

Joshua Brody

CONTACT INFORMATION	Swarthmore College Computer Science Department 500 College Ave Swarthmore, PA 19081	609 Elm Ave. Swarthmore, PA 19081 www.cs.swarthmore.edu/~brody joshua.e.brody@gmail.com (610)-690-6866
RESEARCH INTERESTS	Theoretical Computer Science, including communication complexity, unconditional lower bounds, property testing, streaming algorithms, data structures.	
EDUCATION	Dartmouth College , Hanover, NH Ph.D., "Some Communication Complexity Results and Their Applications" Advisor: Amit Chakrabarti Research Area: Communication Complexity <i>2005-2010</i>	
	New York University , New York, NY Master of Science in Computer Science GPA: 3.97/4.0 <i>2003-2005</i>	
	Carnegie Mellon University , Pittsburgh, PA Bachelor of Science in Mathematics/Computer Science GPA: 3.32/4.0 <i>1993-1997</i>	
EMPLOYMENT	Swarthmore College , Swarthmore, PA Assistant Professor Visiting Assistant Professor <i>2014-present</i> <i>2013-2014</i>	
	University of Waterloo , Waterloo, Canada Visiting Assistant Professor <i>2017-2018</i>	
	Aarhus University , Aarhus, Denmark Postdoctoral researcher, Computer Science Supervisor: Peter Bro Miltersen <i>2011-2013</i>	
	Tsinghua University IIIS , Beijing, China Postdoctoral researcher at the Institute for Interdisciplinary Information Sciences Supervisor: Andy Yao <i>2010-2011</i>	
	Dartmouth College , Hanover, NH Lecturer for Computer Architecture (CS 37) <i>2010</i>	
	Dartmouth College , Hanover, NH Research Assistant <i>2006-2010</i>	
	Encoda Systems , New York, NY Software Developer <i>2003-2004</i>	
	Lycée Provincial de Yako , Yako, Burkina Faso Peace Corps Volunteer (Secondary Math Education) <i>2000-2002</i>	
	Lockheed Martin ATL , Camden, NJ Software Engineer <i>1998-2000</i>	
	6DOS, Inc. , Pittsburgh, PA Software Developer <i>1996-1998</i>	

GRANTS
AND FUNDING

Eugene M. Lang Faculty Fellowship. For second semester sabbatical support. 2018.
Lower Bounds via Communication Complexity. Danish Council for Independent Research. DKK 1,718,502 (\$318,000). October 2011-June 2013.

JOURNAL
PUBLICATIONS

Undergraduate coauthors indicated with a (*).

[J4] “Certifying Equality With Limited Interaction”, (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), *Algorithmica*, **76**(19), 2016, pp. 796-845. Special issue on Information Complexity and Applications. (see [C16] and [C18] below)

[J3] “Towards a Reverse Newman’s Theorem in Interactive Information Complexity”, (with Harry Buhrman, Michal Koucky, Bruno Loff, Florian Speelman, and Nikolay Vereshchagin), *Algorithmica*, **76**(19), 2016, pp. 749-781. Special Issue on Information Complexity and Applications. (see [C14] below)

[J2] “Adapt or Die: Polynomial Lower Bounds for Nonadaptive Data Structures,” (with Kasper Green Larsen), *Theory of Computing*, **11**(19), 2015, pp. 471-489.

[J1] “Property Testing Lower Bounds via Communication Complexity,” (with Eric Blais and Kevin Matulef), *Computational Complexity*, **21**(2), 2012, pp. 311-358. Special issue of selected papers from the 26th IEEE Conference on Computational Complexity (CCC 2011). (see [C9] below)

CONFERENCE
PUBLICATIONS

Undergraduate coauthors indicated with a (*).

[C21] “Non-Adaptive Data Structures for Predecessor Search.” (with **Joe Boninger*** and **Owen Kephart***), in *37th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2017)*.

[C20] “Position-Based Cryptography and Multiparty Communication.” (with Stefan Dziembowski, Sebastian Faust, and Krzysztof Pietrzak), in *15th IACR Theory of Cryptography Conference (TCC 2017)*.

[C19] “Dependent Random Graphs and Multi-Party Pointer Jumping,” (with **Mario Sanchez***), in *19th International Workshop on Randomization and Computation (RANDOM 2015)*.

[C18] “Certifying Equality with Limited Interaction,” (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), in *18th International Workshop on Randomization and Computation (RANDOM 2014)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J4] above)

[C17] “The Information Complexity of Hamming Distance,” (with Eric Blais and Badih Ghazi), in *18th International Workshop on Randomization and Computation (RANDOM 2014)*.

[C16] “Beyond Set Disjointness: The Communication Complexity of Finding the Intersection,” (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), in *33rd Annual ACM Symposium on Principles of Distributed Computing (PODC 2014)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J4] above)

[C15] “Cryptogenography,” (with Sune Jakobsen, Dominik Scheder, and Peter Winkler), in *5th Innovations in Theoretical Computer Science (ITCS 2014)*.

[C14] “Towards a Reverse Newman’s Theorem in Interactive Information Complexity,” (with Harry Buhrman, Michal Koucky, Bruno Loff, Florian Speelman, and Nikolay Vereshchagin), in *28th IEEE Conference on Computational Complexity (CCC 2013)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J3] above)

[C13] “Space-Bounded Communication Complexity,” (with Shiteng Cheng, Periklis A. Pakonstantinou, Hao Song, and Xiaoming Sun), in *4th Innovations in Theoretical Computer Science (ITCS 2013)*.

[C12] “Space Efficient Approximation Scheme for Circular Earth Mover Distance,” (with Hongyu Liang and Xiaoming Sun), in *10th Latin American Theoretical Informatics Symposium (LATIN 2012)*.

[C11] “Streaming Algorithms with One-Sided Estimation,” (with David P. Woodruff), in *15th International Workshop on Randomization and Computation (RANDOM 2011)*.

[C10] “Lower Bounds for Testing Computability by Small Width OBDDs,” (with Kevin Matulef and Chenggang Wu), in *8th Annual Conference on Theory and Applications of Models of Computation (TAMC 2011)*.

[C9] “Property Testing Lower Bounds via Communication Complexity,” (with Eric Blais and Kevin Matulef), in *26th Annual IEEE Conference on Computational Complexity (CCC 2011)*.
Invited to the Special Issue of Computational Complexity. (see [J1] above)

[C8] “The Coin Problem and Pseudorandomness for Branching Programs,” (with Elad Verbin), in *51st Annual IEEE Symposium on Foundations of Computer Science (FOCS 2010)*.

[C7] “Better Gap Hamming Lower Bounds via Better Round Elimination,” (with Amit Chakrabarti, Oded Regev, Thomas Vidick, and Ronald de Wolf), in *14th International Workshop on Randomization and Computation (RANDOM 2010)*.

[C6] “Distributed Monitoring of Conditional Entropy for Anomaly Detection in Streams,” (with Chrisil Arackaparambil, Sergey Bratus, and Anna Shubina), in *3rd International Workshop on Scalable Stream Processing Systems (SSPS 2010)*.

[C5] “A Multi-Round Communication Lower Bound for Gap Hamming and Some Consequences,” (with Amit Chakrabarti), in *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*.

[C4] “The Maximum Communication Complexity of Multiparty Pointer Jumping,” (sole author), in *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*.

[C3] “Functional Monitoring Without Monotonicity,” (with Chrisil Arackaparambil and Amit Chakrabarti), in *36th International Colloquium on Automata, Languages, and Programming (ICALP 2009)*.

[C2] “Streaming Estimation of Information-theoretic Metrics for Anomaly Detection,” (with Sergey Bratus, David Kotz, and Anna Shubina), in *11th International Symposium on Recent Advances in Intrusion Detection (RAID 2008)*.

[C1] “Sublinear Communication Protocols for Multi-Party Pointer Jumping and a Related Lower Bound,” (with Amit Chakrabarti), in *25th International Symposium on Theoretical Aspects of Computer Science (STACS 2008)*.

MANUSCRIPTS

[M2] “Graph Containment Properties in Dependent Random Graphs.” (with Mario Sanchez), 2016.

[M1] “Distance-Sensitive Property Testing Lower Bounds.” (with Pooya Hatami), 2014.

TEACHING EXPERIENCE	<p>Swarthmore College, Swarthmore, PA <i>September 2013-present</i> Instructor for CPSC21 (<i>Introduction to Computer Science</i>), CPSC35 (<i>Data Structures and Algorithms</i>), CPSC41 (<i>Algorithms</i>), CPSC49/Math59 (<i>The Probabilistic Method</i>), CPSC93 (<i>Directed Reading Course in Communication Complexity</i>).</p> <p>Aarhus University, Aarhus, Denmark <i>Third Quarter, Winter 2013</i> Instructor for <i>Sublinear Time Algorithms: Property Testing</i></p> <p>KTH Royal Institute of Technology, Stockholm, Sweden <i>September 2012</i> Guest Lecturer for <i>Seminars on Theoretical Computer Science: Communication Complexity</i>. Six lecture hours total. Primary Instructor: Jakob Nordström.</p> <p>Aarhus University, Aarhus, Denmark <i>Second Quarter, Fall 2011</i> Instructor for <i>Communication Complexity</i></p> <p>Tsinghua University IIIS, Beijing, China <i>Summer 2011</i> Instructor for <i>Yao Class Research Immersion Course in Theoretical Computer Science</i></p> <p>Dartmouth College, Hanover, NH <i>Summer 2010</i> Instructor for CS37 (<i>Computer Architecture</i>)</p> <p>Dartmouth College, Hanover, NH <i>2005-2010</i> Teaching Assistant for CS4 (<i>Concepts in Computing</i>), CS5 (<i>Introduction to Computer Science</i>), CS37 (<i>Computer Architecture</i>)</p> <p>New York University, New York, NY <i>Spring 2005</i> Grader for V22.0478 (<i>Introduction to Cryptography</i>)</p> <p>Lycée Provincial de Yako, Yako, Burkina Faso <i>2000-2002</i> Teacher for Junior and Senior High School Mathematics (instruction in French)</p> <p>Carnegie Mellon University, Pittsburgh, PA <i>Spring 1995</i> Teaching Assistant for <i>Introduction to Calculus</i></p>
UNIVERSITY ACTIVITIES	<p>Swarthmore College Coach of the ACM-ICPC Programming Team (2014-2017) Grace Hopper Celebration Department Coordinator (2016) Sigma Xi Treasurer, Swarthmore College Chapter (2015-2017) Aydelotte Foundation Faculty Seminar in Pedagogy (2016-2017) Aydelotte Foundation Faculty Seminar in Collaboration (2015-2016) ITS Committee (2014-2015)</p> <p>Tsinghua University IIIS Organizer, Theory Lunch (2010-2011) Organizer, Algorithms, Complexity, Cryptography Seminar (2011)</p> <p>Dartmouth College Ph.D. Admissions Committee, student member (2006, 2008) Co-founder and organizer, Dartmouth Computer Science Research Symposium (2006,2007)</p>
SUMMER RESEARCH STUDENTS	<p>Alex Crane (2016). “Cryptogenography”.</p> <p>Joseph Boninger, Owen Kephart (2015). “Non-adaptive Data Structures”.</p> <p>Mario Sanchez (2014). “Dependent Random Graphs and Multiparty Pointer Jumping”.</p> <p>KJ Bredder (2014). “Cryptogenography”.</p>
HONORS THESES	<p>Joseph Boninger (Highest Honors, 2016). “New Bounds for the Memoryless and Nonadaptive Dynamic Predecessor Problems”.</p>

PROFESSIONAL
SERVICE

Program Committee Member:

- 22nd International Conference on Randomization and Computation (**RANDOM 2018**).

Workshop Co-Organizer: CTIC Workshop on Synergies in Lower Bounds (2009)

Funding Reviewer: Israeli Science Foundation.

Journal Referee: Algorithmica, Computational Complexity, DIST, JACM, Journal of Cryptography, SICOMP, Theory of Computing, Theory of Computing Systems, Transactions on Computation Theory, Transactions on Information Theory.

Conference Referee: APPROX, CCC, DISC, FOCS, ICALP, ITCS, PODS, RANDOM, SIROCCO, SODA, SOFSEM, SPAA, STACS, STOC.

INVITED
TALKS

“Dependent Random Graphs and Multiparty Pointer Jumping,” *University of Waterloo Algorithms and Complexity Seminar*, Waterloo, Canada. February 2018.

“Non-Adaptive Data Structure Bounds for Dynamic Predecessor,” *BIRS Workshop on Communication Complexity and Applications*, Banff, Canada. March 2017.

“Dependent Random Graphs and Multiparty Pointer Jumping,” *Johns Hopkins Algorithms and Complexity Seminar*, Baltimore, MD. March 2016.

“Dependent Random Graphs and Multiparty Pointer Jumping,” *University of Pennsylvania Theory Seminar*, Philadelphia, PA. December 2015.

“Property Testing Lower Bounds via Communication Complexity,” *BIRS Workshop on Communication Complexity and Applications*, Banff, Canada. August 2014.

“Amazingly Dense Ruzsa-Szemerédi Graphs, Plus Applications,” *KTH Theory Reading Group*, Stockholm, Sweden. September 2012.

“Streaming Algorithms with One-Sided Estimation,” *TU Dortmund Workshop on Algorithms for Data Streams*, Dortmund, Germany. July 2012.

“Property Testing Lower Bounds via Communication Complexity: A Survey,” *Centrum Wiskunde & Informatica (CWI)*, Amsterdam, Netherlands. March 2012.

“Property Testing Lower Bounds via Communication Complexity: A Survey,” *LIAFA Theory Seminar*, Paris, France. March 2012.

“Property Testing Lower Bounds via Communication Complexity,” *University of Massachusetts-Amherst Theory Seminar*, Amherst, MA. June 2011.

“Property Testing Lower Bounds via Communication Complexity,” *Dartmouth College Theory Seminar*, Hanover, NH. June 2011.

“Communication Complexity and Applications,” *Tsinghua University ITCS Institute Seminar*, Beijing, China. September 2010.

“Better Gap Hamming Lower Bounds via Better Round Elimination,” *University of Massachusetts-Amherst Theory Seminar*, Amherst, Massachusetts. February 2010.

“The NOF Communication Complexity of Multi-Party Pointer Jumping,” *Institute for Advanced Study (IAS) Computer Science/Discrete Mathematics Seminar*, Princeton, NJ. December 2009.

“Multiround Lower Bounds for Gap Hamming via Round Elimination,” *Aarhus University*, Aarhus, Denmark. November 2009.

“The NOF Communication Complexity of Multi-Party Pointer Jumping,” *Aarhus University*, Aarhus, Denmark. November 2009.

“Lower Bounds for Gap-Hamming-Distance and Consequences for Streaming Algorithms,” *Centrum Wiskunde & Informatica (CWI)*, Amsterdam, Netherlands. July 2009.

“A Multi-Round Communication Lower Bound for the Gap Hamming Problem,” *Tel Aviv University Theory of Computation Seminar*, Tel Aviv, Israel. June 2009.

“Some Applications of Communication Complexity,” *Northeastern University Theory of Computation Seminar*, Boston, MA. February 2009.