2013 IEEE 54th Annual Symposium on Foundations of Computer Science

(FOCS 2013)

Berkeley, California, USA
26-29 October 2013
2013 IEEE 54th Annual
Symposium on Foundations
of Computer Science

FOCS 2013

Table of Contents

Foreword
Organizing Committee and Sponsors
Program Committee
Reviewers
Awards

Session 1A
An Improved Competitive Algorithm for Reordering Buffer Management
Noa Avigdor-Elgrabli and Yuval Rabani

On Randomized Memoryless Algorithms for the Weighted K-Server Problem
Ashish Chiplunkar and Sundar Vishwanathan

Approximating Bin Packing within O(log OPT * Log Log OPT) Bins
Thomas Rothvoß

Approximating Minimum-Cost k-Node Connected Subgraphs via Independence-Free Graphs
Joseph Cheriyan and László A. Végh

Session 1B
Candidate Indistinguishability Obfuscation and Functional Encryption for all Circuits
Sanjam Garg, Craig Gentry, Shai Halevi, Mariana Raykova, Amit Sahai, and Brent Waters

Constant-Round Concurrent Zero Knowledge from P-Certificates
Kai-Min Chung, Huijia Lin, and Rafael Pass

Simultaneous Resettability from One-Way Functions
Kai-Min Chung, Rafail Ostrovsky, Rafael Pass, and Ivan Visconti
From Unprovability to Environmentally Friendly Protocols .......................................................... 70  
Ran Canetti, Huijia Lin, and Rafael Pass

Session 2A

How to Approximate a Set without Knowing Its Size in Advance .................................................. 80  
Rasmus Pagh, Gil Segev, and Udi Wieder

Simple Tabulation, Fast Expanders, Double Tabulation, and High Independence ........................................ 90  
Mikkel Thorup

Extractors for a Constant Number of Independent Sources with Polylogarithmic Min-Entropy .................. 100  
Xin Li

A Polynomial Time Algorithm for Lossy Population Recovery .......................................................... 110  
Ankur Moitra and Michael Saks

Session 2B

OSNAP: Faster Numerical Linear Algebra Algorithms via Sparser Subspace Embeddings .......................... 117  
Jelani Nelson and Huy L. Nguyén

Iterative Row Sampling ........................................................................................................................ 127  
Mu Li, Gary L. Miller, and Richard Peng

Algebraic Algorithms for B-Matching, Shortest Undirected Paths, and F-Factors ................................. 137  
Harold N. Gabow and Piotr Sankowski

Efficient Accelerated Coordinate Descent Methods and Faster Algorithms for Solving Linear Systems .......... 147  
Yin Tat Lee and Aaron Sidford

Session 3A

Faster Canonical Forms for Strongly Regular Graphs ............................................................................. 157  
László Babai, Xi Chen, Xiaorui Sun, Shang-Hua Teng, and John Wilmes

Approximation Algorithms for Euler Genus and Related Problems ....................................................... 167  
Chandra Chekuri and Anastasios Sidiropoulos

Non-positive Curvature and the Planar Embedding Conjecture ............................................................. 177  
Anastasios Sidiropoulos

All-or-Nothing Multicommodity Flow Problem with Bounded Fractionality in Planar Graphs .................. 187  
Ken-ichi Kawarabayashi and Yusuke Kobayashi
The Planar Directed K-Vertex-Disjoint Paths Problem Is Fixed-Parameter Tractable
Marek Cygan, Daniel Marx, Marcin Pilipczuk, and Michal Pilipczuk

Session 3B
Bandits with Knapsacks
Ashwinkumar Badanidiyuru, Robert Kleinberg, and Aleksandrs Slivkins
Learning Sums of Independent Integer Random Variables
Constantinos Daskalakis, Ilias Diakonikolas, Ryan O’Donnell, Rocco A. Servedio, and Li-Yang Tan
Optimal Bounds on Approximation of Submodular and XOS Functions by Juntas
Vitaly Feldman and Jan Vondrak
Estimating the Distance from Testable Affine-Invariant Properties
Hamed Hatami and Shachar Lovett
Quasipolynomial-Time Identity Testing of Non-commutative and Read-Once Oblivious Algebraic Branching Programs
Michael A. Forbes and Amir Shpilka

Session 4
Navigating Central Path with Electrical Flows: From Flows to Matchings, and Back
Aleksander Madry
Nearly Maximum Flows in Nearly Linear Time
Jonah Sherman

Session 5A
Towards a Better Approximation for Sparsest Cut?
Sanjeev Arora, Rong Ge, and Ali Kemal Sinop
Layered Separators for Queue Layouts, 3D Graph Drawing and Nonrepetitive Coloring
Vida Dujmovic, Pat Morin, and David R. Wood
Element Distinctness, Frequency Moments, and Sliding Windows
Paul Beame, Raphael Clifford, and Widad Machmouchi
Spatial Mixing and Approximation Algorithms for Graphs with Bounded Connective Constant
Alistair Sinclair, Piyush Srivastava, and Yitong Yin
Session 5B

Polar Codes: Speed of Polarization and Polynomial Gap to Capacity ........................................310
Venkatesan Guruswami and Patrick Xia

Constant Rate PCPs for Circuit-SAT with Sublinear Query Complexity ........................................320
Eli Ben-Sasson, Yohay Kaplan, Swastik Kopparty, Or Meir, and Henning Stichtenoth

Strong LTCs with Inverse Poly-Log Rate and Constant Soundness ...............................................330
Michael Viderman

PCPs via Low-Degree Long Code and Hardness for Constrained Hypergraph Coloring ................................................340
Irit Dinur and Venkatesan Guruswami

Session 6A

Approximate Constraint Satisfaction Requires Large LP Relaxations ........................................350
Siu On Chan, James R. Lee, Prasad Raghavendra, and David Steurer

The Complexity of Approximating Vertex Expansion ................................................................360
Anand Louis, Prasad Raghavendra, and Santosh Vempala

Independent Set, Induced Matching, and Pricing: Connections and Tight (Subexponential Time) Approximation Hardnesses ..........................................................370
Parinya Chalermsook, Bundit Laekhanukit, and Danupon Nanongkai

Chasing the K-Colorability Threshold ......................................................................................380
Amin Coja-Oghlan and Dan Vilenchik

Session 6B

On Clustering Induced Voronoi Diagrams ..................................................................................390
Danny Z. Chen, Ziyun Huang, Yangwei Liu, and Jinhui Xu

Approximation Schemes for Maximum Weight Independent Set of Rectangles .........................400
Anna Adamaszek and Andreas Wiese

Klee’s Measure Problem Made Easy ......................................................................................410
Timothy M. Chan

Playing Non-linear Games with Linear Oracles .......................................................................420
Dan Garber and Elad Hazan

Session 7A

Local Privacy and Statistical Minimax Rates .............................................................................429
John C. Duchi, Michael I. Jordan, and Martin J. Wainwright
Coupled-Worlds Privacy: Exploiting Adversarial Uncertainty in Statistical Data
Privacy .................................................................................................................................439
  Raef Bassily, Adam Groce, Jonathan Katz, and Adam Smith

Knowledge-Preserving Interactive Coding .................................................................449
  Kai-Min Chung, Rafael Pass, and Sidharth Telang

Adaptive Seeding in Social Networks ............................................................................459
  Lior Seeman and Yaron Singer

**Session 7B**

The Moser-Tardos Framework with Partial Resampling ..............................................469
  David G. Harris and Aravind Srinivasan

A Satisfiability Algorithm for Sparse Depth Two Threshold Circuits ..........................479
  Russell Impagliazzo, Ramamohan Paturi, and Stefan Schneider

Strong Backdoors to Bounded Treewidth SAT ............................................................489
  Serge Gaspers and Stefan Szeider

An \(O(c^k n)\) 5-Approximation Algorithm for Treewidth ........................................泸州
  Hans L. Bodlaender, Pál Grenás Drange, Markus S. Dregi, Fedor V. Fomin,
  Daniel Lokshtanov, and Michal Pilipczuk

Improved Approximation for 3-Dimensional Matching via Bounded Pathwidth
Local Search .....................................................................................................................509
  Marek Cygan

**Session 8**

On Kinetic Delaunay Triangulations: A Near Quadratic Bound for Unit Speed
Motions ..............................................................................................................................519
  Natan Rubin

Interlacing Families I: Bipartite Ramanujan Graphs of All Degrees ............................529
  Adam Marcus, Daniel A. Spielman, and Nikhil Srivastava

**Session 9A**

Dynamic Approximate All-Pairs Shortest Paths: Breaking the \(O(mn)\) Barrier
and Derandomization ......................................................................................................538
  Monika Henzinger, Sebastian Krinninger, and Danupon Nanongkai

Fully Dynamic \((1+\epsilon)\)-Approximate Matchings .......................................................548
  Manoj Gupta and Richard Peng

Online Node-Weighted Steiner Forest and Extensions via Disk Paintings ........................558
  Mohammad Taghi Hajiaghayi, Vahid Liaghat, and Debmalya Panigrahi
An LMP O(log n)-Approximation Algorithm for Node Weighted Prize Collecting Steiner Tree ................................................................. 568

Jochen Könemann, Sina Sadeghian, and Laura Sanità

Session 9B

Arithmetic Circuits: A Chasm at Depth Three .................................................. 578
Ankit Gupta, Pritish Kamath, Neeraj Kayal, and Ramprasad Saptharishi

Improved Average-Case Lower Bounds for DeMorgan Formula Size ..................... 588
Ilan Komargodski, Ran Raz, and Avishay Tal

Average Case Lower Bounds for Monotone Switching Networks .............................. 598
Yuval Filmus, Toniann Pitassi, Robert Robere, and Stephen A. Cook

Explicit Subspace Designs .................................................................................. 608
Venkatesan Guruswami and Swastik Kopparty

Session 10A

Understanding Incentives: Mechanism Design Becomes Algorithm Design .................. 618
Yang Cai, Constantinos Daskalakis, and S. Matthew Weinberg

The Simple Economics of Approximately Optimal Auctions ...................................... 628
Saeed Alaei, Hu Fu, Nima Haghpanah, and Jason Hartline

The Price of Stability for Undirected Broadcast Network Design with Fair Cost Allocation Is Constant ................................................................. 638
Vittorio Bilò, Michele Flammini, and Luca Moscardelli

Rational Protocol Design: Cryptography against Incentive-Driven Adversaries .............. 648
Juan Garay, Jonathan Katz, Ueli Maurer, Björn Tackmann, and Vassilis Zikas

Session 10B

Fourier Sparsity, Spectral Norm, and the Log-Rank Conjecture ................................ 658
Hing Yin Tsang, Chung Hoi Wong, Ning Xie, and Shengyu Zhang

A Tight Bound for Set Disjointness in the Message-Passing Model ................................. 668
Mark Braverman, Faith Ellen, Rotem Oshman, Toniann Pitassi, and Vinod Vaikuntanathan

On the Communication Complexity of Sparse Set Disjointness and Exists-Equal Problems ................................................................. 678
Mert Saglam and Gábor Tardos

Common Information and Unique Disjointness ...................................................... 688
Gábor Braun and Sebastian Pokutta
Session 11A

A Linear Time Approximation Scheme for Euclidean TSP ................................................................. 698
  Yair Bartal and Lee-Ad Gottlieb

A Forward-Backward Single-Source Shortest Paths Algorithm ................................................. 707
  David B. Wilson and Uri Zwick

Approximating Minimization Diagrams and Generalized Proximity Search ............................. 717
  Sariel Har-Peled and Nirman Kumar

The Parity of Directed Hamiltonian Cycles ...................................................................................... 727
  Andreas Björklund and Thore Husfeldt

Session 11B

Nondeterministic Direct Product Reductions and the Success Probability
of SAT Solvers ................................................................................................................................. 736
  Andrew Drucker

Direct Products in Communication Complexity ............................................................................. 746
  Mark Braverman, Anup Rao, Omri Weinstein, and Amir Yehudayoff

Quantum 3-SAT Is QMA1-Complete ............................................................................................... 756
  David Gosset and Daniel Nagaj

Three-Player Entangled XOR Games Are NP-Hard to Approximate ......................................... 766
  Thomas Vidick

Author Index ..................................................................................................................................... 776