Joshua D. Brakensiek

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Curriculum Vitae

Education

Stanford University 09/2018 – 06/2023
Toward Doctor of Philosophy in Computer Science
Co-advised by Aviad Rubinstein and Moses Charikar

Carnegie Mellon University 08/2016 – 05/2018
Master of Science in Mathematical Sciences
Thesis: "Polymorphic Inquiries: Promise Constraint Satisfaction and Beyond"
Advisor: Professor Venkatesan Guruswami
GPA: 4.00/4.00

Carnegie Mellon University 08/2014 – 05/2018
Bachelor of Science in Mathematical Sciences
Minor in Science, Technology, and Society
University and Mellon College of Science Honors
GPA: 4.00/4.00

Publications

Smoothed Complexity of 2-player Nash Equilibria
Boodaghians, S., **Brakensiek, J.**, Hopkins, S., and Rubinstein, A.
Symposium on Foundations of Computer Science (FOCS) 2020, to appear.

Coded Trace Reconstruction in a Constant Number of Traces.
Brakensiek, J., Li, R., and Spang, B.
Symposium on Foundations of Computer Science (FOCS) 2020, to appear. arXiv:1908.03996

The Resolution of Keller's Conjecture
Brakensiek, J., Heule, M., Mackey, J., and Narváez, D.
International Joint Conference on Automated Reasoning (IJCAR) 2020 arXiv:1910.03740
Best Paper Award

Constant-factor Approximation of Near-linear Edit Distance in Near-linear Time.
Brakensiek, J. and Rubinstein, A.
Symposium on Theory of Computing (STOC) 2020. arXiv:1904.05390

Symmetric Polymorphisms and Efficient Decidability of Promise CSPs.
Brakensiek, J. and Guruswami, V.
Symposium on Discrete Algorithms (SODA) 2020, to appear. arXiv:1907.04383

Bridging between 0/1 and Linear Programming via Random Walks
Brakensiek, J. and Guruswami, V.
Symposium on Theory of Computing (STOC) 2019. arXiv:1904.04860

CSPs with Global Modular Constraints: Algorithms and Hardness via Polynomial Representations
Brakensiek, J., Gopi, S., and Guruswami, V.
Symposium on Theory of Computing (STOC) 2019. ECCC TR19-013

Combining LPs and Ring Equations Via Structured Polymorphisms
Brakensiek, J. and Guruswami, V.
Symposium on Discrete Algorithms (SODA) 2019. ECCC TR18-059

Promise Constraint Satisfaction:
Algebraic Structure and a Symmetric Boolean Dichotomy
Brakensiek, J. and Guruswami, V.
Symposium on Discrete Algorithms (SODA) 2018. arXiv:1704.01937 ECCC TR16-183

Efficient Low-Redundancy Codes for Correcting Multiple Deletions
Brakensiek, J., Guruswami, V., and Zbarsky, S.
To appear, IEEE Transactions on Information Theory
Conference version: Symposium on Discrete Algorithms (SODA) 2016. arXiv:1507.06175

Vertex isoperimetry and independent set stability for tensor powers of cliques
Brakensiek, J.
Intl. Workshop on Randomization and Computation (RANDOM) 2017. arXiv:1702.04432

The Quest for Strong Inapproximability Results with Perfect Completeness
Brakensiek, J. and Guruswami, V.
Intl. Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX) 2017. ECCC TR17-80

New Hardness Results for Graph and Hypergraph Colorings
Brakensiek, J. and Guruswami, V.
Computational Complexity Conference (CCC) 2016. ECCC TR16-029

Efficient Geometric Probabilities of
Multi-Transiting Exoplanetary Systems from CORBITS
Brakensiek, J., and Ragozzine, D.
The Astrophysical Journal, 821, 47. arXiv:1602.07014, Open source CORBITS code.

Manuscripts

A Dictatorship Test with Perfect Completeness for 2–to–2 Label Cover
Brakensiek, J. and Guruswami, V. ECCC TR17-141

Bounds on the Size of Sound Monotone Switching
Networks Accepting Permutation Sets of Directed Trees
Brakensiek, J., and Potechin, A. arXiv:1301.3780

Research Talks and Posters

Symposium on Theory of Computing
Virtual. June 2020.

Symposium on Discrete Algorithms
Salt Lake City, Utah, January 2020.

ACO Seminar
Carnegie Mellon University, Pittsburgh, Pennsylvania, September 2019.

Microsoft Research
Redmond, Washington, July 2019.

Symposium on Theory of Computing
Phoenix, Arizona, June 2019. (talk and poster)

Stanford Theory Lunch
Stanford, California, January 2019.

Symposium on Discrete Algorithms
San Diego, California, January 2019.

Dagstuhl Seminar 18231
Schloss Dagstuhl, Wadern, Germany, June 2018
Recipient of NSF Support Grant

CMU Theory Lunch (invited talk)
Carnegie Mellon University, Pittsburgh, Pennsylvania, January 2018.

AMS Contributed Papers in Combinatorics
Joint Mathematics Meetings, San Diego, California, January 2018

Symposium on Discrete Algorithms
New Orleans, Louisiana, January 2018

APPROX/RANDOM conference
Berkeley, California, August 2017 (two talks)

Conference on Computational Complexity
Tokyo, Japan, May/June 2016

Meeting of the Minds Undergraduate Poster Session
Carnegie Mellon University, Pittsburgh, Pennsylvania, May 2016
Recipient of Early Research Award

CMU Theory Lunch (invited talk)
Carnegie Mellon University, Pittsburgh, Pennsylvania, January 2016.

Symposium on Discrete Algorithms
Arlington, Virginia, January 2016.

CMU Theory Lunch
Carnegie Mellon University, Pittsburgh, Pennsylvania, November 2015

Pi Mu Epsilon Undergraduate Student Presentations
MAA MathFest, Hartford, Connecticut, August 2013
Recipient of Pi Mu Epsilon Student Presentation Award

MAA Undergraduate Poster Session
Joint Mathematics Meetings, San Diego, California, January 2013
Recipient of Outstanding Presentation Award

Division of Planetary Science Poster Session
Reno, Nevada, October 2012
Recipient of Hartmann Student Travel Grant

Research Science Institute Symposium
MIT, Cambridge, Massachusetts, August 2012

Research Awards

IJCAR Best Paper Award co-winner, 2020
NSF Graduate Research Fellowship, 2018
CRA Outstanding Undergraduate Researcher Award, 2018
Goldwater Scholarship, 2016
Davidson Fellow, 2013
Top Five Awardee: Written Research, Research Science Institute, 2012

Competition Awards

Putnam Fellow (top 5 individual) and 1st place team, 2016
8th place individual and 2nd place team, Putnam Competition, 2015
10.5th place individual, Putnam Competition, 2014
Two-time Gold Medalist: International Olympiad in Informatics, 2013-14
Silver Medalist: International Mathematical Olympiad, 2014
Samuel L. Greitzer/Murray S. Klamkin Award for Mathematical Excellence, 2014
USA Mathematical Olympiad sole perfect scorer, 2014
Akamai Foundation Scholarship, 2014
USA Mathematical Olympiad Winner, 2012, 2014
International Mathematical Olympiad invitee (declined), 2012
Bronze Medalist: Romanian Masters of Mathematics, 2012

Other Awards

Senior Leadership Recognition, 2018
Phi Kappa Phi, 2018
Phi Beta Kappa *early inductee*, 2017
Knaster-McWilliams Scholar, 2014-18
Pi Mu Epsilon, 2012

Work Experience

Research Intern for Microsoft — Summer 2020
Research in the algorithms group at Microsoft Research under the supervision of Sivakanth Gopi.

Course Assistant — Spring 2019
Course assistant for Stanford course CS 354 (Unfullfilled Algorithmic Fantasies) taught by Aviad Rubinstein. *Recognized to be in top 5% of CAs.*

Teaching Assistant — Fall 2017
Teaching assistant for CMU course 15-458/15-858 (Discrete Differential Geometry) taught by Keenan Crane.

Research Assistant — 2015–18
Theoretical computer science research under Venkatesan Guruswami at CMU

Mathematics Olympiad grader — 2014–17
Graded exams which helped to decide the USA International Math Olympiad team

Research Assistant — 2015–16
Astrostatistics research under Chad Schafer and Peter Freeman at CMU

Technical Consultant for Expii, Inc. — 2014
Web design

Other

MCS College Council
Undergraduate representative for 2017-18 academic year.

(Sub)reviewer/referee
ISIT 2019; ICALP 2019; FOCS 2019; ESA 2019; FSTTCS 2019; SODA 2020; *Theory of Computing Systems*; *IEEE Transactions on Information Theory*; *Mathematical Reviews* (MathSciNet)

Photography
Photograph "Symphony of Architectural Geometry" selected as the 2013, Week 52 photo in the MAA Found Math column of the Mathematical Association of America. Also featured in the MAA's 100th anniversary calendar.

Computer Languages
Industrial Experience: C/C++, Python, Javascript, HTML/CSS
Academic Experience: C/C++, LaTeX, Asymptote, Haskell, Python, Java, R, Sage, SML