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RESEARCH INTERESTS

- Computational molecular biology
- Algorithms for noisy and error-prone data
- Graph theory
- Comparative genomics
- Combinatorics
- Discrete mathematics
- Genomic network analysis

ACADEMIC DEGREES

Cornell University,	Ithaca, NY	
Ph.D. Applied Mathematics		2001
M.S. Applied Mathematics		2000
Advisors:	Jon Kleinberg (Computer Science) and Susan McCouch (Plant Breeding & Genetics)	
Dissertation:	Algorithms for constructing comparative genome maps.	
University of Denver,	Denver, CO	
M.S. Computer Science		1988
Advisor:	James Hagler (Mathematics and Computer Science)	
Thesis:	Algorithms and constructions related to combinatorial design of maximal families of k -tuples.	
Yale University,	New Haven, CT	
B.S. Biology		1984
Advisor:	Jeffrey Powell (Biology)	
Senior Project:	A computer simulation of an original mathematical model of nucleic and mitochondrial DNA based on observations of populations of <i>Drosophila</i> .	

RESEARCH EXPERIENCE

Harvard Medical School, Research Fellow 2001-2005

Dr. Frederick Roth (advisor), Department of Biological Chemistry & Molecular Pharmacology
 Dr. Marc Vidal (co-mentor), Department of Genetics, Dana Farber Cancer Institute
 Developed graph-theoretic algorithms to enhance understanding of diverse types of large-scale genomic data, such as protein-protein interaction networks. Integrated protein interaction, gene expression, and gene knockdown phenotype data and exploited the small-world and other topological properties of genomic networks to make interaction and function predictions.

Cornell University, Doctoral Research, Center for Applied Mathematics 1996-2001

Dr. Jon Kleinberg (advisor), Department of Computer Science
 Dr. Susan McCouch (advisor), Department of Plant Breeding & Genetics
 Provided a rigorous mathematical framework for the construction of comparative genome maps with the goal of identifying common ancestral chromosome fragments. Developed broadly applicable models that balance parsimony and accuracy using dynamic programming techniques. Applied methods to rice-maize, rice-sorghum, and human-mouse comparisons.

TRW Space & Defense, Aurora, CO, Senior Member of Technical Staff 1988-1996

Research and development. Designed, implemented, tested, and maintained signal processing algorithms to gain insights from noisy data. Responsible to keep system operational 24 hours a day. Wrote portions of proposals considered critical to company activities.

The Johns Hopkins School of Medicine, Research Programmer 1985-1986

Dr. Dean Wong (supervisor), Department of Nuclear Medicine
 Analyzed data from human Positron Emission Tomography (PET) scan studies. Assisted with the design of theoretical models of brain biochemistry.

The Johns Hopkins School of Medicine, Sr. Lab Technician 1984-1985

Dr. Marshall Plaut (supervisor), Department of Clinical Immunology
 Studied human macrophages. Responsible for all phases of the cycle for in-vitro research, including experimental design, specimen collection, cell culture, analysis and reporting of results, and subsequent redesign and refinement of procedures.

Yale University, Undergraduate Research 1984

Dr. Jeffrey Powell, Biology Department
 Senior project: developed an original mathematical model of nucleic and mitochondrial DNA inheritance in *Drosophila* and wrote a computer simulation.

Yale University, Undergraduate Research 1983

Dr. Steven Handel, Biology Department
 Independent research project: grew controlled replicate plants in a greenhouse and performed statistical analysis.

Yale School of Medicine, Lab Technician 1980-1982

Department of Dermatology, part-time.

Rockefeller University, High School Extern 1979

Lab Technician: one semester, full-time. Ran polyacrylamide gel electrophoresis experiments.

TEACHING EXPERIENCE

Cornell University, Department of Computer Science, Lecturer 2000

Data Structures. Senior-level class. 5 lectures/week. Managed 2 TAs.
 On course evaluations, averaged less than 2.1 for question "How did the teaching skills of the instructor in this course compare with other instructors? (1) very favorably (5) very unfavorably"
 Some completions to the statement "The aspects of this course I valued most were:"
 - "Teaching was very good, I learned a lot."
 - "Great instructor and great TAs. HWs have the right level of difficulty, though it's a rush in summer."

- "Clear presentation of material."
 - "The obvious engagement of the instructor in the material, the availability of help."
 - "The homework and quizzes kept me on track and get [sic] a good understanding of the course."
- A complete list of comments and average scores available upon request.

Cornell University, Department of Computer Science, **Teaching Assistant**

Introduction to Computer Programming (Java) 1999
 Discrete Structures; Introduction to Computer Programming (C++) 1996-1997

TRW Space & Defense, Aurora, CO, **Senior Member of Technical Staff**

Organized and taught a class on signal processing algorithms. 1995-1996
 Led development, teaching of 12-day software maintenance class for customers. 1988-1990

University of Denver, Department of Mathematics and Computer Science,
Teaching Assistant

1987-1988

Taught Core Computer Lab; Taught Calculus III problem sessions.

University of Denver, Computing and Information Resources, **User Consultant**

1988

Prepared and taught classes on the use of commonly used software and assisted university computer users.

Sylvan Learning Center, Littleton, CO, **Tutor**

1986-1988

Basic skills, SAT preparation, enrichment. Elementary and high school students.

Yale University, Department of Computer Science, **Tutor**

1984

Introduction to Computer Programming (Pascal)

MANAGEMENT EXPERIENCE

Harvard Medical School, **Research Fellow**

2001-2005

Hired and managed an undergraduate research assistant.

TRW Space & Defense, Aurora, CO, **Senior Member of Technical Staff**

1988-1996

Managed maintenance and upgrade group for software required to operate 24 hours a day.

Group Lead, design and implementation of new signal processing algorithms.

Coordinator for a 500-page volume of a proposal for recompetition of company's major contract.

Factory Direct Sales, Littleton, CO, **M.I.S. Manager**

1986-1987

Supervised all aspects of data processing department responsible for all programming needs of the company.

PUBLICATIONS (Peer-Reviewed)

1. L Zhang, OD King, SL Wong, **DS Goldberg**, AHY Tong, G Lesage, B Andrews, H Bussey, C Boone, FP Roth. Motifs, themes and thematic maps of an integrated *S. cerevisiae* network. (in review)
2. SL Wong, LV Zhang, AHY Tong, Z Li, **DS Goldberg**, OD King, G Lesage, M Vidal, B Andrews, H Bussey, C Boone, FP Roth. Combining biological networks to predict genetic interactions. *Proceedings of the National Academy of Sciences* 101: 15682-15687 (2004).
3. J-DJ Han, N Bertin, T Hao, **DS Goldberg**, GF Berriz, LV Zhang, D Dupuy, AJM Walhout, ME Cusick, FP Roth, M Vidal. Evidence for dynamically organized modularity in the yeast protein-protein interaction network. *Nature* 430: 88-93 (2004).
4. AHY Tong*, G Lesage*, GD Bader, H Ding, H Xu, X Xin, J Young, GF Berriz, RL Brost, M Chang, Y Chen, X Cheng, G Chua, H Friesen, **DS Goldberg**, J Haynes, C Humphries, G He, S Hussein, L Ke, N Krogan, Z Li, JN Levinson, H Lu, P Ménard, C Munyana, AB Parsons, O Ryan, R Tonikian, T Roberts, A-M Sdicu, J Shapiro, B Sheikh, B Suter, SL Wong, LV Zhang, H Zhu, CG Burd, S Munro, C Sander, J Rine, J Greenblatt, M Peter, A Bretscher, G Bell, FP Roth, GW Brown, B Andrews, H

- Bussey C Boone. Global mapping of the yeast genetic interaction network. *Science* 303: 808-813 (2004).
5. S Li*, CM Armstrong*, N Bertin*, H Ge*, S Milstein*, M Boxem*, P-O Vidalain*, J-DJ Han*, A Chesneau*, T Hao, **DS Goldberg**, N Li, M Martinez, J-F Rual, P Lamesch, L Xu, M Tewari, SL Wong, LV Zhang, GF Berriz, L Jacotot, P Vaglio, J Reboul, T Hirozane-Kishikawa, Q Li, HW Gabel, A Elewa, B Baumgartner, DJ Rose, H Yu, S Bosak, R Sequerra, A Fraser, SE Mango, WM Saxton, S Strome, S van den Heuvel, F Piano, J Vandenhaute, C Sardet, M Gerstein, L Doucette-Stamm, KC Gunsalus, JW Harper, ME Cusick, FP Roth, DE Hill, M Vidal. A map of the interactome network of the metazoan *C. elegans*. *Science*, 303: 540-543 (2004).
 6. **DS Goldberg**, FP Roth. Assessing experimentally derived interactions in a small world. *Proceedings of the National Academy of Sciences* 100:4372-4376 (2003).
 7. **D Goldberg**, S McCouch, J Kleinberg. Constructing Comparative Genome Maps with Unresolved Marker Order. *Proceedings of the Pacific Symposium on Biocomputing (PSB)* (2002).
 8. **D Goldberg**. Algorithms for constructing comparative genome maps. Ph.D. thesis (2001).
 9. **D Goldberg**, S McCouch, J Kleinberg. Algorithms for Constructing Comparative Maps. In D Sankoff and JH Nadeau, editors, *Comparative Genomics: Empirical and Analytical Approaches to Gene Order Dynamics, Map Alignment and the Evolution of Gene Families*, Vol. 1 of *Series in Computational Biology*, Dordrecht, NL. Kluwer Academic Press (2000).
 10. DM Post, ME Conners, **DS Goldberg**. Prey preference of mobile predators and the stability of partially linked food webs. *Ecology* 81:8-14 (2000).
 11. **DS Goldberg**. Algorithms and Constructions Related to Combinatorial Design of Maximal Families of k -tuples Master's thesis (1988)
 12. DF Wong, A Gjedde, HN Wagner, Jr., RF Dannals, L Tune, C Tamminga, L O'Tuama, J Williams, **DS Goldberg**, J Links. In Vivo Quantification of Absolute D2 Dopamine Receptor Density Using Positron Emission Tomography: Preliminary Human Studies. [Abstract] *J Nucl Med.*, 27:954 (1986).
 13. DF Wong, G Wand, H Zacur, **DS Goldberg**, J Williams, L O'Tuama, E Broussolle, RF Dannals, JM Links, HN Wagner, Jr. The Effect of the Menstrual Cycle on Dopamine Receptor Binding of c11-3-N-Methylspiperone. [Abstract] *J Nucl Med.*, 27:1010 (1986).

* These authors contributed equally to this work

MANUSCRIPTS (submitted)

1. K Gunsalus*, H Ge*, AJ Schetter*, **DS Goldberg***, J-DJ Han, T Hao, N Bertin, N Li, J Huang, L-S Chuang, R Mani, AA Hyman, B Sönnichsen, CJ Echeverri, FP Roth, M Vidal, F Piano. Predictive models of molecular machines involved in *C. elegans* early embryogenesis. (in review)
3. **DS Goldberg**, G Franklin, FP Roth. Breaking the power law: improved model selection reveals increased network complexity. (submitted)

* These authors contributed equally to this work

HONORS AND AWARDS

National Science Foundation Postdoctoral Research Fellowship in Interdisciplinary Informatics Starter grants for those taking tenure-track positions	2003-2005
Engineering Graduate Research Symposium , Cornell University Oral Presentation Award Winner	2001
Cornell University Department of Computer Science	1999-2000

Outstanding Teaching Assistant Award

National Science Foundation

1998-99

Training Grant DEB-9602229: Evolution from DNA to the Organism: The interface between evolutionary biology and the mathematical sciences.

National Science Foundation

1997-98

Training Grant BIR-9113307: Dynamics of heterogeneous ecological and evolutionary systems.

AAUW Educational Foundation

1997-98

Research and Projects Career Development Grant

INVITED PRESENTATIONS

What can we learn from the topology of inaccurate biological networks?

Georgia Institute of Technology, Applied Mathematics Seminar, Atlanta, GA, March 2005.

Data Assessment and Function Prediction Using Inaccurate Network Data

Rocky Mountain Regional Bioinformatics Conference, Aspen, CO, December 2004.

A model selection approach to classify the topology of biological networks

BioPathways, Glasgow, UK, July 2004.

Gaining biological insight from genomic network topology

Society of Industrial and Applied Mathematics (SIAM) Conference on the Life Sciences, Portland, OR, July 2004.

Interactome networks

ORFeome Meeting, Boston, MA, December 2003.

Using small-world network topology to refine experimentally-derived networks

Tufts University, Electrical Engineering and Computer Science Department, Medford, MA, October 2002.

Constructing Comparative Maps with Unresolved Marker Order

Pacific Symposium on Biocomputing, Lihue, HI, January 2002.

DeCAL: An Open Source System for Constructing Comparative Maps

Bioinformatics Open Source Conference, Copenhagen, Denmark, July 2001.

Automated Construction of Genomic Comparative Maps

Cincinnati Children's Hospital Research Foundation, Cincinnati, OH, July 2001.

Harvard Medical School, Boston, MA, June 2001.

Engineering Graduate Research Symposium, Cornell University, Ithaca, NY, March 2001.

DIMACS Workshop on Whole Genome Comparison, Piscataway, NJ, March 2001.

Plant and Animal Genome IX Conference, San Diego, CA, January 2001.

Algorithms for Constructing Comparative Maps

Cornell University, Mathematical Sciences Seminar, Ithaca, NY, October 2000.

Tel Aviv University, School of Computer Science, Tel Aviv, Israel, October 2000.

Conference on Gene Order Dynamics, Comparative Maps and Multigene Families,

Sainte-Adèle, Canada, September 2000.

Prey preference by mobile predators and the stability of partially linked food webs.

Ecological Society of America (ESA) Annual Meeting, Albuquerque, NM, August 1997.

PRESS COVERAGE

Comparative genome map algorithms were featured in:

[Cornell Chronicle](#), January 18, 2001.

[Cornell press release](#), December 21, 2000.

EurekAlert, December 21, 2000.

[GenomeWeb](#), December 26, 2000.

[bioresearch online](#), December 27, 2000.

[ScienceDaily](#), January 1, 2001.

[Bioinform](#), January 2001.

[Technology Research News](#), February 14, 2001.

[Genome Technology](#), March 2001.

PROFESSIONAL SERVICE

International Society for Computational Biology

Vice-Chair, inaugural Student Council

2004-current

Reviewer

Nucleic Acid Research Bioinformatics	2003-2004 2003
Advisory Committee on the Status of Women (ACSW); Cornell University Elected to represent graduate students on this committee comprised primarily of Cornell faculty and staff. The mission of ACSW is to advise Cornell Administration and educate the University community on women's issues, and to advocate for equality for women.	2000-2001
Engineering Graduate Student Association (EGSA); Cornell University Organized professional seminars and social activities.	1999-2001

OUTREACH ACTIVITIES

Williams Elementary School Regularly posted mathematical puzzles at "Dr. Deb's Puzzle Corner" Led activities for Mathematics Awareness Month	2002-current
Expanding Your Horizons in Math, Science, and Engineering; Cornell University Chairman, Science Resources and Books Committee Chairman, Evaluations Committee Workshop co-leader: Computational Genomics Workshop co-leader: Mathematics	1999-2001 1999 2000 2000, 2001 2001
Kids on Campus; Cornell University Organized mathematical activities at the Center for Applied Mathematics.	1997
Girls, Inc., Science, Math, And Relevant Technology (SMART) program Volunteer, leading weekly science and math activities for girls in grades 1-8.	1993-1994.

PROFESSIONAL AFFILIATIONS

International Society for Computational Biology (**ISCB**)
 American Mathematical Society (**AMS**)
 Association for Computing Machinery (**ACM**)
 Society for Industrial and Applied Mathematics (**SIAM**)
 American Association of University Women (**AAUW**)

REFERENCES

Frederick Roth, Ph.D. (Postdoctoral Advisor) (617) 432-3551 fritz_roth@hms.harvard.edu
Assistant Professor, Department of Biological Chemistry and Molecular Pharmacology
Harvard Medical School, 250 Longwood Ave., SGM-322, Boston, MA 02115

Marc Vidal, Ph.D. (Postdoctoral Co-Mentor) (617) 632-5180 Marc_Vidal@dfci.harvard.edu
Associate Professor, Department of Genetics
Dana Farber Cancer Institute, Smith 858, 44 Binney St., Boston, MA 02115

Jon Kleinberg, Ph.D. (Doctoral Advisor) (607) 255-3600 kleinber@cs.cornell.edu
Associate Professor, Department of Computer Science
Cornell University, 5134 Upson Hall, Ithaca, NY 14853

Susan McCouch, Ph.D. (Doctoral Advisor) (607) 255-0420 srm4@cornell.edu
Professor, Department of Plant Breeding & Genetics
Cornell University, 162 Emerson Hall, Ithaca, NY 14853

David Schwartz, Ph.D. (Teaching Advisor) (607) 255-5395 dis@cs.cornell.edu
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Cornell University, 5137 Upson Hall, Ithaca, NY 14853