Rachel Lawrence

Researcher, Theoretical Computer Science

Education

2017 – Present **Ph.D. Computer Science**, *University of California, Berkeley*, Berkeley, CA.
Research interests: Combinatorial dynamical systems; graph algorithms; privacy and security in machine learning.

2012–2016 **Bachelor of Science**, *Yale University*, New Haven, CT.
Applied Mathematics, concentration in Computer Science

Research

2017 – 2018 **U.C. Berkeley EECS**, *Ph.D. Student.*
Quadratic Dynamical Systems: Proving special cases of the Global Attractor Conjecture and Persistence Conjecture regarding steady states of combinatorially-inspired dynamical systems; developing new tools for analysis of chemical reaction networks and quadratic dynamical systems.
Differentially Private GANs: Designing attacks and defenses against generative adversarial neural networks (GANs); designing new GANs with differential privacy guarantees and robustness to adversarial examples.

2016 – 2017 **Reservoir Labs, Inc.**, *Software Engineer.*
Development and medical research applications of ENSIGN, a high-performance tool for unsupervised hypergraph analysis using tensor decompositions.
Design, development, and testing of a compiler optimized for a specialized SIMD architecture.

2015 – 2016 **Yale Department of Mathematics**, *Undergraduate Researcher, SUMRY Fellow.*
Developed algebraic and combinatorial methods to count arcs in the projective plane over an arbitrary finite field; proved the number of 10-arcs in the projective plane over a finite field is not quasipolynomial.
Publication: *Counting Arcs in the Projective Plane via Glynn's Algorithm.* (2016), Journal of Geometry.
Selected talks: MathFest 2015; Ohio State Young Mathematicians' Conference 2015

2016 **Pixar Animation Studios**, *Research and Development Intern.*
Developed a tool for art-directable cloth simulation for use in Pixar animated feature films as a member of Pixar's computer graphics research group. Work presented at SIGGRAPH 2016.

2013 – 2014 **Yale University**, *Research Intern.*
Center for Statistical Genomics and Proteomics: Applied statistical algorithms to study pleiotropy in genetic pathways implicated in Bipolar Disorder and Schizophrenia.
Department of Mathematics: Designed algorithms using driven iterated function systems for pattern recognition in time-series data.

Teaching

2015, 2016 **Yale University**, *Course Grader.*
Course grader for CPSC 365: Design and Analysis of Algorithms, taught by Professor Dan Spielman.

2013 – 2016 **Splash at Yale**, *Executive Director.*
Directed Yale Splash, a 501(c) non-profit educational outreach organization in which members design and teach courses to secondary school students. Organized five annual programs, as well as conferences for leaders of educational outreach programs across the country. Developed and taught more than 20 courses.

2015 – 2016 **HackYale**, *Board Member and Instructor.*
Coordinated, designed, and taught computer science and graphic design courses for students of all backgrounds. Delivered weekly lectures to classes of 25 students.

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Technical Skills

Experienced with Python, SageMath, MATLAB, and C/C++.

Working knowledge of R, Java, Mathematica, HTML, and CSS.

Academic Honors

2017 **National Physical Sciences Consortium Graduate Fellowship**.
National fellowship supporting graduate study sponsored by the US Department of Defense

2015 **SUMRY Fellowship**.
Supporting a 10-week intensive summer research program at the Yale Department of Mathematics

2014 **Davenport College Richter Fellowship**.
Yale College fellowship awarded for independent study and research

2013, 2014 **Yale College Dean's Research Fellowship**.
Research fellowship for undergraduate work in STEM

Other Projects

2016 – Present **Learning Unlimited**, *Board Member*.
Served as an elected board member of Learning Unlimited, a nonprofit organization dedicated to providing opportunities for accessible, interdisciplinary learning for secondary school students. Advised and coordinated educational outreach programs and conferences at participating universities nationwide.

2015-2016 **Counting Hamiltonian Cycles**, *Undergraduate Thesis Research*.
With Professor Asaf Ferber, outlined a new technique for counting and constructing Hamiltonian Cycles in dense and regular directed graphs.

2014 – 2016 **Yale University ITS**, *Media Technology Project Coordinator*.
Provided support for equipment and media software in the Bass Library Media Lab and the Yale School of Art. Directed a new service connecting student organizations with individualized support for media projects and graphic design. Managed approximately 30 student employees per year.

2011 **RHIC Data Analysis**, *Brookhaven National Laboratory*.
Worked with the STAR Detector physics group at Brookhaven's particle accelerator (RHIC) to identify signatures of heavy antimatter particles in particle collider data.

2010 – 2011 **Ehrenfeucht-Fraïssé Games**, *Independent Research*.
Full characterization of the 2-equivalence categories in two-color Ehrenfeucht-Fraïssé Games, in collaboration with Professor Joel Spencer of NYU.