Benjamin Rossman

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POSITIONS

University of Toronto 2016 – present
Assistant Professor of Mathematics and Computer Science

National Institute of Informatics (Tokyo, Japan) 2013 – 2016
Assistant Professor in the Kawarabayashi Large Graph Project

Simons Institute for the Theory of Computing (Berkeley, CA) 2014 – 2015
Simons-Berkeley Research Fellow

Tokyo Institute of Technology 2010 – 2013
NSF Mathematical Sciences Postdoctoral Research Fellow

EDUCATION

Massachusetts Institute of Technology
Ph.D. in Computer Science 2010
· Advisor: Madhu Sudan
· Thesis: Average-Case Complexity of Detecting Cliques

University of Pennsylvania
M.A. in Mathematics 2002
B.A. in Mathematics, Summa Cum Laude 2001

HONORS AND AWARDS

André Aisenstadt Prize in Mathematics 2018

Invited Speaker at the International Congress of Mathematicians 2018

Alfred P. Sloan Research Fellowship 2017

Best Paper Award at FOCS (IEEE Symposium on Foundations of Computer Science) 2015

Best Paper Award at CCC (Computational Complexity Conference) 2015

Best Paper Award at CSR (International Computer Science Symposium in Russia) 2014

Ackermann Award (Outstanding Dissertation Award of the European Association for Computer Science Logic) 2011

George M. Sprowls Award (Best Doctoral Theses in Computer Science at MIT) 2010

NSF Mathematical Sciences Postdoctoral Research Fellowship 2010

National Defense Science and Engineering Graduate Fellowship 2006

NSF Graduate Research Fellowship 2006

Akamai Presidential Fellowship, MIT 2005

Best Student Paper Award at LICS (IEEE Symp. on Logic in Computer Science) 2003 & 2005

GRANTS

Ontario Early Researcher Award (CAD 100,000) 2018 – 2023

Sloan Research Fellowship (USD 60,000) 2017 – 2019

NSERC Discovery Accelerator Supplement (CAD 120,000) 2016 – 2019

NSERC Discovery Grant (CAD 215,000) 2016 – 2021

TEACHING

University of Toronto, "CSC463: Computational Complexity and Computability" 2019

University of Toronto, "CSC2429/MAT1304: Circuit Complexity" 2016, 2019

University of Toronto, "MAT309: Introduction to Mathematical Logic" 2017, 2018

Swedish Summer School in Computer Science, "Boolean Circuit Complexity" 2017

PUBLICATIONS

Peer-Reviewed Journals

Benjamin Rossman. "Formulas versus Circuits for Small Distance Connectivity". *SIAM Journal of Computing*, Volume 47, Issue 5: 1986–2028, 2018.

Benjamin Rossman. "The Average Sensitivity of Bounded-Depth Formulas". *Computational Complexity*, Volume 27, Issue 2: 209–223, 2018.

Johan Håstad, Benjamin Rossman, Rocco A. Servedio and Li-Yang Tan. "An Average-Case Depth Hierarchy Theorem for Boolean Circuits". *Journal of the ACM*, Volume 64, Issue 5: 1–27, 2017.

Akinori Kawachi, Benjamin Rossman and Osamu Watanabe. "The Query Complexity of Witness Finding". *Theory of Computing Systems*, Volume 61, Issue 2: 305–321, 2017.

Yuan Li, Alexander Razborov and Benjamin Rossman. "On the AC^0 Complexity of Subgraph Isomorphism". *SIAM Journal of Computation*, Volume 46, Issue 3: 936–971, 2017.

Benjamin Rossman. "The Monotone Complexity of k-Clique on Random Graphs". *SIAM Journal of Computation*, Volume 43, Issue 1: 256–279, 2014.

Swastik Koppary and Benjamin Rossman. "The Homomorphism Domination Exponent". *European Journal of Combinatorics*, Volume 32, Issue 7: 1097–1114, 2011.

Erik Demaine, Shay Mozes, Benjamin Rossman and Oren Weimann. "An Optimal Decomposition Algorithm for Tree Edit Distance". *ACM Transactions on Algorithms*, Volume 6, Issue 1: 1–19, 2009.

Benjamin Rossman. "Homomorphism Preservation Theorems". *Journal of the ACM*, Volume 55, Issue 3: 1–53, 2008.

Anuj Dawar, David Richerby and Benjamin Rossman. "Choiceless Polynomial Time, Counting and the Cai-Fürer-Immerman Graphs". *Annals of Pure and Applied Logic*, 152: 31–50, 2008.

Benjamin Rossman. "Successor-Invariant First-Order Logic on Finite Structures". *Journal of Symbolic Logic*, Volume 72, Issue 2: 601–619, 2007.

Andreas Blass, Yuri Gurevich, Dean Rosenzweig and Benjamin Rossman. "Interactive Small-Step Algorithms I: Axiomatization". *Logical Methods in Computer Science*, Volume 3 (4:3): 1–29, 2007.

Andreas Blass, Yuri Gurevich, Dean Rosenzweig and Benjamin Rossman. "Interactive Small-Step Algorithms II: Abstract State Machines and the Characterization Theorem". *Logical Methods in Computer Science*, Volume 3 (4:4): 1–35, 2007.

Yuri Gurevich, Benjamin Rossman and Wolfram Schulte. "Semantic Essence of AsmL". *Theoretical Computer Science*, Volume 343, Issue 3: 370–412, 2005.

Conference Proceedings

Benjamin Rossman. "Criticality of Regular Formulas", To appear in *Proc. 34th Annual Computational Complexity Conference* (CCC), 2019.

Benjamin Rossman. "Lower Bounds for Subgraph Isomorphism". In *Proc. International Congress of Mathematicians* (ICM 2018, Rio de Janeiro), Vol. 3, 3409–3430, 2018.

Ken-ichi Kawarabayashi and Benjamin Rossman. "A Polynomial Excluded-Minor Approximation of Treedepth". In *Proc. 29th ACM-SIAM Symposium on Discrete Algorithms* (SODA), 234–246, 2018.

Benjamin Rossman. "Subspace-Invariant AC^0 Formulas". In *Proc. 44th International Colloquium on Automata, Languages and Programming* (ICALP), LIPIcs, Vol. 80, 93:1–11, 2017. (Special Issue Invitation)

Benjamin Rossman and Srikanth Srinivasan. "Separation of $AC^0[\oplus]$ Formulas and Circuits". In *Proc. 44th International Colloquium on Automata, Languages and Programming* (ICALP), LIPIcs, Vol. 80, 50:1–13, 2017.

Benjamin Rossman. "An Improved Homomorphism Preservation Theorem from Lower Bounds in Circuit Complexity". In *Proc. 8th Innovations in Theoretical Computer Science* (ITCS), LIPIcs, Vol. 67, 27:1–17, 2017.

Robert Robere, Toniann Pitassi, Benjamin Rossman and Stephen A. Cook. "Exponential Lower Bounds for Monotone Span Programs". In *Proc. 57th Annual IEEE Symposium on Foundations of Computer Science* (FOCS), 406–416, 2016. (Special Issue Invitation)

Toniann Pitassi, Benjamin Rossman, Rocco A. Servedio and Li-Yang Tan. "Poly-Logarithmic Frege Depth Lower Bounds Via an Expander Switching Lemma". In *Proc. 48th Annual ACM Symposium on Theory of Computing* (STOC), 644–657, 2016. (Special Issue Invitation)

Benjamin Rossman, Rocco A. Servedio and Li-Yang Tan. "An Average-Case Depth Hierarchy Theorem for Boolean Circuits". In *Proc. 56th Annual IEEE Symposium on Foundations of Computer Science* (FOCS), 1030–1048, 2015. (Best Paper Award)

Benjamin Rossman. "The Average Sensitivity of Bounded-Depth Formulas". In *Proc. 56th Annual IEEE Symposium on Foundations of Computer Science* (FOCS), 424–430, 2015.

Benjamin Rossman. "Correlation Bounds Against Monotone NC^1", In *Proc. 30th Annual Computational Complexity Conference* (CCC), LIPIcs, Vol. 33, 392–411, 2015. (Best Paper Award)

Yuan Li, Alexander Razborov and Benjamin Rossman. "On the AC^0 Complexity of Subgraph Isomorphism". In *Proc. 55th Annual IEEE Symposium on Foundations of Computer Science* (FOCS), 344–353, 2014.

Benjamin Rossman. "Formulas vs. Circuits for Small Distance Connectivity". In *Proc. 46th Annual ACM Symposium on Theory of Computing* (STOC), 203–212, 2014. (Special Issue Invitation)

Akinori Kawachi, Benjamin Rossman and Osamu Watanabe. "The Query Complexity of Witness Finding". In *Proc. 9th International Computer Science Symposium in Russia* (CSR), 218–231, 2014. (Best Paper Award)

Benjamin Rossman. "A Tight Upper Bound on the Number of Variables for Average-Case k-Clique on Ordered Graphs". In *Proc. 19th Workshop on Logic, Language, Information and Computation* (WoLLIC), 282–290, 2012.

Benjamin Rossman. "The Monotone Complexity of k-Clique on Random Graphs". In *Proc. 51st Annual IEEE Symposium on Foundations of Computer Science* (FOCS), 193–201, 2010. (Special Issue Invitation)

Benjamin Rossman. "Ehrenfeucht-Fraïssé Games on Random Structures". In *Proc. 16th Workshop on Logic, Language, Information and Computation* (WoLLIC), 350–364, 2009.

Benjamin Rossman. "On the Constant-Depth Complexity of k-Clique". In *Proc. 40th Annual ACM Symposium on the Theory of Computing* (STOC), 721–730, 2008.

Erik Demaine, Shay Mozes, Benjamin Rossman and Oren Weimann. An Optimal Decomposition Algorithm for Tree Edit Distance. In *Proc. 34th International Colloquium on Automata, Languages and Programming* (ICALP), 146–157, 2007.

Anuj Dawar, David Richerby and Benjamin Rossman. "Choiceless Polynomial Time, Counting and the Cai-Fürer-Immerman Graphs". In *Proc. 12th Workshop on Logic, Language, Information and Computation* (WoLLIC), 13–24, 2005.

Benjamin Rossman. "Existential-Positive Types and Preservation under Homomorphisms". In *Proc. 20th IEEE Symposium on Logic in Computer Science* (LICS), 467–476, 2005. (Best Student Paper Award)

Benjamin Rossman. "Successor Invariance in the Finite". In *Proc. 18th IEEE Symposium on Logic in Computer Science* (LICS), 148–157, 2003. (Best Student Paper Award)

Other Publications

Benjamin Rossman. "An Improved Homomorphism Preservation Theorem from Lower Bounds in Circuit Complexity". *SIGLOG News*, Volume 3, Issue 4: 33–46, 2016.

Benjamin Rossman, Rocco A. Servedio and Li-Yang Tan. "The Polynomial Hierarchy, Random Oracles, and Boolean Circuits". *SIGACT News*, Volume 46, Issue 4: 50–68, 2015.

Benjamin Rossman. "Choiceless Computation and Symmetry". In *Fields of Logic and Computation: Essays Dedicated to Yuri Gurevich on the Occasion of His 70th Birthday*, Lecture Notes in Computer Science, Volume 6300, Springer-Verlag, Berlin, 565–580, 2010.

Nadia Benbernou, Erik Demaine, Martin Demaine and Benjamin Rossman. "Coin-Flipping Magic". Presented at *Gathering for Gardner 8*, 12 pages, 2008.

Andreas Blass and Benjamin Rossman. "Explicit Graphs with Extension Properties". *Bulletin of the EATCS*, Number 86: 166–175, 2005.

INVITED TALKS

Tutorials

"Restriction-Based Methods" (Lower Bounds Boot Camp, Simons Institute)	8/2018
"A Switching Lemma Tutorial" (Low-Depth Complexity Workshop, St. Petersburg)	5/2016
"Finite Model Theory" (TAMC 2011, Tokyo)	5/2011
"Combining Strategies in Ehrenfeucht-Fraïssé Games" (LICS 2009, Los Angeles)	8/2009

Conferences and Workshops

International Congress of Mathematicians (Rio de Janeiro)	8/2018
Oxford Complexity Workshop (Clay Mathematics Institute)	7/2018
Symmetry, Logic, Computation (Simons Institute, Berkeley)	11/2016
Computational Complexity (Banff International Research Station)	9/2016
Meeting on Complexity Theory (Oberwolfach Mathematical Institute)	11/2015
Logic and Computational Complexity (LCC 2014, Vienna)	7/2014
Computer Science in Russia (CSR 2014, Moscow)	6/2014
Algorithmic and Finite Model Theory (part of FSTTCS 2011, Mumbai)	12/2011
Computer Science Logic (CSL 2011, Bergen)	9/2011
Recent Trends in Graph Theory and Combinatorics (ICM Satellite Workshop, Cochin)	8/2010
Complexity and Finite Models (Université de Provence, Marseille)	5/2010
Circuits, Logic and Games (Schloss Dagstuhl)	2/2010
Meeting on Complexity Theory (Oberwolfach Mathematical Institute)	11/2009

China Theory Week (Tsinghua University)	9/2009
Barriers in Complexity Theory (Princeton University)	8/2009
Meeting on the Intersections of Logic and Mathematics (Harvard University)	6/2009
Workshop on Graph Limits (Zámeček, Czech Republic)	1/2009
Model-Theoretic Methods in Combinatorics (AMS Annual Meeting, Wash. D.C.)	1/2009
Logic and Algorithms (University of Edinburgh)	7/2008
Prague Midsummer Combinatorics Workshop (Charles University)	8/2007
Association of Symbolic Logic Annual Meeting (Université du Québec à Montréal)	5/2006

Colloquia

Centre de Recherches Mathématiques, Montreal	11/2018
MIT Algorithms and Complexity Seminar	4/2017
Harvard Theory of Computation Seminar	4/2017
Ryerson Math Colloquium	11/2016
Tokyo University	7/2013, 12/2015, 4/2016
Chinese University of Hong Kong	12/2015
MIT Theory Colloquium	10/2015
MSR/MIT Theory Reading Group	11/2013, 6/2015
University of California, San Diego	1/2015
Simons Institute, UC Berkeley	11/2014
KTH Royal Institute of Technology	6/2014
University of Toronto	3/2014
Princeton University	2/2014
University of Pennsylvania	2/2014
Columbia University	11/2013
University of Chicago	3/2010, 10/2013
Goethe University, Frankfurt	3/2013
Institute for Advanced Study	4/2009, 11/2012
California Institute of Technology	4/2011
Hokkaido University	3/2011
Université Paris-Sud	5/2010
Universitat Politècnica de Catalunya	5/2010
Tokyo Institute of Technology	7/2009
University of Massachusetts, Amherst	10/2007, 4/2009

Northeastern University	12/2008
Tel-Aviv University	8/2008
Technion–Israel Institute of Technology	7/2008
MIT Logic Seminar	10/2005, 3/2006, 9/2008

SCIENTIFIC SERVICE

Coorganizer of Semester Program "Lower Bounds in Computational Complexity" at the Simons Institute for the Theory of Computing, Berkeley	Fall 2018
Coorganizer of Simons Institute Workshop "Boolean Devices"	9/2018
Lecturer at the 4th Swedish Summer School in Computer Science	7/2017
Coorganizer of Workshop on "Low-Depth Complexity" at St. Petersburg State University	5/2016
Coorganizer of Dagstuhl Seminar "Circuits, Logic and Games"	2/2010

Program Committee Member for CCC 2017, LCC 2015, LICS 2011