Curriculum Vitae

William (Will) Rosenbaum

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Reserach Objective

I seek to understand the computational power and limitations of distributed systems, broadly construed. To this end, my work analyzes distributed systems arising in the sciences through the lenses of distributed computing and computational complexity.

Academic Interests & Expertise

- **Theoretical Computer Science**: Distributed Computing; Design and Analysis of Algorithms; Computational Complexity; Algorithmic Game Theory
- **Mathematics**: Discrete Math/Combinatorics; Graph Theory; Probability

Employment

- **Max Planck Institute for Informatics** August 2018–present
  Postdoctoral Researcher, Algorithms and Complexity Division, Theory of Distributed and Embedded Systems group
- **Tel Aviv University** August 2016–July 2018
  Postdoctoral Fellow, School of Electrical Engineering
- **University of California, Los Angeles** Spring 2016
  Assistant Adjunct Professor, Department of Mathematics

Education

- **University of California**, Los Angeles, CA
  Ph.D. in Mathematics, March 2016
  M.A. in Mathematics, March 2011
  Dissertation: *Distributed Almost Stable Matchings*
  Adviser: Rafail Ostrovsky
- **Reed College**, Portland, OR
  B.A. in Mathematics, Spring 2009
  Thesis: *Analysis on Circles: A Modern View of Fourier Series*
  Adviser: Jerry Shurman

Awards & Grants

- **Postdoctoral Scholarship**
  Tel Aviv University, 2016–2017
  Scholarship awarded to at most 20 postdocs university-wide
- **Travel Grant**
  Max Planck Advanced Course on the Foundations of Computer Science (ADFOCS), Saarbrücken, Germany, August, 2016
- **Teaching Assistant Consultantship**
  Department of Mathematics, UCLA, Fall 2015
- **Student Travel Grant**
  Association of Computing Machinery, PODC, 2015

- ◇ **Graduate Student Instructorship**
  Department of Mathematics, UCLA, 2014
- ◇ **Robert Sorgenfrey Distinguished Teaching Award**
  Department of Mathematics, UCLA, 2013
- ◇ **Phi Beta Kappa**
  Reed College, 2009
- ◇ **Commendation for Academic Achievement**
  Reed College, 2004–2005, 2006–2007, 2007–2008, 2008–2009

Monographs

[1] William Bailey Rosenbaum. *Distributed Almost Stable Matchings*. University of California, Los Angeles, Los Angeles, CA 90095, March 2016. PhD thesis

[2] William B Rosenbaum. *Analysis on circles: a modern view of Fourier series*. Reed College, Portland, OR 97202, May 2009. BA thesis

Preprints

[3] Will Rosenbaum and Jukka Suomela. Seeing far vs. seeing wide: Volume complexity of local graph problems. *CoRR*, abs/1907.08160, 2019

Published Articles

[4] Yannai A. Gonczarowski, Noam Nisan, Rafail Ostrovsky, and Will Rosenbaum. A stable marriage requires communication. *Games and Economic Behavior*, 2019

- Extendend version of [15]. **Invited** to appear in special issue.

[5] Talya Eden, Dana Ron, and Will Rosenbaum. The arboricity captures the complexity of sampling edges. In *46th International Colloquium on Automata, Languages, and Programming, ICALP 2019, July 9-12, 2019, Patras, Greece.*, pages 52:1–52:14, 2019

[6] Avery Miller, Boaz Patt-Shamir, and Will Rosenbaum. With great speed come small buffers: Space-bandwidth tradeoffs for routing. In *Proceedings of the 2019 ACM Symposium on Principles of Distributed Computing, PODC 2019, Toronto, ON, Canada, July 29 - August 2, 2019.*, pages 117–126, 2019

[7] Johannes Bund, Christoph Lenzen, and Will Rosenbaum. Fault tolerant gradient clock synchronization. In *Proceedings of the 2019 ACM Symposium on Principles of Distributed Computing, PODC 2019, Toronto, ON, Canada, July 29 - August 2, 2019.*, pages 357–365, 2019

[8] Boaz Patt-Shamir and Will Rosenbaum. Space-optimal packet routing on trees. In *2019 IEEE Conference on Computer Communications, INFOCOM 2019, Paris, France, April 29 - May 2, 2019*, pages 1036–1044, 2019

[9] Talya Eden and Will Rosenbaum. Lower bounds for approximating graph parameters via communication complexity. In *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques, APPROX/RANDOM 2018, August 20-22, 2018 - Princeton, NJ, USA*, pages 11:1–11:18, 2018

[10] Talya Eden and Will Rosenbaum. On sampling edges almost uniformly. In *1st Symposium on Simplicity in Algorithms, SOSA 2018, January 7-10, 2018, New Orleans, LA, USA*, pages 7:1–7:9, 2018

[11] Boaz Patt-Shamir and Will Rosenbaum. The space requirement of local forwarding on acyclic networks. In *Proceedings of the ACM Symposium on Principles of Distributed Computing, PODC 2017, Washington, DC, USA, July 25-27, 2017*, pages 13–22, 2017

[12] Rafail Ostrovsky, Mor Perry, and Will Rosenbaum. Space-time tradeoffs for distributed verification. In *Structural Information and Communication Complexity - 24th International Colloquium, SIROCCO 2017, Porquerolles, France, June 19-22, 2017, Revised Selected Papers*, pages 53–70, 2017

- Extended version of [13].

[13] Mor Baruch, Rafail Ostrovsky, and Will Rosenbaum. Brief announcement: Space-time tradeoffs for distributed verification. In *Proceedings of the 2016 ACM Symposium on Principles of Distributed Computing, PODC 2016, Chicago, IL, USA, July 25-28, 2016*, pages 357–359, 2016

[14] Rafail Ostrovsky and Will Rosenbaum. Fast distributed almost stable matchings. In *Proceedings of the 2015 ACM Symposium on Principles of Distributed Computing, PODC 2015, Donostia-San Sebastián, Spain, July 21 - 23, 2015*, pages 101–108, 2015

[15] Yannai A. Gonczarowski, Noam Nisan, Rafail Ostrovsky, and Will Rosenbaum. A stable marriage requires communication. In *Proceedings of the Twenty-Sixth Annual ACM-SIAM Symposium on Discrete Algorithms, SODA 2015, San Diego, CA, USA, January 4-6, 2015*, pages 1003–1017, 2015

[16] Rafail Ostrovsky and Will Rosenbaum. It's not easy being three: The approximability of three-dimensional stable matching problems. In *Proceedings of the 3rd International Workshop on Matching Under Preferences*, pages 90–101, 2015

Lecture Notes

[17] Will Rosenbaum. Honors multivariable differential calculus, 2014. Course notes for Math 32AH at UCLA. `willrosenbaum.com/fall-2014-math-32ah/`

Teaching

◇ **Instructor**

- *Algorithms on Directed Graphs*, Advanced Course at Max Planck Institute for Informatics, Winter 2018–9.
- *Intermediate Programming (C++)*, PIC 10B at UCLA, Spring 2016.
- *Teaching College Mathematics*, Math 495 at UCLA, Fall 2015. (*Teaching Assistant Consultantship*)
- *Honors Multivariable Differential Calculus*, Math 32AH at UCLA, Fall 2014.

◇ **Assistant Instructor**, Los Angeles Math Circle (Sept. 2014 – June 2015)

◇ **Teaching Assistant**, UCLA (September 2009 – June 2015)
Average teaching evaluation: 8.7 / 9

- *Calculus for Life Sciences* (Math 3A)
- *Introduction to Programming (C++)*, (PIC 10A)
- *Differential Calculus* (Math 31A)
- *Honors Multivariable Differential Calculus*, (Math 32AH)
- *Multivariable Differential Calculus*, (Math 32A)
- *Honors Multivariable Integral Calculus*, (Math 32BH)
- *Multivariable Integral Calculus*, (Math 32B)
- *Differential Equations*, (Math 33B)

- *Discrete Mathematics*, (Math 61)
- *Honors Linear Algebra*, (Math 115AH)
- *Real Analysis*, (Math 131A)
- *Mathematical Game Theory*, (Math 167)

◇ **Teaching Assistant**, Reed College (August 2007 – May 2009)

- *Introductory Physics*, (Physics 100)

◇ **Tutor**

- Student Mathematics Center, UCLA, (September 2009 – March 2015)
- Math Center, Reed College (September 2007 – May 2009)

Advising & Mentorship

◇ **Summer Internship** Mohammad Nikan Ghorbani, Max Planck Institute for Informatics, Summer 2019.

◇ **MSc Project** Yair Rechter, *Empirical Comparison of Static Routing Algorithms*, Tel Aviv University, 2017.

◇ **Honors Contract** Adela Armstrong-Spielberg, *Snakes and Ladders in the Unity Development Platform* UCLA, 2016.

◇ **Student Co-authors**

- Johannes Bund [7]
  PhD Student, Max Planck Institute for Informatics
- Talya Eden [5, 9, 10]
  Former PhD Student, Tel Aviv University

Service

◇ **Organizer** 20th Max Planck Advanced Course on the Foundations of Computer Science (ADFOCS), Saarbrücken, Germany, August 2019.

◇ **Organizer** Network Algorithms Seminar, Department of Electrical Engineering, Tel Aviv University, 2017/2018 academic year.

◇ **Peer reviewer**

- ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)
- ACM Transactions on Algorithms (TALG)
- ACM Transactions on Parallel Computing (TOPC)
- Algorithmica
- Conference on Principles of Distributed Systems (OPODIS)
- Distributed Computing
- EATCS International Colloquium on Autamata, Languages and Programming (ICALP)
- EATCS International Symposium on Distributed Computing (DISC)
- IEEE International Parallel and Distributed Processing Symposium (IPDPS)
- Innovations in Theoretical Computer Science (ITCS)
- International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS)

- Theoretical Computer Science

TALKS

- *Lynch-Welch Clock Synchronization* Workshop on Robust Hardware Design, Saarbrücken, Germany, October 2019.
- *Introduction to Active Learning* Guest Lecture for Theory of Distributed Systems, Saarbrücken, Germany, October 2019.
- *With Great Speed Come Small Buffers: Space-Bandwidth Tradeoffs for Routing* ACM Principles of Distributed Computing, Toronto, Canada, July 2019.
- *On the Volume Complexity of LCLs* Workshop on Local Algorithms, Zürich, Switzerland, July 2019.
- *Space-Optimal Packet Routing on Trees* IEEE Conference on Computer Communications (INFOCOM), Paris, France, April 2019.
  - **Awarded** Best In-session Presentation
- *Gradient Clock Synchronization* Resiliant Hardware Design Workshop, Mainz, Germany, March, 2018.
- *On Sampling Edges Almost Uniformly* Symposium on Simplicity in Algorithms, New Orleans, LA, January 2018.
- *What Cannot Be Computed Locally!* Distributed Computing Seminar, Tel Aviv University, December 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* ACM Symposium on Principles of Distributed Computing (PODC), Washington DC, July 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* Distributed Computing Seminar, Technion Israel Institute of Technology, May 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* Engineering Seminar, Bar-Ilan University, May 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* Networking Agora, Ben Gurion University, May 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* Algorithms Seminar, Tel Aviv University, April 2017.
- *The Space Requirement of Local Forwarding on Acyclic Networks* Israeli Networking Day, Netanya, Israel, March 2017.
- *Space-Time Tradeoffs for Distributed Verification* ACM Symposium on Principles of Distributed Computing (PODC). Chicago, Il, July 2016.
- *Stable Matchings with Bounded Preferences* AMS/MAA Joint Math Meetings. Seattle, Washington, January 2016.
- *The Stable Marriage Problem* Los Angeles Math Circle. October 2015.
- *Teaching Problem Solving and Grading in Mathematics* 42nd Annual Teaching Assistant Conference. UCLA, September 2015.
- *Fast Distributed Almost Stable Matchings* ACM Symposium on Principles of Distributed Computing. San Sebastién, Spain, July 2015.

- ◇ *It's Not Easy Being Three: The Approximability of Three-Dimensional Stable Matching Problems* International Workshop on Matching Under Preferences (MATCH-UP). Glasgow, UK, April 2015.
- ◇ *A Stable Marriage Requires Communication* Math Colloquium, Reed College, February 2015.
- ◇ *Introduction to Communication Complexity.* Participating Logic Seminar, UCLA, Spring 2014.
- ◇ *The Communication Complexity of Finding a Stable Marriage.* ATC talk, UCLA, March 2014.
- ◇ *Estimating the Second Frequency Moment.* Participating Probability Seminar, UCLA, Fall 2012.
- ◇ *Azuma's Inequality and Concentration of Measure.* Participating Probability Seminar, UCLA, Spring 2012.
- ◇ *Rusza Calculus.* Participating Combinatorics Seminar, UCLA, Fall 2011.
- ◇ *Exact Solutions for Anisotropic Coarsening in the Dilute Limit* American Physical Society, March Meeting, 2008.
- ◇ *Anisotropic Coarsening: 2 Models in 3 Dimensions.* Physics Depertment Colloquium, Reed College, September 2007.
- ◇ *Anisotropic Coarsening: 2 Models in 3 Dimensions.* Summer REU Presentation, Bucknell University, August 2007.

Workshops Attended (No Talk Given)

- ◇ *Algorithms Postdocs in Europe and Israel (AlgPiE) by IGAFIT*, Bedlewo, Poland, October 2019.
  - ○ **Invited** participant.
- ◇ *SPP Winter School on Algorithms for Big Data*, Tel Aviv University, November 2017.
- ◇ *French-Israeli Laboratory on Foundations of Computer Science*, Tel Aviv, Israel University, November 2017.
- ◇ *Randomness, Complexity, and Cryptography*, Weizmann Institute, Rehovot, Israel, April 2017.
- ◇ *Israeli Networking Day*, Cisco Systems, Natanya, Israel, March 2017.
- ◇ *Young Researcher Workshop on Economics and Computation*, Tel Aviv, Israel, January 2017.
- ◇ *Israel CS Theory Day*, The Open University, Ra'anana, Israel, January 2017.
- ◇ *Max Planck Advanced Course on the Foundations of Computer Science (ADFOCS)*, Saarbrücken, Germany, August, 2016.
- ◇ *Teaching Assistant Consultant Central Seminar*, UCLA, Los Angeles, CA, Fall 2015.
- ◇ *Information Complexity and Applications* at the ACM Symposium on the Theory of Computing, Palo Alto, CA, June 2013.
- ◇ *Extremal and Probabilistic Combinatorics*, Los Angeles, CA, January 2013.

Professional Memberships

- ◇ **ACM** Association for Computing Machinery

- **AMS** American Mathematical Society
- **IEEE** Institute of Electrical and Electronics Engineers
- **MAA** Mathematical Associate of America
- **SIAM** Society for Industrial and Applied Mathematics

Graduate Coursework

- **Discrete Math** Topics in Combinatorics, Probabilistic Methods in Combinatorics, Algebraic Methods in Combinatorics, The Symmetric Group, Algebraic Number Theory, Additive Combinatorics, Expander Graphs
- **Computer Science** Randomized Algorithms, Cryptography, Communication Complexity
- **Probability & Analysis** Measure Theory, Probability Theory, Stochastic Processes, Applied Probability
- **Geometry & Topology** Differential Topology, Differential Geometry, Algebraic Topology (Qualifying Exam Passed)
- **Algebra** Abstract Algebra, Commutative Algebra (Qualifying Exam Passed)
- **Teaching** Teaching College Mathematics, Teaching Assistant Consultant Central Seminar

Undergrad Research Experience

- **Math REU** Mount Holyoke College, Summer 2008. Summer research program on number theory with Professor Giuliana Davidoff. Explored class numbers and relative class numbers for quadratic number fields. Developed numerical algorithms to test our conjectures.
- **Physics REU** Bucknell University, Summer 2007. Summer research program on statistical physics with Professor Ben Vollmayr-Lee. Worked on theoretical aspects of coarsening models in three dimensions. Found explicit description of equilibrium shapes for a coarsening model with surface anisotropy. Presented findings at the American Physical Society's March Meeting in 2008.

Computing

- **Languages**: C/C++, HTML/CSS/JavaScript, Python
- **Miscellaneous**: LaTeX

Other Skills

- **Spanish** Working knowledge
- **German** Limited knowledge
- **Nuclear Reactor Operator** NRC licensed operator for Reed College's TRIGA Mark I research reactor.
- **Fishmonger** Seafood team member at Whole Foods, Roosevelt Square (Seattle), October 2005 – May 2006.
- **Snowboard Instructor** AASI certified Level I instructor for Clancy's Ski School, January 2003 – April 2004.