JOSH ALMAN

Positions

Columbia University   **2021-present**
     Assistant Professor, Department of Computer Science

Harvard University   **2019-2021**
     Michael O. Rabin Postdoctoral Fellow, Theory of Computing Group

Education

Massachusetts Institute of Technology   **2017-2019**
     Ph.D. in Computer Science
     Advisors: Ryan Williams and Virginia Vassilevska Williams
     Thesis: Linear Algebraic Techniques in Algorithms and Complexity

Stanford University   **2014-2016**
     M.S. in Computer Science
     Advisors: Ryan Williams and Virginia Vassilevska Williams

Massachusetts Institute of Technology   **2010-2014**
     B.S. in Mathematics

Selected Honors

- Machtey Award for Best Student Paper at FOCS 2019

- Best Student Paper Award at CCC 2019

- European Association of TCS Distinguished Dissertation Award, 2019

- George M. Sprowls Award for outstanding Ph.D. theses in Computer Science at MIT, 2019

- Michael Cohen Award for Best MIT Theory of Computation Student Paper, 2017

- Special Issue Papers at STOC 2021, FOCS 2019, CCC 2019, and FOCS 2018

- NSF Graduate Research Fellowship, 2014-2017

- Student Travel Awards, sponsored by NSF and ACM for FOCS 2016, 2018, STOC 2016, 2017, 2018

- Represented Stanford at the ACM International Collegiate Programming Contest World Finals, 2016

- Top 25 at the Putnam Math Competition, 2012

- Member of Phi Beta Kappa Honor Society since 2014

Publications

Copies of all my publications can be found at joshalman.com/publications

Kronecker Products, Low-Depth Circuits, and Matrix Rigidity
     In 53rd Annual ACM Symposium on the Theory of Computing (STOC 2021)
     Invited to special issue of SIAM Journal on Computing for STOC

A Refined Laser Method and Faster Matrix Multiplication
  with Virginia Vassilevska Williams
  In 32nd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2021)
  Covered by Kevin Hartnett in Quanta Magazine [link]

Algorithms and Hardness for Linear Algebra on Geometric Graphs
  with Timothy Chu, Aaron Schild, Zhao Song
  In 61st Annual IEEE Symposium on Foundations of Computer Science (FOCS 2020)

OV Graphs are (Probably) Hard Instances
  with Virginia Vassilevska Williams
  In 11th Innovations in Theoretical Computer Science Conference (ITCS 2020)

Faster Update Time for Turnstile Streaming Algorithms
  with Huacheng Yu
  In 31st Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2020)

Faster Deterministic and Las Vegas Algorithms for Offline Approximate Nearest Neighbors in High Dimensions
  with Timothy M. Chan, Ryan Williams
  In 31st Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2020)

Predicate Encryption from Bilinear Maps and One-Sided Probabilistic Rank
  with Robin Hui
  In 17th Theory of Cryptography Conference (TCC 2019)

Efficient Construction of Rigid Matrices Using an NP Oracle
  with Lijie Chen
  In 60th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2019)
  Machtey Award for Best Student Paper at FOCS 2019
  Invited to special issue of SIAM Journal on Computing for FOCS

Limits on the Universal Method for Matrix Multiplication
  In 34th Computational Complexity Conference (CCC 2019)
  Best Student Paper Award at CCC 2019
  Invited to special issue of ToC for CCC

An Illuminating Algorithm for the Light Bulb Problem
  In 2nd Symposium on Simplicity in Algorithms (SOSA 2019)

Limits on All Known (and Some Unknown) Approaches to Matrix Multiplication
  with Virginia Vassilevska Williams
  In 59th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2018)
  Invited to special issue of SIAM Journal on Computing for FOCS

Cell-Probe Lower Bounds from Online Communication Complexity
  with Joshua Wang, Huacheng Yu
  In 50th Annual ACM Symposium on the Theory of Computing (STOC 2018)

Further Limitations of the Known Approaches for Matrix Multiplication
  with Virginia Vassilevska Williams
  In 9th Innovations in Theoretical Computer Science Conference (ITCS 2018)

Dynamic Parameterized Problems and Algorithms
>   with Matthias Mnich, Virginia Vassilevska Williams
>   *In 44th International Colloquium on Automata, Languages, and Programming (ICALP 2017)*

Probabilistic Rank and Matrix Rigidity
>   with Ryan Williams
>   *In 49th Annual ACM Symposium on the Theory of Computing (STOC 2017)*
>   ***Michael Cohen Award for Best MIT Theory of Computation Student Paper***

Theoretical Foundations of Team Matchmaking
>   with Dylan McKay
>   *In 16th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2017)*

Polynomial Representations of Threshold Functions and Algorithmic Applications
>   with Timothy M. Chan, Ryan Williams
>   *In 57th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2016)*

Probabilistic Polynomials and Hamming Nearest Neighbors
>   with Ryan Williams
>   *In 56th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2015)*

Laurent Phenomenon Sequences
>   with Cesar Cuenca, Jiaoyang Huang
>   *Journal of Algebraic Combinatorics 43, 589-633 (2016)*

Circular Planar Electrical Networks: Posets and Positivity
>   with Carl Lian, Brandon Tran
>   *Journal of Combinatorial Theory, Ser. A 132, 58-101 (2015).*

Invited Talks

A Refined Laser Method and Faster Matrix Multiplication
- University of Washington Theory Seminar, May 2021
- MIT Algorithms and Complexity Seminar, May 2021
- AMS Western Sectional Meeting, session on Quivers, Tensors, and their Applications, May 2021

Kronecker Products, Low-Depth Circuits, and Matrix Rigidity
- Oxford-Warwick Complexity Meetings, Apr 2021

Faster Update Time for Turnstile Streaming Algorithms
- Stanford Theory Seminar, Jan 2020
- Google Mountain View Theory Seminar, Jan 2020

Limits on the Universal Method for Matrix Multiplication
- SIAM Annual Meeting, Minisymposium on Lower Bounds in Numerical Linear Algebra, July 2021
- AMS Sectional Meeting at the University of Virginia, session on Tensors and Complexity, Mar 2020
- Northeastern Theory Seminar, Dec 2019
- University of Chicago Combinatorics and Theoretical Computer Science Seminar, Oct 2019
- MIT Combinatorics Seminar, Sept 2019

Efficient Construction of Rigid Matrices Using an NP Oracle
- BIRS Workshop on Algebraic Techniques in Computational Complexity, July 2019

Limits on All Known (and Some Unknown) Approaches to Matrix Multiplication
- Highlights of Algorithms Invited Speaker, June 2019
- MIT Algorithms and Complexity Seminar, Oct 2018
- Schloss Dagstuhl Seminar on Algebraic Methods in Computational Complexity, Sept 2018
- China Theory Week at Tsinghua University, Sept 2018
- Oxford/Clay Mathematics Institute Workshop on Complexity Theory, July 2018

Dynamic Parameterized Problems and Algorithms
- SIAM DM Conference, Minisymposium on Modification Problems to Discrete Structures, June 2018

Cell-Probe Lower Bounds from Online Communication Complexity
- MIT Algorithms and Complexity Seminar, May 2017

Probabilistic Rank and Matrix Rigidity
- TCS+ Online Seminar, Mar 2017

Polynomial Representations of Threshold Functions with Algorithmic Applications
- IT University of Copenhagen Theory Seminar, Aug 2016

Probabilistic Polynomials and Hamming Nearest Neighbors
- SODA Workshop on Multi-dimensional Proximity Problems, Jan 2016
- Simons Institute Workshop on Connections between Algorithm Design and Complexity Theory, Oct 2015

Positivity Phenomena in Circular Planar Electrical Networks
- University of Michigan Combinatorics Seminar, Feb 2014

Research Internships

IBM Research – Almaden Research Center   **Summer 2017**
　　　Worked in the Principles and Methodologies group

Service and Outreach

Leadership Activities:
- Co-Organizer of STOC Workshop on MCSP and Hardness Magnification, July 2020
- Organizer of Harvard Theory Seminar, 2020-21 academic year

Conference Reviewing: STOC, FOCS, SODA, CCC, SoCG, SOSA, ICALP, ITCS, ESA, FSTTCS, ISSAC, STACS, SPAA, CSR, SWAT, MFCS, FUN, WADS, COCOON, *etc.*

Journal Reviewing: ACM Transactions on Algorithms, Journal of Computational Geometry, Computational Complexity, Theory of Computing, Electronic Journal of Combinatorics, Random Structures & Algorithms, Theoretical Computer Science, SIAM Journal on Computing, SIAM Journal on Discrete Mathematics, *etc.*

Volunteering:
- Team Leader for Ghana at the 2021 International Math Olympiad; coach and teacher since 2013
- Taught over 50 Computer Science and Math classes for Middle and High School students through the Educational Studies Programs at MIT and Stanford
- 75+ hours volunteering at the MIT Museum, including designing puzzles for new museum activities