

Samantha J. Riesenfeld

Postdoctoral Fellow, Gladstone Institutes, University of California, San Francisco
1650 Owens St, San Francisco, CA 94158 • (415) 734-2748
<http://docpollard.com/sriesenfeld/> • samantha.riesenfeld@gladstone.ucsf.edu

Research Interests

My research focuses on developing computational and statistical methods to make biological discoveries from genomic data. One main interest is the evolutionary analysis of gene families represented in metagenomic data, i.e., microbial DNA extracted directly from environmental samples. I am also collaborating on a project aiming to comprehensively characterize short regulatory sequences.

Education

University of California, Berkeley, CA, 2001–07

Ph.D. in Computer Science, 2007.

Dissertation: *Optimization and Reconstruction over Graphs*. Advisor: Richard M. Karp.

Committee: Richard M. Karp (Chair), Satish Rao, Alistair Sinclair, and Dorit Hochbaum.

Summary: A study of several variants of the problem of efficiently finding a graph that satisfies, to the extent possible, a given set of constraints. The results include approximation algorithms for finding a minimum-cost bounded-degree spanning tree in a given graph, as well as algorithms and lower bounds for sorting a partially ordered set, given an oracle for the partial order relation.

Honors: *National Science Foundation (NSF) Graduate Research Fellowship*, awarded in 2001.

Relevant Courses: Approximation Algorithms, Probability on Trees and Networks, Mathematics of Phylogenetic Trees, Randomness and Computation, Computational Complexity, Polynomials of Random Variables, Information Theory, Data Transport Protocols, Random Graphs, Knowledge Representation and Reasoning. GPA: 3.88/4.0.

Harvard University, Cambridge, MA, 1995–2000

Joint concentration: Mathematics and Computer Science, B.A. cum laude, Departmental Honors, 2000.

Senior thesis: *Computing the Irreducible Representations of a Finite Group over Finite Fields: The Non-Modular Case*. Advisor: Michael Rabin.

Honors: *John Harvard* and *Harvard College Scholarships* for academic achievement. GPA: 3.75/4.0.

Awarded three *Teaching Fellow* positions (reserved for best-performing undergraduates).

Research Experience

Postdoctoral Fellow, Nov. 2008–present

Gladstone Institutes, University of California, San Francisco, CA. Advisor: Katherine S. Pollard.

Project 1: Designed and programmed a pipeline for simulating metagenomic data that enables essential testing of phylogenetic inference methods. The results of the ongoing analysis will guide our group's future work with real metagenomic data. Project 2: Developing algorithms for optimizing the design of DNA oligomers so certain potential gene regulatory sequences are efficiently covered. The Ahituv Lab at UCSF plans to use the oligomers in transgenic zebrafish experiments.

Graduate Student Researcher, 2002–07

University of California, Berkeley, CA. Advisor: Richard M. Karp.

Funded partially by an NSF Graduate Research Fellowship (three years in 2001–05).

Designed approximation algorithms for and analyzed the computational complexity of discrete optimization problems in theoretical computer science and computational biology.

Research Intern, Feb.–Aug. 1998

I.N.R.I.A., Sophia-Antipolis, France. Advisor: Olivier Faugeras, Director of Project Robotvis.

Designed and programmed an image-based–rendering pilot project for a computer vision research lab.

Research Intern, Summer 1997

Michigan Technical University, Houghton, MI. Advisor: Anant Godbole.

Funded as part of an NSF Research Experiences for Undergraduates (REU) program.

Conducted and presented original research in combinatorics and probability theory.

Teaching Experience

Graduate Student Instructor, Spring semester 2004

University of California, Berkeley, CA

Taught two weekly sections of 20–30 students, graded exams.

Efficient Algorithms and Intractable Problems, Profs. Christos Papadimitriou and Umesh Vazirani.

Teaching Fellow, Fall semesters 1997–99

Harvard University, Cambridge, MA

Taught a weekly section of 10–15 students, graded homework and exams.

- Efficient Algorithms (graduate level), Prof. Michael Rabin;
- Honors Linear Algebra and Real Analysis I, Prof. Michael Nakamaye;
- Introduction to Formal Systems and Computation, Prof. Harry Lewis.

Publications

- **Riesenfeld SJ**, Orecchia L, Pollard KS. *Pseudo-de-Bruijn Sets Provide Optimal Oligomer Library Design for Discovery of Transcription Factor Binding Site Motifs*. In submission.
- **Riesenfeld SJ**, Pollard KS. *MetaPASSAGE: A Metagenomic Pipeline for Automated Simulations and Analysis of Gene Families*. Submitted.
- Sharpton TJ, **Riesenfeld SJ**, Kembel SW, Ladau J, O’Dwyer JP, Green JL, Eisen JA, Pollard KS. *PHYLOTU: A high-throughput procedure quantifies microbial community diversity and resolves novel taxa from metagenomic data*. PLoS Computational Biology, in press.
- Capra JA, Carbone L, **Riesenfeld SJ**, Wall JD (2010). *Genomics through the lens of next-generation sequencing*. Genome Biology, 11:306.
- ^{*†}Daskalakis C, Karp RM, Mossel E, **Riesenfeld S**, Verbin E (2009). *Sorting and selection in posets*. Proc. Nineteenth Annual ACM-SIAM Symp. on Discrete Algorithms, 392–401. Journal ver. submitted.
- [†]Chaudhuri K, Rao S, **Riesenfeld S**, Talwar K (2009). *A push-relabel algorithm for approximating the minimum-degree MST problem and its generalization to matroids*. Theoretical Computer Science, 410(44):4489–4503. (Invited submission.)
- [†]Chaudhuri K, Rao S, **Riesenfeld S**, Talwar K (2009). *What would Edmonds do? Augmenting paths and witnesses for degree-bounded MSTs*. Algorithmica, 55(1):157–189. (Invited submission.) ^{*}Earlier version appears in Proc. 8th Intl. Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX), 2005; 3624/2005:26–39.
- **Riesenfeld, S** (2008). *Optimization and reconstruction over graphs*. Ph.D. Thesis, Electrical

^{*}*In computer science, conference publications are often more influential than journal publications. Full papers are submitted to conferences for peer review. If accepted, they appear in printed or electronic proceedings and are presented in conference talks. Authors may submit refined versions to journals.*

[†]*The order of authors has no significance. Alphabetical order is typical in theoretical computer science.*

Engineering and Computer Sciences Dept., UC Berkeley, CA. Tech. Rep. No. UCB/EECS-2008-6.

- *†Chaudhuri, K, Rao S, **Riesenfeld S**, Talwar K (2006). *A push-relabel algorithm for approximating degree bounded MSTs*. Proc. 33rd Intl. Colloq. on Automata, Languages, and Programming (ICALP), 4051/2006:191–201.
- *†Bogdanov A, Maneva E, **Riesenfeld S** (2004). *Power-aware base station positioning for sensor networks*. Proc. INFOCOM Twenty-third Annual Joint Conf. of the IEEE Computer and Communications Societies; 1:575–585.

Selected Talks

- *Building phylogenies with metagenomic sequence reads*. Platform presentation. Biology of Genomes Meeting, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 2010.
- *Sorting and ranking in partially ordered sets*. Invited talk. Bay Area Theory Symposium (BATS), IBM Almaden Research Center, Almaden, CA, 2006.
- * *A push-relabel algorithm for approximating degree-bounded minimum spanning trees*. Conference presentation. ICALP, Venice, Italy, 2006.
- *Inferring reticulate evolution networks from consensus gene trees*. Invited talk. Cyberinfrastructure for Phylogenetic Research (CIPRES) Annual All-Hands meeting, San Diego, CA, 2005. †Based on manuscript by Karp RM, Riesenfeld S, 2004.
- * *Sensor networks with base stations*. Conference presentation. INFOCOM, Hong Kong, 2004.
- *A probabilistic look at the Schur and van der Waerden numbers*. Conference presentation (with Jager A). MAA/AMS Joint Winter Meetings, Baltimore, MD, 1998. †Based on manuscript by Godbole A, Jager A, Riesenfeld S, 1997.

Other Work Experience

Medical Assistant, 2000–01

Planned Parenthood Santa Fe Medical Office, Santa Fe, NM

Supervisor: Kristen Kikut, Clinic Manager.

Software Engineer, Summer 1996

Engineering Geometry Systems (now Delcam USA), Salt Lake City, UT

Supervisor: Tom McCollough, Vice President of Software Development.

Languages

- Fluent in C, Perl, and R. Experienced in C++. Familiar with Java, Lisp, Mathematica, MATLAB.
- Fluent in spoken French; fair written French. Conversational Italian and Spanish.

References

- Katherine S. Pollard, Gladstone Institutes, UCSF <katherine.pollard@gladstone.ucsf.edu>
- Nadav Ahituv, UCSF <nadav.ahituv@ucsf.edu>
- Deepak Srivastava, Gladstone Institutes, UCSF <dsrivastava@gladstone.ucsf.edu>
- Richard M. Karp, UC Berkeley <karp@cs.berkeley.edu>
- Satish Rao, UC Berkeley <satishr@cs.berkeley.edu>
- Alistair Sinclair, UC Berkeley <sinclair@cs.berkeley.edu>