus V. X. Ferreira, and S. Matthew Weinberg</i>	66:1–66:19
Small Circuits Imply Efficient Arthur-Merlin Protocols <i>Michael Ezra and Ron D. Rothblum</i>	67:1–67:16
A Lower Bound on the Space Overhead of Fault-Tolerant Quantum Computation <i>Omar Fawzi, Alexander Müller-Hermes, and Ala Shayeghi</i>	68:1–68:20

On Semi-Algebraic Proofs and Algorithms <i>Noah Fleming, Mika Göös, Stefan Grosser, and Robert Robere</i>	69:1–69:25
Extremely Deep Proofs <i>Noah Fleming, Toniann Pitassi, and Robert Robere</i>	70:1–70:23
On the Download Rate of Homomorphic Secret Sharing <i>Ingerid Fosli, Yuval Ishai, Victor I. Kolobov, and Mary Wootters</i>	71:1–71:22
A Variant of the VC-Dimension with Applications to Depth-3 Circuits <i>Peter Frankl, Svyatoslav Gryaznov, and Navid Talebanfard</i>	72:1–72:19
Continuous Tasks and the Asynchronous Computability Theorem <i>Hugo Rincon Galeana, Sergio Rajsbaum, and Ulrich Schmid</i>	73:1–73:27
Correlation Detection in Trees for Planted Graph Alignment <i>Luca Ganassali, Laurent Massoulié, and Marc Lelarge</i>	74:1–74:8
On Polynomially Many Queries to NP or QMA Oracles <i>Sevag Gharibian and Dorian Rudolph</i>	75:1–75:27
Eliminating Intermediate Measurements Using Pseudorandom Generators <i>Uma Girish and Ran Raz</i>	76:1–76:18
Sample-Based Proofs of Proximity <i>Guy Goldberg and Guy N. Rothblum</i>	77:1–77:19
Testing Distributions of Huge Objects <i>Oded Goldreich and Dana Ron</i>	78:1–78:19
Omnipredictors <i>Parikshit Gopalan, Adam Tauman Kalai, Omer Reingold, Vatsal Sharan, and Udi Wieder</i>	79:1–79:21
Mixing in Non-Quasirandom Groups <i>W. T. Gowers and Emanuele Viola</i>	80:1–80:9
Time-Traveling Simulators Using Blockchains and Their Applications <i>Vipul Goyal, Justin Raizes, and Pratik Soni</i>	81:1–81:19
Online Multivald Learning: Means, Moments, and Prediction Intervals <i>Varun Gupta, Christopher Jung, Georgy Noarov, Malleesh M. Pai, and Aaron Roth</i>	82:1–82:24
Adaptive Massively Parallel Constant-Round Tree Contraction <i>MohammadTaghi Hajiaghayi, Marina Knittel, Hamed Saleh, and Hsin-Hao Su</i> ...	83:1–83:23
Errorless Versus Error-Prone Average-Case Complexity <i>Shuichi Hirahara and Rahul Santhanam</i>	84:1–84:23
Excluding PH Pessiland <i>Shuichi Hirahara and Rahul Santhanam</i>	85:1–85:25
Nash-Bargaining-Based Models for Matching Markets: One-Sided and Two-Sided; Fisher and Arrow-Debreu <i>Mojtaba Hosseini and Vijay V. Vazirani</i>	86:1–86:20

Symbolic Determinant Identity Testing and Non-Commutative Ranks of Matrix Lie Algebras <i>Gábor Ivanyos, Tushant Mittal, and Youming Qiao</i>	87:1–87:21
Explicit Abelian Lifts and Quantum LDPC Codes <i>Fernando Granha Jeronimo, Tushant Mittal, Ryan O’Donnell, Pedro Paredes, and Madhur Tulsiani</i>	88:1–88:21
Almost-Orthogonal Bases for Inner Product Polynomials <i>Chris Jones and Aaron Potechin</i>	89:1–89:21
Sublinear-Time Computation in the Presence of Online Erasures <i>Iden Kalemaj, Sofya Raskhodnikova, and Nithin Varma</i>	90:1–90:25
Noisy Boolean Hidden Matching with Applications <i>Michael Kapralov, Amulya Musipatla, Jakab Tardos, David P. Woodruff, and Samson Zhou</i>	91:1–91:19
On Fairness and Stability in Two-Sided Matchings <i>Gili Karni, Guy N. Rothblum, and Gal Yona</i>	92:1–92:17
Optimal Bounds for Dominating Set in Graph Streams <i>Sanjeev Khanna and Christian Konrad</i>	93:1–93:23
Deterministic Dynamic Matching in Worst-Case Update Time <i>Peter Kiss</i>	94:1–94:21
More Dominantly Truthful Multi-Task Peer Prediction with a Finite Number of Tasks <i>Yuqing Kong</i>	95:1–95:20
Dynamic Matching Algorithms Under Vertex Updates <i>Hung Le, Lazar Milenković, Shay Solomon, and Virginia Vassilevska Williams</i> ...	96:1–96:24
Quantum Meets Fine-Grained Complexity: Sublinear Time Quantum Algorithms for String Problems <i>François Le Gall and Saeed Seddighin</i>	97:1–97:23
Optimal Sub-Gaussian Mean Estimation in Very High Dimensions <i>Jasper C. H. Lee and Paul Valiant</i>	98:1–98:21
Double Coverage with Machine-Learned Advice <i>Alexander Lindermayr, Nicole Megow, and Bertrand Simon</i>	99:1–99:18
Beating Classical Impossibility of Position Verification <i>Jiahui Liu, Qipeng Liu, and Luowen Qian</i>	100:1–100:11
A Gaussian Fixed Point Random Walk <i>Yang P. Liu, Ashwin Sah, and Mehtaab Sawhney</i>	101:1–101:10
Correlation-Intractable Hash Functions via Shift-Hiding <i>Alex Lombardi and Vinod Vaikuntanathan</i>	102:1–102:16
Balanced Allocations with Incomplete Information: The Power of Two Queries <i>Dimitrios Los and Thomas Sauerwald</i>	103:1–103:23

Lifting with Sunflowers <i>Shachar Lovett, Raghu Meka, Ian Mertz, Toniann Pitassi, and Jiapeng Zhang</i> . . .	104:1–104:24
Interactive Communication in Bilateral Trade <i>Jieming Mao, Renato Paes Leme, and Kangning Wang</i>	105:1–105:21
Support Recovery in Universal One-Bit Compressed Sensing <i>Arya Mazumdar and Soumyabrata Pal</i>	106:1–106:20
Keep That Card in Mind: Card Guessing with Limited Memory <i>Boaz Menuhin and Moni Naor</i>	107:1–107:28
A Spectral Approach to Polytope Diameter <i>Hariharan Narayanan, Rikhav Shah, and Nikhil Srivastava</i>	108:1–108:22
Geometric Bounds on the Fastest Mixing Markov Chain <i>Sam Olesker-Taylor and Luca Zanetti</i>	109:1–109:1
Lower Bounds on Stabilizer Rank <i>Shir Peleg, Ben Lee Volk, and Amir Shpilka</i>	110:1–110:4
Beating the Folklore Algorithm for Dynamic Matching <i>Mohammad Roghani, Amin Saberi, and David Wajc</i>	111:1–111:23
Interactive Proofs for Synthesizing Quantum States and Unitaries <i>Gregory Rosenthal and Henry Yuen</i>	112:1–112:4
Budget-Smoothed Analysis for Submodular Maximization <i>Aviad Rubinfeld and Junyao Zhao</i>	113:1–113:23
Uniform Bounds for Scheduling with Job Size Estimates <i>Ziv Scully, Isaac Grosf, and Michael Mitzenmacher</i>	114:1–114:30
$3 + \epsilon$ Approximation of Tree Edit Distance in Truly Subquadratic Time <i>Masoud Seddighin and Saeed Seddighin</i>	115:1–115:22
On Hardness Assumptions Needed for “Extreme High-End” PRGs and Fast Derandomization <i>Ronen Shaltiel and Emanuele Viola</i>	116:1–116:17
Low-Bandwidth Recovery of Linear Functions of Reed-Solomon-Encoded Data <i>Noah Shetty and Mary Wootters</i>	117:1–117:19
Efficient Reconstruction of Depth Three Arithmetic Circuits with Top Fan-In Two <i>Gaurav Sinha</i>	118:1–118:33
Polynomial Identity Testing via Evaluation of Rational Functions <i>Dieter van Melkebeek and Andrew Morgan</i>	119:1–119:24
Probing to Minimize <i>Weina Wang, Anupam Gupta, and Jalani K. Williams</i>	120:1–120:23