# David P. Woodruff

Curriculum Vitae

## Biographical

Computer Science Department
Gates-Hillman Complex
Carnegie Mellon University
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Pittsburgh, PA 15213

Citizenship: United States

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## Research Interests

Compressed Sensing, Data Stream Algorithms and Lower Bounds, Dimensionality Reduction, Distributed Computation, Machine Learning, Numerical Linear Algebra, Optimization

## Education

All degrees received from Massachusetts Institute of Technology, Cambridge, MA

Ph.D. in Computer Science. September 2007
Research Advisor: Piotr Indyk
Thesis Title: Efficient and Private Distance Approximation in the Communication and Streaming Models.

Master of Engineering in Computer Science and Electrical Engineering, May 2002
Research Advisor: Ron Rivest
Thesis Title: Cryptography in an Unbounded Computational Model

Bachelor of Science in Computer Science and Electrical Engineering May 2002

Bachelor of Pure Mathematics May 2002

## Professional Experience

August 2018-present, Carnegie Mellon University
Computer Science Department
Associate Professor (with tenure)

August 2017 - present, Carnegie Mellon University
Computer Science Department
Associate Professor

June 2018 – December 2018, Google, Mountain View
Research Division
Visiting Faculty Program

August 2007 - August 2017, IBM Almaden Research Center
Principles and Methodologies Group
Research Scientist

Aug 2005 - Aug 2006, Tsinghua University
Institute for Theoretical Computer Science
Visiting Scholar. Host: Andrew Yao

Jun - Jul 2005, DoCoMo Research Labs
Cryptography and Security Group
Research Intern. Mentors: Craig Gentry and Zulfikar Ramzan

May - Aug 2003, Palo Alto Research Center
Computer Science Lab
Research Intern. Mentor: Jessica Staddon

Jun - Aug 1999, January 2000, June - Aug. 2000, Hughes Research Labs
Signal Processing Group
Research Intern. Host: Peter Capofreddi

# Awards

- Herbert Simon Award for Teaching Excellence in Computer Science, 2021

- Simons Investigator Award, 2020-present

- PODS 2020 Best Paper Award for the paper "A Framework for Adversarially Robust Streaming Algorithms (coauthors Omri Ben-Eliezer, Rajesh Jayaram, and Eylon Yogev)
  Paper invited to the Journal of the ACM
  Paper selected as a 2021 ACM Sigmod Research Highlight Award
  Invited to Highlights of Algorithms (HALG) 2021

- Google Faculty Award, 2018

- 2014 EATCS Presburger Award
  http://www.eatcs.org/index.php/component/content/article/1-news/1866-presburger-award-2014/

- STOC 2013 Best Paper Award for the paper "Low Rank Approximation and Regression in Input Sparsity Time" (coauthor Ken Clarkson)
  Paper invited to the Journal of the ACM

- PODS 2010 Best Paper Award for the paper "An Optimal Algorithm for the Distinct Elements Problem" (coauthors Daniel M. Kane, Jelani Nelson)
  Paper invited to the Journal of the ACM

- Elected into the IBM Academy of Technology in 2014
  http://en.wikipedia.org/wiki/IBM_Academy_of_Technology

- IBM Master Inventor Award in 2012, an award given to an employee based on a significant contribution to the IBM Patent Portfolio, see:
  http://en.wikipedia.org/wiki/IBM_Master_Inventor
  Multiple IBM Achievement Plateau Awards for patents filed

- "Outstanding" IBM Research Division Accomplishment awarded in 2019 for earlier research on implementing fast sketching techniques in the Skylark package, as part of the XDATA project

- "Outstanding" IBM Research Division Accomplishment for 2012 for research on "Processing Large Datasets: Algorithms and Computational Limits" (one award given to all of IBM Almaden Computer Science in 2012)

- IBM Research Division Accomplishment for 2014 for research on "Low Complexity Kernels for Cognitive Computing"

- IBM Pat Goldberg Award for one of the four Best IBM Research Papers in Computer Science, Electrical Engineering and Math published in 2013 for the paper "Low Rank Approximation and Regression in Input Sparsity Time" (coauthor Ken Clarkson)

- IBM Pat Goldberg Award for one of the five Best IBM Research Papers in Computer Science, Electrical Engineering and Math published in 2012 for the paper "Sublinear Optimization for Machine Learning" (coauthors Ken Clarkson, Elad Hazan)

- IBM Pat Goldberg Award for one of the four Best IBM Research Papers in Computer Science, Electrical Engineering and Math published in 2010 for the paper "An Optimal Algorithm for the Distinct Elements Problem" (coauthors Daniel M. Kane, Jelani Nelson)

- DOD/NDSEG Graduate Fellowship 2003-2007

- Akamai Presidential Fellow 2002-2003

## Professional Activities

- Carnegie Mellon University PhD Admissions Chair, 2021

- Program Chair for 2018 Program on Foundations of Data Science at the Simons Institute at UC Berkeley

- Conference Program Chair: ICALP Track A, 2022

- Program Committee Memberships:
    - 2021: ICLR area chair, ICML area chair, NeurIPS area chair
    - 2020: SODA, ITCS, ICML area chair, IJCAI senior PC, ESA, NeurIPS area chair
    - 2019: COLT, NeurIPS area chair, ICML, RANDOM, ISIT, IJCAI senior PC
    - 2018: STOC, SODA, ICML, ITCS, AAAI senior PC, ISIT, SOSA, NeurIPS, ICDT
    - 2017: RANDOM, KDD senior PC, SPAA, ICML, AISTATS
    - 2016: WSDM, NIPS, KDD, ICML, PODS
    - 2015: MASSIVE, RANDOM, ICDT, SIGMOD/PODS Ph.D. Symposium
    - 2014: FOCS, ESA, SPIRE
    - 2013: PODS, RANDOM, SPIRE, TAMC
    - 2012: FOCS, SODA, PODS, FAW
    - 2008: RANDOM

- Editorial Boards
    - Transactions on Algorithms (2015 – present)
    - Journal of Computer System Sciences (2016-present)
    - Data Science Book Series (2018-present)
    - Stochastic Models (2019-present)

- Guest Editorships
    - Co-editor for Transactions on Algorithms special issue for SODA, 2018
    - Co-editor for Algorithmica issue on Information Complexity and Applications
    - Co-editor for Transactions on Algorithms special issue for SODA, 2012

- Workshops Organized
    - Co-organizer of 2020, Theoretical Computer Science Visioning Workshop
    - Co-Organizer for session in the 2020 Information Theory and Applications (ITA) workshop on Low Rank Approximation
    - Co-organizer of 2019 Foundations of Data Science Reunion Workshop at Simons
    - Co-organizer of DIMACS and Simons Special Focus Workshop on Bridging Discrete and Continuous Optimization for 2019
    - Co-organizer of Data Stream Algorithms Workshop at Institute for Mathematical

Sciences at Nanyang Technological Institute, Singapore, 2020 (upcoming)
- Co-organizer for 2018 Foundations of Data Science Bootcamp at Simons
- Organizer for 2018 Data Science Finale Workshop at Simons
- Co-Organizer for FOCS 2017 Workshop on Linear Sketching
- Co-Organizer for Shonan 2017 Workshop on Processing Big Data Streams
- Co-Organizer for Dagstuhl 2017 Workshop on Theory and Applications of Hashing
- Co-Organizer for Shonan 2016 Workshop on Recent Advances in Randomized Numerical Linear Algebra
- Co-Organizer for 2015 Program in Computer Science for the Institut Henri Poincare in Paris for the "Inference Workshop" on streaming, sketching, sublinear algorithms, and compressed sensing
- Co-Organizer of Workshop on Algorithms for Data Streams, Dortmund, Germany, 2012
- Co-Organizer for session in the 2016 Information Theory and Applications (ITA) workshop on Heavy Hitters
- Co-Organizer for session in the 2015 Information Theory and Applications (ITA) workshop on Sketching for Numerical Linear Algebra

- Member of the SIGACT Committee for the Advancement of Theoretical Computer Science (CATCS), 2017-present

- Simons Institute Long-Term Fellow in:
  - Theoretical Foundations of Big Data Analysis Program, Fall 2013
  - Theoretical Foundations of Machine Learning, Spring 2017
  - Foundations of Data Science (chair), Fall 2018

- CMU PhD student admissions committee member
  - 2018
  - 2019

- CMU faculty review and promotion committee reader

- IBM Raviv Fellowship Selection Committee Co-Chair, 2012 and 2013

- National Science Foundation (NSF) Panel Service for AF – Algorithms and Foundations

- Extensive journal and conference reviewing. Selected for top 5% of ICML reviewers in 2019.

- External reviewer for university hiring

- IBM committee service, e.g., computer science workshop and social planning.
  CMU community activities, e.g., SCS4All Faculty Ask Me Anything Panel

## Summer Interns Mentored

- Jelani Nelson - 2008, 2009
  - Current position: Professor, UC Berkeley

- Arnab Bhattacharyya - 2010
  - Current position: Assistant Professor, National University of Singapore

- Eric Price - 2011
  - Current position: Assistant Professor, UT Austin

- Marco Molinaro - 2012
  - Current position: Assistant Professor, PUC-Rio

- Grigory Yaroslavtsev - 2012
  - Current position: Assistant Professor, Indiana Bloomington

- Yi Li - 2011, 2013
  - Current position: Assistant Professor, Nanyang Technological University

- Huy L. Nguyen - 2013
  - Current position: Assistant Professor, Northeastern

- Michael Crouch – 2014
  - Current position: Bell Labs, Ireland

- Ilya Razenshteyn – 2015
  - Current position: Theory Group at MSR Redmond (currently postdoc at Columbia)

- Zhao Song – 2015, 2016, 2017 (also: winter 2015, winter 2016)
  - Current position: Postdoc at Princeton

- Cameron Musco – 2016
  - Current position: Assistant Professor at UMass Amherst

- Xingguo Li – 2016
  - Current position: Postdoc at Princeton

- Lin Yang – 2017
  - Current position: Assistant Professor at UCLA

- Peilin Zhong – 2017
    - Current position: Graduate Student at Columbia

- Hongyang Zhang – 2017
    - Current position: Postdoc at TTIC

- Chen Shao – 2017
    - Current position: Google

# CMU PhD Students

- Ainesh Bakshi - fourth year (co-advised with Pravesh Kothari)
- Rajesh Jayaram - fourth year
- Praneeth Kacham - second year
- Taisuke Yasuda - first year
- Hongyang Zhang – graduated – now a postdoc at TTIC (co-advised with Nina Balcan)

## CMU Postdocs

- Samson Zhou 2019-21
- Amir Zandieh 2021-22

## Visiting Students at CMU

- Frank Ban from Berkeley: Spring, 2018
- Amir Zandieh from EPFL: Fall, 2019

## Master's/PhD Thesis Committees at CMU

- Hui Han Chan 2017
- Dimitris Konomis 2017-18
- Anit Kumar Sahu 2018
- Colin White 2018
- Vijay Bhattiprolu, 2019
- Hang Liao 2020

### Ph.D Thesis Committees Outside of CMU

- Cameron Musco (MIT), 2018
- Ashkay Kamath (UT Austin), 2020
- Casper Freksen (Aarhus University), 2020
- Peilin Zhong (Columbia University), 2021

## Master's Students Supervised at CMU

- Shuli Jiang 2020
- Dongyu Li 2020

- Neil Xu 2020

### Visiting Undergraduates at CMU

- Peng Ye (Tsinghua), Spring, 2020
- Hanlin Zhu (Tsinghua), Spring, 2020

### Undergraduates Advised at CMU

- Manuel Fernandez 2017-19
- Taisuke Yasude 2017-19
- Amulya Musipatla 2018-19, received Summer Undergraduate Research Fellowship (SURF) award
- Arvind Mahankali 2020, received Goldwater Scholarship, as well as Summer Undergraduate Research Fellowship (SURF) award
- Justin Jia 2020
- Anubhav Baweja 2020
- Vaidehi Srinivas 2020
- Lichen Zhang 2021
- Shreyan Jaiswal 2021
- Shaan Dave 2021
- Tian Luo 2021

## Courses Taught at CMU

- Spring, 2021, Carnegie Mellon University, Algorithms, 15-451, with Danny Sleator
- Fall, 2020, Carnegie Mellon University, Algorithms for Big Data, graduate class 15-859
- Spring, 2020, Carnegie Mellon University, Algorithms, 15-451, with Danny Sleator
- Fall, 2019, Carnegie Mellon University, Algorithms for Big Data, graduate class 15-859
- Spring, 2019, Carnegie Mellon University, Algorithms, 15-451, with Anupam Gupta
- Spring, 2018, Carnegie Mellon University, Algorithms, 15-451, with Anupam Gupta
- Fall, 2017, Carnegie Mellon University, Algorithms for Big Data, graduate class 15-859

CMU SCS Executive Education online course in planning – Algorithms, with Anupam Gupta

## Courses Taught Outside of CMU

- Cathaypath Institute of Science (CIS) 2019-present
  - teaching of algorithms, learning, and optimization courses for high school and undergraduate students
  - taught a 4-week undergraduate algorithms course in summer, 2019 (120 hours)
  - taught a 6-week convex optimization course in summer, 2020 (120 hours)
  - taught 8 8-week online courses on algorithms (192 hours total)
- January 2018, Indian Institute of Technology Kanpur, part of the Global Initiative of Academic Networks (GIAN) program, “Sketching and Sampling for Big Data Analysis”, 14

lectures, each 1 hour
- February 2017, Indian Institute of Technology Kanpur, part of the Global Initiative of Academic Networks (GIAN) program, “Numerical Linear Algebra Methods for Big Data Processing”, 14 lectures, each 1 hour
- Summer, 2016, Shanghai University of Finance and Economics, “Sketching as a Tool for Numerical Linear Algebra”, 16 lectures, each 50-minutes
- Summer, 2015, BASICS Summer School on Communication Complexity, 3 lectures, each 90 minutes
- Summer, 2015, MADALGO Summer School on Streaming Algorithms, 3 lectures, each 90 minutes
- Class project supervisor for Tsinghua Undergraduate Course on Big Data taught by Professor Periklis Papakonstantinou (supervised 6 research projects)

## Patents

U.S. Patents issued:

- Server-implemented system and method for providing private inference control
Patent 8229939 in U.S.
Co-inventor Jessica Staddon

- Exclusive set system constructions including, but not limited to, applications to broadcast encryption and certificate revocation
Patent 7818570 in U.S.
Co-inventors Craig Gentry and Zulfikar Ramzan

- Generation of set coverings with free riders, and generation of ordered sets of meeting points, in systems which include, but are not limited to, systems for broadcast encryption and systems for certificate revocation
Patent 7523304 in U.S.
Co-inventors Craig Gentry and Zulfikar Ramzan

- Random sampling from distributed streams
Patent 8392434 in U.S.
Co-inventor Srikanta Tirthapura

- Aggregate contribution of iceberg queries
Patent 8499003 in U.S.
Co-inventor Jelani Nelson

- Summarizing internet traffic patterns
Patent 8310922 in U.S.
Co-inventor Jelani Nelson

- Computer information retrieval using latent semantic structure via sketches
Patent 8255401 in U.S.
Co-inventor Ken Clarkson

## U.S. Patents Filed for:

- By Indiana University Bloomington: Sketching Algorithms for Genomic Data Analysis and Querying in a Secure Enclave, Co-inventors: Can Kockan, Kaiyuan Zhu, Natnatee Dokmai, Nikolai Karpov, M. Oguzhan Kulekci, and S. Cenk Sahinalp

- ARC820150019 Lower-Dimensional Subspace Approximation of a Dataset (previous title: A Method for Subspace Approximation for Minimizing the Maximum Distance)
Co-inventor Kenneth Clarkson

- ARC820130198 merged with ARC820130199: A Fast Method for Regression Using M-Estimators and A Method for Polynomial Kernel Support Vector Machines and Principal Component Analysis
Co-inventors Haim Avron, Ken Clarkson, Huy L. Nguyen

- ARC820130197 A Method and Apparatus for Optimally Finding a CUR Decomposition
Co-inventor Christos Boutsidis

- ARC820120173 Communication and Message-Efficient Protocol for Computing the Intersection Between Two Sets
Co-inventor Grigory Yaroslavtsev

- ARC820120174 Method for Adaptively Breaking Compressed Sensing Schemes and Data Stream Algorithms
Co-inventor Moritz Hardt

- ARC820130017 Faster Robust Regression Using Exponential Random Variables
Co-inventor Qin Zhang

- ARC820130047 A Method for Managing Deduplication Using Estimated Benefits
Co-inventors David Chambliss, Maohua Lu, M. Corenliu Constantinescu, Joseph S. Glider, Danny Harnik

- ARC820120029 A Method For Fast Distributed Database Frequency Summarization

- ARC820120053 A Method For Estimating the Total Sales over Streaming Bids
Co-inventor Benny Kimelfeld

- ARC820110015 A Method for Efficiently Computing Correlated Aggregates Over a Data Stream
Co-inventor Srikanta Tirthapura

- ARC820110006 A Method for Approximating Klee's Measure Problem and Other Moments on a Stream of Rectangles
Co-inventor Srikanta Tirthapura

- ARC820100022 A Method for Two Parties to Privately Estimate Similarity of Their Datasets

- ARC820100017 Sublinear Time Algorithms for Classification
Co-inventor Ken Clarkson and Elad Hazan

- ARC820080170 Algorithms for Computing Cascaded Aggregates in a Stream
Co-inventor T.S. Jayram

- ARC820070201 An Algorithm for Finding Sparse Directed Spanners, with Applications to Access Control, Networks, and Data Structures

- YOR820130853 Sketching Structured Matrices for Faster Nonlinear Regression
Co-inventors Haim Avron and Vikas Sindhwani

# Grants

- Simons Investigator Award 2020-present: $660, 000 total
- National Institutes of Health (NIH) CMU position: $319,952 (subaward/subcontractor with Indiana Bloomington, PI S. Cenk Sahinalp)
- Office of Naval Research (ONR) CMU position: $603,654 (PI, co-PI is Jelani Nelson at UC Berkeley)
- National Science Foundation (NSF) Small: $433,978 (PI)
- Google Faculty Award $82,535
- Team Member of DARPA Grant Skylark Project on “Randomized Numerical Linear Algebra for Large Scale Data Analysis”. Fully funded 1 day / week for 4 years 2013-2017 (PI: Kenneth Clarkson)
- Received 20K as a subcontractor for Johns Hopkins University for work on an NSF Big Data 2017 grant (PI: Vladimir Braverman)
- Long-term visitor as part of an MOE AcRF Singapore grant at Nanyang Technological Institute (PI: Yi Li)
- Chinese Academy of Sciences PIFI Award – awarded 60,000RMB to visit and collaborate with Professor Xiaoming Sun

# Consulting

- Cathaypath Institute of Science (CIS) 2019-present
  - teaching of algorithms, learning, and optimization courses for high school and

undergraduate students (courses described above)
- several hour-long speeches promoting computer science / algorithms in China

- Johns Hopkins University, sub-contracted under Vladimir Braverman – work on streaming algorithms, Fall '17-Fall '18

- Eureka High School Opportunity Program – mentored 5 high school students interested in machine learning, one-on-one, Fall '17 – Fall '18

## Publications

Electronic copies are available at my DBLP entry:
http://www.informatik.uni-trier.de/~%20ley/pers/hd/w/Woodruff:David_P=.html

Citation information is available on my Google Scholar profile:
https://scholar.google.com/citations?user=kMmxbbIAAAAJ&hl=en

*Books:*

David P. Woodruff: Sketching as a Tool for Numerical Linear Algebra, in NOW Publishers Foundations and Trends of Theoretical Computer Science , Vol 10, Issue 1—2, 2014, pp 1—157.

*Refereed Conference Publications (Reverse Chronological Order):*

188. Akshay Kamath, Eric Price, and David P. Woodruff
A Simple Proof of a New Set Disjointness with Applications to Data Streams
CCC, 2021

187. David P. Woodruff and Samson Zhou
Separations for Estimating Large Frequency Moments on Data Streams
ICALP, 2021

186. Ainesh Bakshi, Chiranjib Bhattacharyya, Ravi Kannan, David P. Woodruff, and Samson Zhou
Learning a Latent Simplex in Input Sparsity Time
ICLR, 2021
Selected for Spotlight Presentation

185. Cameron Musco, Christopher Musco, and David P. Woodruff
Simple Heuristics Yield Provable Algorithms for Masked Low Rank Approximation
ITCS, 2021

184. Raphael Mayer, Cameron Musco, Christopher Musco, and David P. Woodruff
Hutch++: Optimal Stochastic Trace Estimation
SOSA, 2021

183. Arvind Mahankali and David P. Woodruff
Optimal $\ell_1$ Column Subset Selection and a Fast PTAS for Low Rank Approximation,
SODA, 2021

182. Graham Cormode, Charlie Dickens, and David P. Woodruff
(Sub)space Exploration: Bounds on Projected Frequency Estimation, PODS 2021

181. Edith Cohen, Rasmus Pagh, and David P. Woodruff
WOR and $p$'s: Sketches for $\ell_p$-Sampling Without Replacement, NeurIPS, 2020

180. Minh Hoang, Nghia Hoang, Hai Pham, and David P. Woodruff
Revisiting the Sample Complexity of Sparse Spectrum Approximation of Gaussian Processes,
NeurIPS, 2020

179. Ainesh Bakshi, Nadiia Chepurko, and David P. Woodruff
Robust and Sample Optimal Algorithms for PSD Low-Rank Approximation, FOCS, 2020

178. Mark Braverman, Sumegha Garg, and David P. Woodruff
The Coin Problem with Applications to Data Streams, FOCS, 2020

177. Vladimir Braverman, Petros Drineas, Cameron Musco, Christopher Musco, Jalaj Upadhyay,
David P. Woodruff, and Samson Zhou
Near Optimal Linear Algebra in the Online and Sliding Window Models, FOCS, 2020

176. Alexandr Andoni, Collin Burns, Yi Li, Sepideh Mahabadi, and David P. Woodruff
Streaming Complexity of SVMs, APPROX, 2020

175. Ainesh Bakshi, Nadiia Chepurko, and David P. Woodruff
Weighted Maximum Independent Set of Geometric Objects in Turnstile Streams, APPROX,
2020

175. Cyrus Rashtchian, David P. Woodruff, and Hanlin Zhu
Vector-Matrix-Vector Queries for Solving Linear Algebra, Statistics, and Graph Problems,
RANDOM, 2020

174. Yi Li and David P. Woodruff
Input-Sparsity Low Rank Approximation in Schatten Norm, ICML, 2020

173. David P. Woodruff and Amir Zandieh
Near Input Sparsity Time Kernel Embeddings via Adaptive Sampling, ICML, 2020

172. Debmalya Mandal, Nisarg Shah, and David P. Woodruff:

Optimal Communication-Distortion Tradeoff in Voting, EC, 2020

171. Omri Ben-Eliezer, Rajesh Jayaram, David P. Woodruff, and Eylon Yogev:

A Framework for Adversarially Robust Streaming Algorithms, PODS, 2020, invited to the JACM, and to Highlights of Algorithms (HALG), 2021.

170. Sepideh Mahabadi, Ilya Razenshteyn, David P. Woodruff, and Samson Zhou: Non-Adaptive Adaptive Sampling on Turnstile Streams, STOC, 2020

169. Cyrus Rashtchian, Aneesh Sharma, and David P. Woodruff: LSF-Join: Locality Sensitive Filtering for Distributed All-Pairs Similarity Under Skew, WWW (The Web Conference): 2020

168. Praneeth Kacham and David P. Woodruff: Optimal Deterministic Coresets for Ridge Regression, AISTATS, 2020

167. Hang Liao, Barak A. Pearlmutter, Vamsi K. Potluru, and David P. Woodruff: Automatic Differentiation of Sketched Regression, AISTATS, 2020

166. Rajesh Jayram, David P. Woodruff, and Richard Zhang: Span Recovery for Deep Neural Networks with Applications to Input Obfuscation, ICLR, 2020

165. Tanqiu Jiang, Yi Li, Honghao Lin, Yisong Ruan, and David P. Woodruff: Learning-Augmented Data Stream Algorithms, ICLR, 2020

164. Manuel Fernandez, David P. Woodruff, and Taisuke Yasuda: Graph Spanners in the Message-Passing Model, ITCS, 2020

163. Shafi Goldwasser, Ofer Grossman, Sidhanth Mohanty, and David P. Woodruff: Pseudo-deterministic Streaming, ITCS, 2020

162. Thomas D. Ahle, Michael Kapralov, Jakob B. T. Knudsen, Rasmus Pagh, Ameya Velingker, David P. Woodruff, and Amir Zandieh: Oblivious Sketching of High-Degree Polynomial Kernels, SODA, 2020

161. Yi Li, Ruosong Wang, and David P. Woodruff: Tight Bounds for the Subspace Sketch Problem, SODA, 2020

160. Santosh Vempala, Ruosong Wang, and David P. Woodruff: The Communication Complexity of Optimization, SODA, 2020.

Invited to Highlights of Algorithms (HALG), 2020.

159. Debmalya Mandal, Ariel Procaccia, Nisarg Shah, and David P. Woodruff: Efficient and Thrifty Voting by Any Means Necessary, NeurIPS, 2019.

**Selected for Oral Presentation (1 of 36 out of 1428 papers)**

158. Frank Ban, David P. Woodruff, and Richard Zhang: Regeularized Weighted Low Rank

Approximation, NeurIPS, 2019

157. Huaian Diao, Rajesh Jayaram, Zhao Song, Wen Sun, and David P. Woodruff: Optimal Sketching for Kronecker Product Regression and Low Rank Approximation, NeurIPS, 2019

156. Huaian Diao, Zhao Song, David P. Woodruff, and Xin Yang: Total Least Squares in Input Sparsity Time, NeurIPS, 2019

155. Michela Meister, Tamas Sarlos, and David P. Woodruff: Tight Dimensionality Reduction for Sketching Low Degree Polynomial Kernels, NeurIPS, 2019

154. Zhao Song, David P. Woodruff, and Peilin Zhong: Average Case Column Subset Selection for Entrywise $\ell_1$-Norm, NeurIPS, 2019

153. Zhao Song, David P. Woodruff, and Peilin Zhong: Towards a Zero-One Law for Column Subset Selection, NeurIPS, 2019

15.2 Manuel Fernandez, David P. Woodruff, and Taisuke Yasude: The Query Complexity of Mastermind with Lp Distances, APPROX, 2019

151. Rajesh Jayaram and David P. Woodruff: Towards Optimal Moment Estimation in Streaming and Distributed Models, APPROX, 2019

150. Kenneth L. Clarkson, Ruosong Wang, and David P. Woodruff: Dimensionality Reduction for Tukey Regression, ICML, 2019

149. Manuel Fernandez, David P. Woodruff, and Taisuke Yasude: Tight Kernel Query Complexity of Kernel Ridge Regression and Kernel $k$-Means Clustering, ICML, 2019. Selected for a long talk.

148. Ravi Kumar, Rina Panigrahy, Ali Rahimi, and David P. Woodruff: Faster Algorithms for Boolean Matrix Factorization, ICML, 2019. Selected for a long talk.

147. Pranjal Awasthi, Ainesh Bakshi, Nina Balcan, Colin White, and David P. Woodruff: Robust Communication-Optimal Distributed Clustering, ICALP, 2019

146. Xiaoming Sun, David P. Woodruff, Guang Yang, and Jialin Zhang: Querying a Matrix through Matrix-Vector Products, ICALP, 2019

145. David P. Woodruff and Guang Yang: Separating k-Player from t-Player One-Way Communication, ICALP, 2019

144. Ainesh Bakshi, Rajesh Jayaram, and David P. Woodruff: Learning Two Layer Rectified Neural Networks in Polynomial Time, COLT, 2019

143. Yu Cheng, Ilias Diakonikolas, Rong Ge, and David P. Woodruff: Faster Algorithms for High Dimensional Robust Covariance Estimation, COLT, 2019

142. Piotr Indyk, Ali Vakilian, Tal Wagner, and David P. Woodruff: Sample-Optimal Low-Rank Approximation of Distance Matrices, COLT, 2019

141. Rajesh Jayram, Gokarna Sharma, Srikanta Tirthapura, and David P. Woodruff: Weighted Reservoir Sampling from Distributed Streams, PODS, 2019

140. Vladimir Braverman, Moses Charikar, William Kuszmaul, David P. Woodruff, and Lin F. Yang: The One-Way communication Complexity of Dynamic Time Warping, SOCG, 2019, invited to the special issue for SOCG, 2019

139. John Hainline, Brendan Juba, Hai S. Le, and David P. Woodruff: Conditional Sparse L_p-norm Regression with Optimal Probability, AISTATS, 2019

138. Can Kockan, Kaiyuan Zhu, Natnatee Dokmai, Nikolai Karpov, M. Oguzhan Kulecki, David P. Woodruff, and S. Cenk Sahinalp: Sketching Algorithms for Genomic Data Analysis and Querying in a Secure Enclave, RECOMB, 2019. Full version submitted to Nature Methods.

137. Xiaofei Shi and David P. Woodruff: Sublinear Time Numerical Linear Algebra for Structured Matrices, AAAI, 2019

136. Nina Balcan, Yi Li, David P. Woodruff, and Hongyang Zhang: Testing Matrix Rank, optimally, SODA, 2019

135. Frank Ban, Vijay Bhattiprolu, Karl Bringmann, Pavel Kolev, Euiwoong Lee, and David P. Woodruff: A PTAS for $\ell_p$ Low Rank Approximation, SODA, 2019

134. Zhao Song, David P. Woodruff, and Peilin Zhong: Relative Error Tensor Low Rank Approximation, SODA, 2019

133. Ruosong Wang and David P. Woodruff: Tight Bounds for $\ell_p$ Oblivious Subspace Embeddings, SODA, 2019, invited to the special issue for SODA, 2019

132. Ainesh Bakshi and David P. Woodruff: Sublinear Time Low-Rank Approximation of Distance Matrices, NeurIPS, 2018, selected for spotlight presentation

131. Alexander Munteanu, Chris Schweigelshohn, Christian Sohler, and David P. Woodruff: On Coresets for Logistic Regression, NeurIPS, 2018, selected for spotlight presentation. Also presented at Informatik, 2019

130. Roie Levin, Anish Sevekari, and David P. Woodruff: Robust Subspace Approximation in a Stream, NeurIPS, 2018, selected for spotlight presentation

129. Christian Sohler and David P. Woodruff: Strong Coresets for k-Median and Subspace Approximation, Goodbye Dimension, FOCS, 2018

128. Rajesh Jayaram and David P. Woodruff: Perfect $L_p$ Sampling in a Data Stream, FOCS, 2018.

127. Aditya Krishnan, Sidhanth Mohanty, and David P. Woodruff: On Sketching the q to p Norms, APPROX, 2018.

126. Yi Li, Vasileios Nakos, and David P. Woodruff: On Low-Risk Heavy Hitters and Sparse Recovery Schemes, APPROX, 2018

125. Graham Cormode, Charlie Dickens, and David P. Woodruff: Leveraging Well-Conditioned Bases: Streaming and Distributed Summaries in Minkowski $p$-Norms, ICML, 2018. Selected for a long talk.

124. Vladimir Braverman, Stephen R. Chestnut, Robert Krauthgamer, Yi Li, David P. Woodruff, and Lin Yang: Matrix Norms in Data Streams: Faster, Multi-Pass, and Row-Order, ICML, 2018

123. Yogesh Dahiya, Dimitris Konomis, and David P. Woodruff: An Empirical Evaluation of Sketching for Numerical Linear Algebra, KDD, 2018

122. Vladimir Braverman, Emanuele Viola, David P. Woodruff, and Lin Yang: Revisiting Frequency Moment Estimation in Random Order Streams, ICALP, 2018

121. Sumit Ganguly and David P. Woodruff: High Probability Frequency Moment Sketches, ICALP, 2018

120. Vasileios Nakos, Xiaofei Shi, David P. Woodruff, and Hongyang Zhang: Improved Algorithms for Adaptive Compressed Sensing, ICALP, 2018

119. Rajesh Jayaram and David P. Woodruff: Data Streams with Bounded Deletions, PODS, 2018

118. Huaian Diao, Zhao Song, Wen Sun, and David P. Woodruff: Sketching for Kronecker Product Regression and P-Splines, AISTATS, 2018. Selected for oral presentation

117. David P. Woodruff and Qin Zhang: Distributed Statistical Estimation of Matrix Products, PODS, 2018

116. Cameron Musco, Praneeth Netrapalli, Aaron Sidford, Shashanka Ubaru, and David P. Woodruff: Spectrum Approximation Beyond Fast Matrix Multiplication, ITCS, 2018

115. Nina Balcan, Yingyu Liang, David P. Woodruff, and Hongyang Zhang: Matrix Completion and Related Problems via Strong Duality, ITCS, 2018

114. Cameron Musco and David P. Woodruff: Is Input Sparsity Time Possible for Kernel Low-Rank Approximation?, NIPS, 2017

113. Jarvis Haupt, Xingguo Li, and David P. Woodruff: Near Optimal Sketching of Low-Rank Tensor Regression, NIPS, 2017

112. Karl Bringmann, Pavel Kolev, and David P. Woodruff: Approximation Algorithms for $\ell_0$-Low Rank Approximation, NIPS 2017

111. Michael Kapralov, Jelani Nelson, Jakub Pachocki, Zhengyu Wang, David P. Woodruff, and Mobin Yahyazadeh: Optimal Lower Bounds for Universal Relation, and for Samplers and Finding Duplicates in Streams, FOCS, 2017

110. Cameron Musco and David P. Woodruff: Sublinear Time Low-Rank Approximation of Positive Semidefinite Matrices, FOCS, 2017

110. Haim Avron and Kenneth L. Clarkson: Sharper Bounds for Regularized Data Fitting,

RANDOM, 2017

109. Flavio Chierichetti, Sreenivas Gollapudi, Ravi Kumar, Silvio Latanzi, Rina Panigrahy, and David P. Woodruff: Algorithms for $\ell_p$ Low-Rank Approximation, ICML, 2017

108. Yi Li and David P. Woodruff: Embeddings of Schatten Norms wit hApplications to Data Streams, ICALP, 2017

107. Eric Price, Zhao Song, and David P. Woodruff: Fast Regression with an $\ell_\infty$ Guarantee, ICALP, 2017

106. Zhao Song, David P. Woodruff, and Peilin Zhong: Low Rank Approximation with Entrywise $\ell_1$-Norm Error, STOC, 2017

105. Vladimir Braverman, Stephen R. Chestnut, Nikita Ivkin, Jelani Nelson, Zhengyu Wang, and David P. Woodruff: BPTree: an L2 Heavy Hitters Algorithm Using Constant Memory, PODS, 2017

104. Kenneth L. Clarkson and David P. Woodruff: Low-Rank PSD Approximation in Input-Sparsity Time, SODA, 2017

103. Santosh Vempala and David P. Woodruff: Adaptive Matrix Vector Product, SODA, 2017

102. Jiecao Chen, He Sun, David P. Woodruff, and Qin Zhang: Communication-Optimal Distributed Clustering, NIPS, 2016

101. Zhao Song, David P. Woodruff, and Huan Zhang: Sublinear Time Orthogonal Tensor Decomposition, NIPS, 2016

100. Hossein Esfandiari, Mohammad Taghi Hajiaghayi, and David P. Woodruff: Applications of Uniform Sampling: Densest Subgraph and Beyond, SPAA, 2016

99. Yi Li and David P. Woodruff: Tight Bounds for Sketching the Operator Norm, Schatten Norms, and Subspace Embeddings, RANDOM, 2016

98. Michael Crouch, Andrew McGregor, Gregory Valiant, and David P. Woodruff: Stochastic Streams: Sample Complexity vs. Space Complexity, ESA, 2016

97. Maria-Florina Balcan, Yingyu Liang, Le Song, David P. Woodruff, and Bo Xie: Communication Efficient Distributed Kernel Principal Component Analysis, KDD, 2016

96. Michael Kapralov, Vamsi k. Potluru, and David P. Woodruff: How to Fake Multiply by a Gaussian Matrix, ICML, 2016

95. Michael B. Cohen, Jelani Nelson, and David P. Woodruff: Optimal Approximate Matrix Product in Terms of Stable Rank, ICALP, 2016

94. David P. Woodruff: New Algorithms for Heavy Hitters in Data Streams, ICDT (invited paper), 2016

93. Arnab Bhattacharyya, Palash Dey, and David P. Woodruff: An Optimal Algorithm for

l1-Heavy Hitters in Insertion Streams and Related Problems, PODS, 2016

92. Vladimir Braverman, Stephen R. Chestnut, Lin F. Yang, and David P. Woodruff: Streaming Space Complexity of Nearly All Functions of One Variable on Frequency Vectors, PODS, 2016

91. Yuqing Ai, Wei Hu, Yi Li, and David P. Woodruff: New Characterizations in Turnstile Streams with Applications, CCC, 2016

90. Vladimir Braverman, Stephen R. Chestnut, Nikita Ivkin, and David P. Woodruff: Beating CountSketch for Heavy Hitters in Insertion Streams, STOC, 2016

89. Yi Li and David P. Woodruff: On Approximating Functions of the Singular Values in a Stream, STOC, 2016

88. Mark Braverman, Ankit Garg, Tengyu Ma, Huy L. Nguyen, and David P. Woodruff: Communication Lower Bounds for Statistical Estimation Problems via a Distributed Data Processing Inequality, STOC, 2016

87. Christos Boutsidis, David P. Woodruff, and Peilin Zhong: Optimal Principal Component Analysis in Distributed and Streaming Models, STOC, 2016

86. Ilya Razenshteyn, Zhao Song, and David P. Woodruff: Weighted Low Rank Approximations with Provable Guarantees, STOC, 2016

85. David P. Woodruff, Peilin Zhong: Distributed Low Rank Approximation of Implicit Functions of a Matrix, ICDE, 2016

84. Arturs Backurs, Piotr Indyk, Ilya Razenshteyn, and David P. Woodruff: Nearly-optimal Bounds for Sparse Recovery in Generic Norms, with Applications to k-median Sketching, SODA, 2016

83. Alexandr Andoni, Jiecao Chen, Bo Qin, Robert Krauthgamer, David P. Woodruff, and Qin Zhang: On Sketching Quadratic Forms, ITCS, 2016

82. Xiaoming Sun, David P. Woodruff: Tight Bounds for Graphs Problems in Insertion Streams, APPROX, 2015

81. Ken Clarkson, David P. Woodruff: Input Sparsity and Hardness for Robust Subspace Approximation. FOCS, 2015

80. Dirk van Gucht, Ryan Williams, David P. Woodruff, Qin Zhang: The Communication Complexity of Distributed Set-Joins with Applications to Matrix Multiplication, PODS, 2015

79. Marco Molinaro, David P. Woodruff, Grigory Yaroslavtsev: Amplification of One-Way Information Complexity via Codes and Noise Sensitivity, ICALP, 2015

78. Omri Weinstein, David P. Woodruff: The Simultaneous Communication of Disjointness with Applications to Data Streams, ICALP 2015

77. Ken Clarkson, David P. Woodruff: Sketching for M-Estimators: A Unified Approach to

Robust Regression. SODA, 2015

76. Haim Avron, Huy L. Nguyen, David P. Woodruff: Subspace Embeddings for the Polynomial Kernel. NIPS, 2014

75. David P. Woodruff: Low Rank Approximation Lower Bounds in Row-Update Streams. NIPS, 2014

74. Nina Balcan, Vandana Kanchanapally, Yingyu Liang, David P. Woodruff: Improved Distributed Principal Component Analysis. NIPS, 2014

73. Ravi Kannan, Santosh Vempala, David P. Woodruff: Principal Component Analysis and Higher Correlations for Distributed Data. COLT, 2014: 1040-1057

72. Joshua Brody, Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, Grigory Yaroslavtsev: Certifying Equality with Limited Interaction. APPROX-RANDOM, 2014: 545-581

71. Yi Li, Zhengyu Wang, David P. Woodruff: Improved Testing of Low Rank Matrices. KDD, 2014: 691-700, invited to the special issue in ACM Transactions on Knowledge Discovery from Data for select papers from KDD, 2014

70. Joshua Brody, Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, Grigory Yaroslavtsev: Beyond Set Disjointness: the Communication Complexity of Finding the Intersection. PODC, 2014: 106-113

69. Michael Kapralov, David P. Woodruff: Spanners and Sparsifiers in Dynamic Streams. PODC, 2014: 272-281, invited to the special issue in Distributed Computing for select papers from PODC, 2014

68. Rasmus Pagh, Morten Stockel, David P. Woodruff: Is Min-Wise Hashing Optimal for Summarizing Set Intersection? PODS, 2014: 109-120

67. Yi Li, Xiaoming Sun, Chengu Wang, David P. Woodruff: On the Communication Complexity of Linear Algebraic Problems in the Message Passing Model. DISC, 2014

66. Christos Boutsidis, David P. Woodruff: Optimal CUR Matrix Decompositions. STOC, 2014: 353-362

65. Yi Li, Huy L. Nguyen, David P. Woodruff: Turnstile Streaming Algorithms Might as Well be Linear Sketches. STOC, 2014: 174-183

64. Benny Kimelfeld, Jan Vondrk, David P.Woodruff: Multi-Tuple Deletion Propagation: Approximations and Complexity. VLDB 2014: 1558-1569

63. David P.Woodruff, Qin Zhang: An Optimal Lower Bound for Distinct Elements in the

Message Passing Model. SODA 2014: 718-733

62. Yi Li, Huy L. Nguyen, David P. Woodruff: On Sketching Matrix Norms and the Top Singular Vector. SODA 2014: 1562-1581

61. Yi Li, David P. Woodruff: A Tight Lower Bound for High Frequency Moment Estimation with Small Error. APPROX-RANDOM 2013: 623-638

60. David P. Woodruff, Qin Zhang: Subspace Embeddings and Lp-Regression Using Exponential Random Variables. COLT 2013: 546-567

59. Kenneth L. Clarkson, Petros Drineas, Malik Magdon-Ismail, Michael W. Mahoney, Xiangrui Meng, David P. Woodruff: The Fast Cauchy Transform and Faster Robust Linear Regression. SODA 2013: 466-477

58. Eric Price, David P. Woodruff: Lower Bounds for Adaptive Sparse Recovery. SODA 2013: 652-663

57. Marco Molinaro, David P. Woodruff, Grigory Yaroslavtsev: Beating the Direct Sum Theorem in Communication Complexity with Implications for Sketching. SODA 2013: 1738-1756

56. Kenneth L. Clarkson, David P. Woodruff: Low Rank Approximation and Regression in Input Sparsity Time. STOC 2013: 81-90, invited to the Journal of the ACM

55. Moritz Hardt, David P. Woodruff: How Robust are Linear Sketches to Adaptive Inputs? STOC 2013: 121-130

54. David P. Woodruff, Qin Zhang: When Distributed Computation Is Communication Expensive. DISC 2013: 16-30, invited to the special issue in Distributed Computing for select papers from DISC, 2013

53. Haim Avron, Vikas Sindhwani, David P. Woodruff: Sketching Structured Matrices for Faster Nonlinear Regression. NIPS 2013

52. Anna C. Gilbert, Brett Hemenway, Martin J. Strauss, David P. Woodruff, Mary Wootters: Reusable Low-error Compressive Sampling Schemes Through Privacy. SSP 2012.

51. Michael W. Mahoney, Petros Drineas, Malik Magdon-Ismail, David P. Woodruff: Fast Approximation of Matrix Coherence and Statistical Leverage. ICML 2012

50. Jelani Nelson, Huy L. Nguyn, David P. Woodruff: On Deterministic Sketching and Streaming for Sparse Recovery and Norm Estimation. APPROX-RANDOM 2012: 627-638

49. Srikanta Tirthapura, David P. Woodruff: A General Method for Estimating Correlated Aggregates over a Data Stream. ICDE 2012: 162-173

48. Eric Price, David P. Woodruff: Applications of the Shannon-Hartley Theorem to Data Streams and Sparse Recovery. ISIT 2012: 2446-2450

47. Andrew McGregor, A. Pavan, Srikanta Tirthapura, David P. Woodruff: Space-efficient Estimation of Statistics over Sub-sampled Streams. PODS 2012: 273-282

46. Srikanta Tirthapura, David P. Woodruff: Rectangle-efficient Aggregation in Spatial Data Streams. PODS 2012: 283-294

45. David P. Woodruff, Qin Zhang: Tight Bounds for Distributed Functional Monitoring. STOC 2012: 941-960

44. Joshua Brody, David P. Woodruff: Streaming Algorithms with One-Sided Estimation. APPROX-RANDOM 2011: 436-447

43. Rolf Klein, Rainer Penninger, Christian Sohler, David P. Woodruff: Tolerant Algorithms. ESA 2011: 736-747

42. Piotr Indyk, Eric Price, David P. Woodruff: On the Power of Adaptivity in Sparse Recovery. FOCS 2011: 285-294

41. Eric Price, David P. Woodruff: (1 + eps)-Approximate Sparse Recovery. FOCS 2011: 295-304, invited to the special issue in Algorithmica on group testing and compressed sensing

40. Piotr Berman, Arnab Bhattacharyya, Elena Grigorescu, Sofya Raskhodnikova, David P. Woodruff, Grigory Yaroslavtsev: Steiner Transitive-Closure Spanners of Low-Dimensional Posets. ICALP (1) 2011: 760-772

39. Arnab Bhattacharyya, Piotr Indyk, David P. Woodruff, Ning Xie: The Complexity of Linear Dependence Problems in Vector Spaces. ICS 2011: 496-508

38. T. S. Jayram, David P. Woodruff: Optimal Bounds for Johnson-Lindenstrauss Transforms and Streaming Problems with Sub-Constant Error. SODA 2011: 1-10, invited to the special issue in Transactions on Algorithms for select papers from SODA, 2011

37. David P. Woodruff: Near-optimal Private Approximation Protocols via a Black Box transformation. STOC 2011: 735-744

36. Daniel M. Kane, Jelani Nelson, Ely Porat, David P.Woodruff: Fast Moment Estimation in Data Streams in Optimal Space. STOC 2011: 745-754

35. Christian Sohler, David P. Woodruff: Subspace Embeddings for the L1-norm with Applications. STOC 2011: 755-764

34. Srikanta Tirthapura, David P. Woodruff: Optimal Random Sampling from Distributed

Streams Revisited. DISC 2011: 283-297

33. Arnab Bhattacharyya, Elena Grigorescu, Madhav Jha, Kyomin Jung, Sofya Raskhodnikova, David P. Woodruff: Lower Bounds for Local Monotonicity Reconstruction from Transitive-Closure Spanners. APPROX-RANDOM 2010: 448-461

32. David P. Woodruff: A Quadratic Lower Bound for Three-Query Linear Locally Decodable Codes over Any Field. APPROX-RANDOM 2010: 766-779

31. Kenneth L. Clarkson, Elad Hazan, David P. Woodruff: Sublinear Optimization for Machine Learning. FOCS 2010: 449-457

30. David P. Woodruff: Additive Spanners in Nearly Quadratic Time. ICALP (1) 2010: 463-474

29. Daniel M. Kane, Jelani Nelson, David P. Woodruff: An Optimal Algorithm for the Distinct Elements Problem. PODS 2010: 41-52, invited to the Journal of the ACM

28. Jelani Nelson, David P. Woodruff: Fast Manhattan Sketches in Data Streams. PODS 2010: 99-110

27. Dan Feldman, Morteza Monemizadeh, Christian Sohler, David P. Woodruff: Coresets and Sketches for High Dimensional Subspace Approximation Problems. SODA 2010: 630-649

26. Morteza Monemizadeh, David P. Woodruff: 1-Pass Relative-Error Lp-Sampling with Applications. SODA 2010: 1143-1160

25. Daniel M. Kane, Jelani Nelson, David P. Woodruff: On the Exact Space Complexity of Sketching and Streaming Small Norms. SODA 2010: 1161-1178

24. Khanh Do Ba, Piotr Indyk, Eric Price, David P. Woodruff: Lower Bounds for Sparse Recovery. SODA 2010: 1190-1197

23. Alexandr Andoni, Khanh Do Ba, Piotr Indyk, David P. Woodruff: Efficient Sketches for Earth-Mover Distance, with Applications. FOCS 2009: 324-330

22. T. S. Jayram, David P. Woodruff: The Data Stream Space Complexity of Cascaded Norms. FOCS 2009: 765-774

21. David P. Woodruff: The Average-case Complexity of Counting Distinct Elements. ICDT 2009: 284-295

20. Arnab Bhattacharyya, Elena Grigorescu, Kyomin Jung, Sofya Raskhodnikova, David P. Woodruff: Transitive-closure Spanners. SODA 2009: 932-941

19. Kenneth L. Clarkson, David P. Woodruff: Numerical Linear Algebra in the Streaming Model. STOC 2009: 205-214

18. David P.Woodruff: Corruption and Recovery-Efficient Locally Decodable Codes. APPROX-RANDOM 2008: 584-595

17. Alexandre V. Evfimievski, Ronald Fagin, David P. Woodruff: Epistemic Privacy. PODS 2008: 171-180

16. David P. Woodruff: Revisiting the Efficiency of Malicious Two-Party Computation. EUROCRYPT 2007: 79-96

15. Xiaoming Sun, David P. Woodruff: The Communication and Streaming Complexity of Computing the Longest Common and Increasing Subsequences. SODA 2007: 336-345

14. David P. Woodruff: Better Approximations for the Minimum Common Integer Partition Problem. APPROX-RANDOM 2006: 248-259

13. Zulfikar Ramzan, David P. Woodruff: Fast Algorithms for the Free Riders Problem in Broadcast Encryption. CRYPTO 2006: 308-325

12. Craig Gentry, Zulfikar Ramzan, David P. Woodruff: Explicit Exclusive Set Systems with Applications to Broadcast Encryption. FOCS 2006: 27-38

11. David P. Woodruff: Lower Bounds for Additive Spanners, Emulators, and More. FOCS 2006: 389-398

10. Piotr Indyk, David P. Woodruff: Polylogarithmic Private Approximations and Efficient Matching. TCC 2006: 245-264

9. David P. Woodruff, Sergey Yekhanin: A Geometric Approach to Information-Theoretic Private Information Retrieval. IEEE Conference on Computational Complexity 2005: 275-284

8. Marten van Dijk, Robert Granger, Dan Page, Karl Rubin, Alice Silverberg, Martijn Stam, David P. Woodruff: Practical Cryptography in High Dimensional Tori. EUROCRYPT 2005: 234-250

7. Piotr Indyk, David P. Woodruff: Optimal Approximations of the Frequency Moments of Data Streams. STOC 2005: 202-208

6. David P. Woodruff, Jessica Staddon: Private Inference Control. ACM Conference on Computer and Communications Security 2004: 188-197

5. Marten van Dijk, David P. Woodruff: Asymptotically Optimal Communication for Torus-Based Cryptography. CRYPTO 2004: 157-178

4. Hanson Zhou, David P. Woodruff: Clustering via Matrix Powering. PODS 2004: 136-142

3. David P. Woodruff: Optimal Space Lower Bounds for all Frequency Moments. SODA 2004: 167-175

2. Piotr Indyk, David P. Woodruff: Tight Lower Bounds for the Distinct Elements Problem. FOCS 2003: 283-288

1. David P. Woodruff, Marten van Dijk: Cryptography in an Unbounded Computational Model. EUROCRYPT 2002: 149-164

## *Refereed Journal Publications:*

32. Yi Li, Ruosong Wang, and David P. Woodruff: Tight Bounds for the Subspace Sketch Problem with Applications, SICOMP, 2021 (to appear)

31. Rajesh Jayaram and David P. Woodruff: Perfect $L_p$ Sampling in a Data Stream, SICOMP, 2020

30. Can Kockan, Kaiyuan Zhu, Natnatee Dokmai, Nikolai Karpov, M. Oguzhan Kulecki, David P. Woodruff, and S. Cenk Sahinalp: Sketching Algorithms for Genomic Data Analysis and Querying in a Secure Enclave, Nature Methods, 2020

29. Yi Li, Huy Le Nguyen, and David P. Woodruff: On Approximating Matrix Norms in a Stream, SICOMP, 2020

28. Nina Balcan, Yingyu Liang, Zhao Song, David P. Woodruff, and Hongyang Zhang: Non-Convex Matrix Completion and Related Problems via Strong Duality, Journal of Machine Learning Research, 2019

27. Arnab Bhattacharyya, Palash Dey, and David P. Woodruff: An Optimal Algorithm for ell_1 Heavy Hitters in Insertion Streams and Related Problems, ACM Transactions on Algorithms, 2019

26. Alexandr Andoni, Jiecao Chen, Robert Krauthgamer, Bo Qin, David P. Woodruff, Qin Zhang: On Sketching Quadratic Forms, submitted to Journal of the ACM, 2017 (passed initial screening, revising according to reviewer comments).

25. Kenneth L. Clarkson, David P. Woodruff: Low Rank Approximation and Regression in Input Sparsity Time, Journal of the ACM, 2017.

24. David P. Woodruff, Qin Zhang: When Distributed Computation is Communication Expensive, Distributed Computing, 30 (5), 309-323, 2017

23. Haim Avron, Kenneth L. Clarkson, David P. Woodruff: Faster Kernel Ridge Regression Using Sketching and Preconditioning, accepted to SIMAX with minor revisions

22. Christos Boutsidis, David P. Woodruff: Optimal CUR Matrix Decompositions, SICOMP 46(2): 543-589, 2017

21. Srikanta Tirthapura, David P. Woodruff: A General Method for Estimating Correlated Aggregates Over a Data Stream. Algorithmica 73(2): 235-260, 2015

20. Yung-Yu Chung, Srikanta Tirthapura, David P. Woodruff:
A Simple Message-Optimal Algorithm for Random Sampling from a Distributed Stream. IEEE Trans. Knowl. Data Eng. 28(6): 1356-1368, 2016

19. Yuval Rabani, Andréa W. Richa, Jared Saia, David P. Woodruff: Editorial to the Special Issue on SODA'12. ACM Trans. Algorithms 12(1): 1:1, 2016

18. Mina Ghashami, Edo Liberty, Jeff M. Phillips, David P. Woodruff:
Frequent Directions: Simple and Deterministic Matrix Sketching. SIAM J. Comput. 45(5): 1762-1792, 2016

17. Kenneth L. Clarkson, Petros Drineas, Malik Magdon-Ismail, Michael W. Mahoney, Xiangrui Meng, David P. Woodruff: The Fast Cauchy Transform and Faster Robust Linear Regression. SIAM J. Comput. 45(3): 763-810, 2016

16. Mark Braverman, David P. Woodruff: Guest Editorial for Information Complexity and Applications. Algorithmica 76(3): 595-596, 2016

15. Joshua Brody, Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, Grigory Yaroslavtsev: Certifying Equality With Limited Interaction. Algorithmica 76(3): 796-845, 2016

14. Periklis Papakonstantinou, David P. Woodruff, and Guang Yang: True Randomness from Big Data, Scientific Reports, 2016

13. Andrew McGregor, Aduri Pavan, Srikanta Tirthapura, David P. Woodruff: Space-Efficient Estimation of Statistics over Sub-Sampled Streams. Algorithmica, 2016

12. David P. Woodruff: Data Streams and Applications in Computer Science 2014: Bulletin of the EATCS 114.

11. Piotr Berman, Arnab Bhattacharyya, Elena Grigorescu, Sofya Raskhodnikova, David Woodruff, Grigory Yaroslavtsev: Steiner Transitive-Closure Spanners of Low-Dimensional Posets. Combinatorica, 2014.

10. Jelani Nelson, Huy L. Nguyen, David P.Woodruff: On Deterministic Sketching and Streaming for Sparse Recovery and Norm Estimation. Linear Algebra and Applications, March 2013.

9. Benny Kimelfeld, Jan Vondrk, David P.Woodruff: Multi-Tuple Deletion Propagation: Approximations and Complexity. PVLDB 6(13): 1558-1569 (2013)

8. T. S. Jayram, David P. Woodruff: Optimal Bounds for Johnson-Lindenstrauss Transforms and Streaming Problems with Subconstant Error. ACM Transactions on Algorithms 9(3): 26 (2013)

7. Petros Drineas, Malik Magdon-Ismail, Michael W. Mahoney, David P. Woodruff: Fast

Approximation of Matrix Coherence and Statistical Leverage. Journal of Machine Learning (JMLR), volume 13, 2012.

6. Kenneth L. Clarkson, Elad Hazan, David P. Woodruff: Sublinear Optimization for Machine Learning. J. ACM 59(5): 23 (2012)

5. Arnab Bhattacharyya, Elena Grigorescu, Kyomin Jung, Sofya Raskhodnikova, David P. Woodruff: Transitive-Closure Spanners. SIAM J. Comput. 41(6): 1380-1425 (2012)

4. Arnab Bhattacharyya, Elena Grigorescu, Madhav Jha, Kyomin Jung, Sofya Raskhodnikova, David P. Woodruff: Lower Bounds for Local Monotonicity Reconstruction from Transitive-Closure Spanners. SIAM J. Discrete Math. 26(2): 618-646 (2012)

3. David P. Woodruff: A Quadratic Lower Bound for Three-Query Linear Locally Decodable Codes over Any Field. J. Comput. Sci. Technol. 27(4): 678-686 (2012)

2. Alexandre V. Evfimievski, Ronald Fagin, David P. Woodruff: Epistemic Privacy. J. ACM 58(1): 2 (2010)

1. David P. Woodruff, Sergey Yekhanin: A Geometric Approach to Information-Theoretic Private Information Retrieval. SIAM J. Comput. 37(4): 1046-1056 (2007)

*Short Surveys, Theses:*

4. Ilias Diakonikolas, Santosh Vempala, David P. Woodruff: Algorithmic High-Dimensional Robust Statistics, Simons Vignette, 2019

3. David P. Woodruff: Frequency Moments. Encyclopedia of Database Systems 2009: 1169-1170

2. David P. Woodruff: Efficient and Private Distance Approximation in the Communication and Streaming Models. MIT Ph.D. Thesis, 2007

1. David P. Woodruff: Cryptography in an Unbounded Computational Model. MIT M.Eng. Thesis, 2002

# Invited Plenary talks at Conferences

- ICDT 2016
- ESA 2017
- AAAC 2018
- AAIM 2019
- CSR 2019

- ICALP 2021

## Invited Talks at Workshops

100. International Conference on Computing and Data Science (CONF-CDS), 2021

99. Matches made in heaven: Cryptography and Theoretical Computer Science, workshop at FOCS/TCC, 2020

98. Mini-Symposium on Low-Rank Models and Applications, Fields Institute, 2021 (upcoming)

97. One World Mathematics of Information, Data, and Signals seminar, 2020

96. Data Stream Algorithms Workshop at Institute for Mathematical Sciences at Nanyang Technological Institute, Singapore (upcoming)

95. Information-Theoretic Methods in Complexity Theory, Princeton, 2020 (upcoming)

94. SIAM Conference on Optimization, 2020 (upcoming)

93. Open Data Science Conference, ODSC, Boston, 2020

92. Theory Underlying Algorithms, TUNGA, 2020

91. Information Theory and Applications, 2020

90. Israel Theory Day, Open University of Israel, 2019

89. Theory of Data Science and Deep Learning program, Tel-Aviv and University of Haifa, 2019

88. Randomized Numerical Linear Algebra and Applications in Data Science, University of Newcastle, Australia, 2019

87. Simons Foundations of Data Science Reunion Workshop, 2019

86. Session on Semidefinite Programming and Low Rank Approximation, INFORMS, 2019

85. Workshop on Bridging Discrete and Continuous Optimization, DIMACS, 2019

84. Workshop on Recent Trends in Clustering and Classification, TTIC, 2019

83. Workshop at STOC on Data Science Through a Geometric Lens, 2019

82. Metric Embeddings and Dimension Reduction, Northwestern University, 2019

81. Simons Foundations of Data Science Boot Camp, 2018

80. International Symposium on Mathematical Programming, University of Bordeaux, 2018

79. International Symposium on Big Data, Tianjin University of Technology, 2018

78. Sublinear Agorithms Workshop, MIT, 2018

77. Workshop on High-Dimensional Robust Statistics, TTI-Chicago, 2018

76. Workshop on Data Summarization, University of Warwick, 2018

75. Mathematical and Computational Challenges in Real-Time Decision Making at Simons, 2018

74. Workshop on Algorithms and Randomness at Georgia Tech, 2018

73. Workshop on Theoretical Computer Science and Statistical Physics Methods in Machine Learning in Bangalore, 2017

72. Workshop at FOCS on Sketching as a Tool for Everything, 2017

71. Allerton Session on Statistical Inference and Machine Learning, 2017

70. Simons Workshop on Fast Iterative Methods in Optimization, 2017

69. Simons Collaboration on Algorithms and Geometry, 2017

68. SF Data Institute Conference, 2017

67. Shonan Workshop on Processing Big Data Streams, 2017

66. Workshop on Algorithmic Challenges in Data Science at EPFL, 2017

65. Toca Theory Day at Google, "Relative Error Tensor Approximation", 2017

64. Dagstuhl Computational Geometry workshop, long survey on "Sketching as a Tool for Geometric Problems", 2017

63. Bellairs Workshop on Data, Learning, and Optimization, long survey on "Parameterized Complexity of Matrix Factorization Problems", 2017

62. Bellairs Workshop on Data, Learning, and Optimization, long survey on "Sketching as a Tool for Numerical Linear Algebra", 2017

61. Banff Communication Complexity and Applications II, "Sketching and Streaming Matrix Norms", 2017

60. Dagstuhl Parameterized Complexity workshop, long survey on “Parameterized Complexity of Matrix Factorization Problems”, 2017

59. Information Theory and Applications, “Low Rank Approximation with Entrywise L_1-Norm Error”, 2017

58. Asilomar Conference on Signals, Systems, and Computers, “Sketching as a Tool for Numerical Linear Algebra”, 2016

57. Shanghai Tech Symposium on Information Science and Technology, “Sketching as a Tool for numerical Linear Algebra and Recent Developments”, 2016

56. Simons Genomics Program Invited Talk, “Beating CountSketch for Heavy Hitters in Insertion Streams”, 2016

55. SIAM Conference on Discrete Math, “Weighted Low Rank Approximation”, 2016

54. Nexus of Information and Computation Theories Central Workshop, “Sketching as a Tool for Numerical Linear Algebra”, 2016

53. Institut Henri Poincare Inference Problems Theme, “New Algorithms for Heavy Hitters in Data Streams”, 2016

52. Institut Henri Poincare Fundamental Inequalities: techniques and applications, “Turnstile Streaming Algorithms Might as Well be Linear Sketches”, 2016

51. Alan Turing Institute Distributed Machine Learning and Optimization, “A Story of Principal Component Analysis in the Distributed Model”, 2015

50. IMA Resource Trade-Offs: Computation, Communication, and Information, “A Story of Principal Component Analysis in the Distributed Model”, 2016

49. Simons Computational Complexity of Low-Polynomial Time Problems, “Input Sparsity and Hardness for Linear Algebra Problems”, 2015

48. Johns Hopkins Sublinear Algorithms Workshop, “Beating CountSketch for Heavy Hitters in Insertion Streams”, 2016

47. NIPS BigNeuro Workshop, “Sketching as a Tool for Numerical Linear Algebra, and Recent Developments”, 2015

46. Shonan Recent Advances in Randomized Numerical Linear Algebra, “Optimal Principal Component Analysis in Distributed and Streaming Models”, 2016

45. Simons Real Time Decision Making Workshop, “Beating CountSketch for Heavy Hitters in

Insertion Streams", 2016

44. Information Theory and Applications, "Beating CountSketch for Heavy Hitters in Insertion Streams", 2016

43. Information Theory and Applications, "The Sketching Complexity of Graph Cuts", 2015.

42. Stanford Compression Forum, "Compressing Matrices", 2015

41. Simons Big Data Reunion Workshop, "Turnstile Streaming Algorithms Might as Well Be Linear Sketches", 2014

40. Distributed Machine Learning and Matrix Computations workshop at NIPS, "Principal Component Analysis and Higher Correlations for Distributed Data, 2014

39. Midwest Theory Day, "Principal Component Analysis and Higher Correlations for Distributed Data", 2014

38. Simons Fast Algorithms via Spectral Methods Workshop, "Sketching as a Tool for Numerical Linear Algebra", 2014

37. CERI/DIMACS Workshop on Streaming Graph Algorithms, "Numerical Linear Algebra in the Streaming Model", 2014

36. Shonan Workshop for Large Scale Graphs, "The Sketching Complexity of Graph Cuts", 2014

35. MIT/MSR Theory Day, "Turnstile Streaming Algorithms Might as Well be Linear Sketches", 2014

34. Bertinoro Workshop on Sublinear Algorithms, "Turnstile Streaming Algorithms Might as Well be Linear Sketches", 2014

33. Presburger Award Speech at ICALP, "Data Streams and Applications in Computer Science", 2014

32. Berkeley Workshop on Algorithms for Modern Massive Data Sets, "Optimal CUR Matrix Decompositions", 2014

31. UC San Diego Information Theory and Applications Workshop, "Sketching as a Tool for Numerical Linear Algebra", 2014

30. Dagstuhl Workshop on Computational Complexity of Discrete Problems, "Turnstile Streaming Algorithms Might as Well be Linear Sketches", 2014

29. Survey Talk at Banff Workshop on Communication Complexity and Applications, "Lower

Bounds for Data Streams", 2014

28. NIPS Workshop on Large Scale Matrix Analysis and Inference, "Sketching as a Tool for Numerical Linear Algebra", 2013

27. Berkeley Simons Workshop on Succinct Data Representations and Applications, "How Robust are Linear Sketches to Adaptive Inputs?", 2013

26. Aggregate Knowledge Conference on Data Streams, "Sketching as a Tool for Numerical Linear Algebra", 2013

25. Coding, Complexity, and Sparsity Workshop at University of Michigan, "How Robust are Linear Sketches to Adaptive Inputs?", 2013

24. Hong Kong Workshop on Theoretical Aspects of Big Data, "Low Rank Approximation and Regression in Input Sparsity Time", 2013

23. STOC Workshop on Information Complexity and Applications, "Applications of Information Complexity II", 2013

22. Pacific Northwest Theory Day, "Low Rank Approximation and Regression in Input Sparsity Time", 2013

21. Survey talk at Institute for Mathematics and its Applications (IMA) Workshop on Group Testing Designs, Algorithms, and Applications to Biology, "A Survey of Norm Estimation with Applications", 2012

20. FOCS Workshop on Randomized Numerical Linear Algebra: Theory and Practice, "Low Rank Approximation and Regression in Input Sparsity Time", 2012

19. Coding, Complexity, and Sparsity Workshop at University of Michigan, "Low Rank Approximation and Regression in Input Sparsity Time", 2012

18. Workshop on Streaming Algorithms at University of Dortmund, "Low Rank Approximation and Regression in Input Sparsity Time", 2012

17. Stanford Workshop on Algorithms for Modern Massive Data Sets, "Low Rank Approximation and Regression in Input Sparsity Time", 2012

16. MSRI Workshop on Quantitative Geometry in Computer Science, "Tight Bounds for Distributed Functional Monitoring", 2011

15. Banff Workshop on Information Theory and Statistics for Large Alphabets, "Sublinear Optimization for Machine Learning", 2011

14. Survey talk at Bertinoro Workshop on Sublinear Algorithms, "A Survey of Norm Estimation

with Applications", 2011

13. Keynote Speaker at ACM SIGACT Chapter at Fudan University, "Efficient Sketches for Earthmover Distance and Cascaded Moments", 2011

12. Coding, Complexity and Sparsity Workshop at University of Michigan, "(1+eps)-Approximate Sparse Recovery", 2011

11. Synergies in Lower Bounds Workshop at Aarhus University, "Lower Bounds in Communication for Streaming Problems Using Information-Theoretic Arguments", 2011

10. Haifa Stringology Workshop, "Fast Moment Estimation in Data Streams in Optimal Space", 2011

9. DIMACS Workshop on Network Data Streaming and Compressive Sensing, "An Optimal Algorithm for the Distinct Elements Problem", 2010

8. Stanford Workshop on Algorithms for Modern Massive Data Sets, "Fast Lp Regression in Data Streams", 2010

7. Tel Aviv Stringology Workshop, "An Optimal Algorithm for the Distinct Elements Problem", 2010

6. IITK Workshop on Algorithms for Data Streams, "1-Pass Relative Error Lp Sampling in a Data Stream", 2010

5. Banff Workshop on Mathematics of String Spaces and Algorithmic Applications, "The Space Complexity of Cascaded Aggregates", 2009

4. Dagstuhl Workshop on Sublinear Algorithms, "Revisiting Norm Estimation in Data Streams", 2008

3. IPAM Workshop on Applications and Foundations of Cryptography and Computer Security on Private information Retrieval and Locally Decodable Codes, "New Lower Bounds for General Locally Decodable Codes", 2006

2. DIMACS Workshop on Privacy-preserving Datamining, "Private Inference Control", 2004

1. DIMACS Workshop on Discrete Metric Spaces and Algorithmic Applications, "Tight Lower Bounds for the Distinct Elements Problem", 2003

## Departmental Seminars and Colloquia

95. Northeast Normal University, "A Very Sketchy Talk", 2020

94. Stanford Information Systems Laboratory Colloquium, “A Very Sketchy Talk”, 2020

93. UT Austin Theory Seminar, “Towards a Zero-One Law for Column Subset Selection”, 2020

92. National University of Singapore, “Towards a Zero-One Law for Column Subset Selection, 2020

91. Rice University, 2019, “Toward a Zero-One Law for Column Subset Selection”, 2019

90. MSR Redmond, 2019, “Towards a Zero-One Law for Column Subset Selection”, 2019

89. Purdue University, “Strong Coresets for k-Median and Subspace Approximation, Goodbye Dimensions”, 2019

88. Peking University, “Tight Bounds for L1 Oblivious Subspace Embeddings”, 2019

87. Nanyang Technological Institute, “Tight Bounds for L1 Oblivious Subspace Embeddings”, 2019

86. Northeast Normal University, “Relative Error Tensor Low Rank Approximation”, 2019

85. Carnegie Mellon University, “Strong Coresets for k-Median and Subspace Approximation, Goodbye Dimension”, 2019

84. Google Pittsburgh, “Sketching as a Tool for Numerical Linear Algebra”, 2019

83. University of Pennsylvania, “Sketching as a Tool for Numerical Linear Algebra”, 2019

82. Princeton, “Strong Coresets for k-Median and Subspace Approximation, Goodbye Dimension”, 2019

81. University of Minnesota, “Strong Coresets for k-Median and Subspace Approximation, Goodbye Dimension”, 2019

80. EPFL, “Weighted Low Rank Approximation with Provable Guarantees”, 2019

79. Google, “Tutorial on Sketching for Linear Algebra”, 2018

78. Lawrence Livermore Labs, “Relative Error Tensor Low Rank Approximation”, 2018

77. Tsinghua, “Relative Error Tensor Low Rank Approximation”, 2018

76. Chinese Academy of Sciences, “Parameterized Complexity of Matrix Factorization Problems”, 2018

76. Northeast Normal University, “Sketching as a Tool for Numerical Linear Algebra”, 2018

75. Chinese Academy of Sciences, “Sketching as a Tool for Numerical Linear Algebra”, 2018

74. University of Pennsylvania, “Relative Error Tensor Low Rank Approximation”, 2018

73. Indian Institute of Science, “The Parameterized Complexity of Matrix Factorization Problems”, 2017

72, CMU theory seminar, “Relative Error Tensor Low Rank Approximation”, 2017

71. MIT TOC Colloquium, “Relative Error Tensor Low Rank Approximation”, 2017

70. Google Zurich, "Sketching as a Tool for Numerical Linear Algebra", 2017

69. TU Dortmund, "Sketching as a Tool for Geometry Problems", 2017

68. Max Planck Institute, "Parameterized Complexity of Matrix Factorization Problems", 2017

67. Nanyang Technological University, “Sketching as a Tool for Numerical Linear Algebra”, 2017

66. Max Planck Institute, “Sketching as a Tool for Numerical Linear Algebra”, 2017

65. Google, “Low Rank Approximation with Entrywise L1-Norm Error” 2016

64. University of Washington at St. Louis, “Sketching as a Tool for Numerical Linear Algebra”, 2016

63. Alan Turing Institute London special masterclass, “Sketching as a Tool for Numerical Linear Algebra”, 2016

62. Comcast Labs Washington DC, “Sketching as a Tool for Numerical Linear Algebra”, 2016

61. Center for Communications Research (CCR), “Sketching as a Tool for Numerical Linear Algebra”, 2016

60. Chinese Academy of Sciences, “Beating CountSketch for Heavy Hitters in Insertion Streams”, 2016

60. University of Washington long board talk, “An Optimal Algorithm for Finding L2 Heavy Hitters”, 2016

59. University of Washington theory seminar, “Beating CountSketch for Heavy Hitters in Insertion Streams”, 2016

58. EPFL, “Beating CountSketch for Heavy Hitters in Insertion Streams”, 2016

57. University of Minnesota Digital Technology Center, “Sketching as a Tool for Numerical Linear Algebra”, 2016

56. IIT Madras, “Sketching as a Tool for Numerical Linear Algebra”, 2016

55. Georgia Tech, “An Optimal Algorithm for Finding L2 Heavy Hitters”, 2016

54. Georgia Tech, “Input Sparsity and Hardness for Robust Subspace Approximation”, 2015

53. Johns Hopkins University, “Sketching for M-Estimators: A Unified Approach to Robust Regression”, 2015

52. Rensselaer Polytechnic Institute, “Sketching as a Tool for Numerical Linear Algebra”, 2014

51. Princeton University, “The Sketching Complexity of Graph Cuts”, 2014

50. Duke University, “Turnstile Streaming Algorithms Might as Well be Linear Sketches”, 2014

49. University of Michigan, “The Sketching Complexity of Graph Cuts”, 2014

48. Microsoft Research Redmond, “Turnstile Streaming Algorithms Might as Well be Linear Sketches”, 2014

47. Chinese Academy of Sciences, “Data Stream Lower Bounds: a Tutorial”, 2014

46. National Institute of Informatics, Tokyo, “Turnstile Streaming Algorithms Might as Well be Linear Sketches”, 2014

45. TCS+ online seminar in theoretical computer science, “Turnstile Streaming Algorithms Might as Well be Linear Sketches”, 2014

44. University of British Columbia, “Sketching as a Tool for Numerical Linear Algebra”, 2014

43. Brown University, “Sketching as a Tool for Numerical Linear Algebra”, 2013

42. Purdue University, “Sketching as a Tool for Numerical Linear Algebra”, 2013

41. University of Indiana, “Sketching as a Tool for Numerical Linear Algebra”, 2013

40. Microsoft Silicon Valley, “Low Rank Approximation and Regression in Input Sparsity Time”, 2013

39. Georgia Tech, “Low Rank Approximation and Regression in Input Sparsity Time”, 2013

38. MIT, “Low Rank Approximation and Regression in Input Sparsity Time”, 2013

37. Stanford, “Low Rank Approximation and Regression in Input Sparsity Time”, 2013

36. Chinese Academy of Sciences, “Sketching Techniques for Numerical Linear Algebra”, 2012

35. Chinese Academy of Sciences, “Low Rank Approximation and Regression in Input Sparsity Time”, 2012

34, Tsinghua, “Low Rank Approximation and Regression in Input Sparsity Time”, 2012

33. Stanford, “Tight Bounds for Distributed Functional Monitoring”, 2012

32. Tokyo Institute of Technology, “Sampling and Sketching Techniques for Machine Learning”, 2012

31. University of Tokyo, “Additive Spanners”, 2012

30. IBM Almaden, “Tight Bounds for Distributed Functional Monitoring”, 2012

29. IBM Tokyo, “Sketching Techniques for Numerical Linear Algebra”, 2012

28. Iowa State University, “An Optimal Algorithm for the Distinct Elements Problem”, 2011

27. Zhejiang University, “Sublinear Optimization for Machine Learning”, 2011

26. Tsinghua, “Efficient Sketches for Earthmover Distance and Cascaded Moments”, 2011

25. Google Tel Aviv, “Fast Robust Regression and Hyperplane Fitting”, 2011

24. Microsoft Asia, “Sublinear Optimzation for Machine Learning”, 2011

23. Technion, “Near-Optimal Private Approximation Protocols via a Black Box Transformation”, 2011

22. Technion, “Subspace Embeddings for the L1-norm with Applications”, 2011

21. Georgia Tech, “Subspace Embeddings for the L1-norm with Applications”, 2011

20. Princeton University, “Subspace Embeddings for the L1-norm with Applications”, 2011

19. IBM Almaden, “Efficient Sketches for Earth-Mover Distance, with Applications”, 2010

18. University of Dortmund, “Efficient Sketches for Earth-Mover Distance, with Applications”, 2010

17. University of Utah, “Fast Robust Regression in Data Streams”, 2010

16. Universite Paris-Sud, “Fast Robust Regression in Data Streams”, 2010

15. University of Dortmund, “Numerical Linear Algebra in a Data Stream”, 2009

14. University of Bonn, “Transitive-Closure Spanners”, 2008

13. Chinese University of Hong Kong, “Private and Efficient Distance Approximation", 2007

12. Toyota Institute of Technology, “Private and Efficient Distance Approximation", 2007

11. University of Southern California”, Private and Efficient Distance Approximation", 2007

10. IBM Almaden, “Private and Efficient Distance Approximation", 2007

9. Microsoft Research Silicon Valley, “Private and Efficient Distance Approximation", 2007

8. Stevens University, “Polylogarithmic Private Approximations and Efficient Matching", 2006

7. Tsinghua, “Explicit Exclusive Set Systems with Applications", 2006

6. City University of Hong Kong, “Lower Bounds for Additive Spanners, Emulators, and More", 2006

5. Chinese University of Hong Kong, “Lower Bounds for Additive Spanners, Emulators, and More", 2006

4. MIT, “Optimal Approximations of the Frequency Moments", 2005

3. Tsinghua, “Polylogarithmic Private Approximations and Efficient Matching", 2005

2. MIT, “Polylogarithmic Private Approximations and Efficient Matching", 2005

1. MIT, “Cryptography in an Unbounded Computational Model”, 2002