

Georg Kurt Gerber

Computer Science and Artificial Intelligence Laboratory
Massachusetts Institute of Technology
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RESEARCH OBJECTIVES

To introduce new diagnostic assays and to discover fundamental mechanisms of human pathology relating to immunology and infectious diseases, by harnessing cutting-edge high-throughput laboratory technologies and developing novel machine learning and statistical techniques.

EDUCATION

- 2007-2009 **Harvard Medical School**
M.D., Medicine (Health Sciences and Technology/London Society)
- 2003-2007 **Harvard-MIT Division of Health Sciences and Technology**
Ph.D., Computer Science and Medical Engineering, GPA: 5.0/5.0.
Thesis title: *Computational Discovery of Gene Modules, Regulatory Networks and Expression Programs*
Committee: Professors David K. Gifford (supervisor), Tommi S. Jaakkola and Richard A. Young
- 2000-2003 **Massachusetts Institute of Technology**
S.M., Electrical Engineering and Computer Science, GPA: 5.0/5.0.
Thesis title: *Do the Time-Warp: Continuous Alignment of Gene Expression Time-Series Data*
Supervisor: Professor David K. Gifford
- 1992-1994 **University of California at Berkeley**
M.P.H., Infectious Diseases, GPA: 4.0/4.0.
- 1989-1991 **B.A.**, Mathematics, *summa cum laude*, GPA: 3.98/4.0.

ACADEMIC EXPERIENCE

- 2009-present **Brigham and Women's Hospital**, Boston, MA
Resident in Clinical Pathology
Supervisor: Professor David B. Sacks
Appointment begins July 1, 2009. Provides training to be medical director of all aspects of the clinical laboratory (methodology, quality control, clinical interpretation of laboratory tests and administration) and also offers opportunities for original investigative work during the appointment. Subspecialties covered include clinical chemistry, microbiology, blood bank, hematology, immunology, molecular biology and tissue typing.
- 2000-2009 **Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory (CSAIL)**, Cambridge, MA
Graduate Research Assistant

Supervisors: Professors David K. Gifford and Tommi S. Jaakkola

Developed novel computational methods for automatic inference of transcriptional regulatory networks and gene expression programs from high-throughput mRNA expression and DNA-protein binding data. Major projects included inference of human infectious disease gene expression programs and hierarchical sample structure from large compendia of temporal expression data; discovery of pancreatic islet cell developmental transcriptional regulatory networks; discovery of large-scale yeast transcriptional regulatory networks from multiple data sources; and reconstruction of temporal transcriptional regulatory control circuitry in the yeast-cell cycle. Research drew on techniques from machine learning, statistics and computational geometry, such as B-splines, mixed effects models, robust estimators and nonparametric Bayesian methods.

2002 **Northeastern University, Bioinformatics Graduate Certificate Program, Boston, MA**

Instructor

Co-taught course on DNA microarray analysis for approximately 50 students. Co-developed complete curriculum and course materials. Delivered four three hour lectures on data normalization, clustering and analysis, and microarray applications in oncology. Created and graded take-home exam.

1993-1994 **UC Berkeley, Department of Computer Science, Berkeley, CA**

Graduate Research Assistant

Supervisor: Professor Brian Barsky

Researched a finite element model of the human cornea incorporating hydrostatic and hydrodynamic forces in the tear and underlying tissue layers; assisted in the development of software for visualizing the cornea using higher order B-spline models.

1993 **UC Berkeley, School of Public Health, Berkeley, CA**

Graduate Laboratory Instructor

Supervisor: Professor Gertrude Buehring

Prepared bacterial cultures and media, gave laboratory demonstrations and provided instruction for two-week microbiology course for optometry students.

1991 **UC Berkeley, Department of Mathematics, Berkeley, CA**

Undergraduate Teaching Assistant, Calculus

Taught one-on-one and small group sections for self-guided introductory calculus course; graded exams.

1990 **UC Berkeley, Division of Biophysics, Berkeley, CA**

Undergraduate Research Assistant

Supervisor: Professor Hans Bremermann

Developed and implemented an ordinary differential equations model of B-cell, T-cell and HIV molecular interactions.

INDUSTRY EXPERIENCE

2000 **IS?TV, Los Altos, CA**

Executive Vice President and Chief Technology Officer

Co-founded interactive television start-up; developed technology including online prototype; wrote business plan; prepared and delivered presentations for venture capitalists.

- 1998-2000 **The Amber Consortium**, Fairfax, VA
Member of the Board of Directors
 Advised on business plan, corporate strategy, and deal structures for company producing natural language software; assisted in writing successful application for Small Business Innovation Research grant for \$350K.
- 1995-1999 **L-Squared Entertainment**, Santa Monica, CA
Senior Vice President
 Managed production and research and development for company producing feature film, 3D IMAX®, online, and location-based entertainment products. Selected production credits include: Head of Production for Onscreen Computer Graphics (*Virtuosity*, starring Denzel Washington and Russell Crowe, Paramount Pictures, \$5M visual effects budget), Creative Director (N.M.E. PC game, Viacom New Media), Creative Director/Writer (*Virtual Studio Tour*, starring Danny DeVito, Creative Artists Agency and Intel Corporation, \$1M budget), Visual Effects Supervisor (*Wetware* pilot, NBC Studios), Technical Director (*T-Rex: Back to the Cretaceous*, starring Peter Horton and Liz Stauber, IMAX Corporation, \$5M visual effects budget).
- 1993-1995 **Infinite Interactions**, Marina del Rey, CA
President and Chief Executive Officer
 Co-founded and directed all operations for company providing 3D technologies to gaming, film, and online industries. Developed business plan and secured funding; led development of real-time 3D software platform; negotiated successful acquisition of company by L-Squared Entertainment in 1995.
- 1992 **Metabolex**, Hayward, CA
Research Associate/Laboratory Automations Specialist
 Planned, implemented and managed laboratory automation and corporate computing infrastructure for biotechnology company researching diabetes therapeutics. Developed software for data acquisition and analysis; designed custom SDS-PAGE system for low molecular weight compounds; implemented local-area-network and document management/groupware environment.
- 1984-1989 **Speak Easy Communications System**, Sherman Oaks, CA
President
 Co-founded, developed software and operated an early online service offering e-mail, bulletin boards, chat and online games.

ACADEMIC AWARDS AND HONORS

- 2002-2005 National Defense Science and Engineering Graduate Fellowship
 2003-present Sigma Xi honor society of science and engineering, Associate Member
 2002 National Science Foundation Fellowship (awarded, declined)
 1992-1994 University of California Regents' Graduate Fellowship
 1991 UC Berkeley Highest Distinction in General Scholarship in Mathematics
 1990-present Phi Beta Kappa
 1989-1991 University of California Regents' Undergraduate Scholarship
 1989-1991 UC Berkeley Dean's List, every semester attended

1989	J&M Seitz Scholarship
1989	Los Angeles Valley College Mathematics Department Scholarship
1986-1989	Los Angeles Valley College Dean's List, every semester attended
1987	CRC Press Freshman Chemistry Award

PEER REVIEWED PUBLICATIONS

G. K. Gerber, R. D. Dowell, T. S. Jaakkola, D. K. Gifford. Automated Discovery of Functional Generality of Human Gene Expression Programs. *PLoS Computational Biology*, 3(8):e148, 2007.

Y. Qi*, A. Rolfe*, K. D. MacIsaac*, **G. K. Gerber**, D. Pokholok, J. Zeitlinger, T. Danford, R. D. Dowell, E. Fraenkel, T. S. Jaakkola, R. A. Young and D. K. Gifford. High-resolution computational models of genome binding events. *Nature Biotechnology*, 24:963-970, 2006.

*Equal contributing authors.

J. Schreiber, R. G. Jenner, H. L. Murray, **G. K. Gerber**, D. K. Gifford and R. A. Young. Coordinated binding of NF- κ B family members in the response of human cells to lipopolysaccharide. *Proceedings of the National Academy of Sciences*, 103(10):5899-5904, 2006.

Z. Bar-Joseph*, **G. K. Gerber***, T. Lee*, N. Rinaldi, J. Yoo, F. Robert, B. Gordon, E. Fraenkel, T. Jaakkola, R. Young and D. Gifford. Computational discovery of gene modules and regulatory networks. *Nature Biotechnology*, 21(11):1337-42, 2003.

*Equal contributing authors.

Z. Bar-Joseph, **G. Gerber**, I. Simon, D. Gifford and T. Jaakkola. Comparing the continuous representation of time-series expression profiles to identify differentially expressed genes. *Proceedings of the National Academy of Sciences*, 100(18):10146-51, 2003.

Z. Bar-Joseph, **G. K. Gerber**, D. Gifford, T. Jaakkola and I. Simon. Continuous Representations of Time Series Gene Expression Data. *Journal of Computational Biology*, 10(3-4):241-256, 2003.

Z. Bar-Joseph, **G. K. Gerber**, D. Gifford, T. Jaakkola and I. Simon. A new approach to analyzing gene expression time series data. In *Proceedings of The Sixth Annual International Conference on Research in Computational Molecular Biology (RECOMB)*:39-48, 2002.

T.I. Lee, N. J. Rinaldi, F. Robert, D. T. Odom, Z. Bar-Joseph, **G. K. Gerber**, N. M. Hannett, C. T. Harbison, C. M. Thompson, I. Simon, J. Zeitlinger, E. G. Jennings, H. L. Murray, D. B. Gordon, B. Ren, J. J. Wyrick, JB Tagne, T. L. Volkert, E. Fraenkel, D. K. Gifford and R. A. Young. Transcriptional Regulatory Networks in *Saccharomyces cerevisiae*. *Science*, 798:799-804, 2002.

G. K. Gerber. Action!: A System For Creating and Delivering Multi-participant Interactive Cinematic Dramas. *International Conference on Application and Development of Computer Games in the 21st Century (ADCOG21)*, 2001.

TECHNICAL REPORTS AND POSTER PRESENTATIONS

G. K. Gerber, R. D. Dowell, T. S. Jaakkola, D. K. Gifford. Hierarchical Dirichlet Process-Based Models For Discovery of Cross-species Mammalian Gene Expression Programs. *MIT-CSAIL Technical Report*, MIT-CSAIL-TR-2007-037, <http://hdl.handle.net/1721.1/37817>.

G. K. Gerber. Computational Discovery of Gene Modules and Regulatory Networks. *Harvard/MIT Health Sciences and Technology Forum*, Boston, MA, July 2004.

G. K. Gerber. Computational Discovery of Gene Modules and Regulatory Networks. *Whitehead Institute for Biomedical Research Annual Retreat*, Waterville Valley, NH, July 2004.

G. K. Gerber. Computational Discovery of Gene Modules and Regulatory Networks. *International conference on Intelligent Systems for Molecular Biology (ISMB)*, Brisbane, Australia, July 2003.

INVITED TALKS

Initial Steps Toward Computational Discovery of Regulatory Networks in Pancreatic Islet Development. *Systems-based Consortium for Organ Design and Engineering (SysCODE) Consortium-Wide Meeting*, Boston, MA, April 2009.

Computational Discovery of Regulatory Networks. *Computational Functional Genomics 7.90J/6.874J (MIT Computer Science and Biology graduate course)*, Cambridge, MA, April 2004, 2005 and 2006.

ACADEMIC/COMMUNITY SERVICE

- Reviewer for journals and conferences including BMC Bioinformatics, Bioinformatics, Intelligent Systems for Molecular Biology (ISMB), International Journal of Artificial Intelligence in Medicine, Nucleic Acids Research, Pacific Symposium on Biocomputing (PSB), Pattern Recognition, Research in Computational Molecular Biology (RECOMB) and SIGGRAPH.
- Supervisor of two Undergraduate Research Opportunities Program (UROP) students and two Masters students at MIT.
- Co-organizer of the MIT/Whitehead Computational Biology Retreat for two years (2001-2002). Planned scientific and recreational agenda, invited guests and scheduled events at retreat venue.
- Student host and evaluator for faculty candidates for the Harvard-MIT Division of Health Sciences and Technology and the MIT Department of Electrical Engineering and Computer Science.
- Co-founder of the Berkeley Biology Enrichment Program (1993-1994), a graduate student volunteer program for teaching microbiology in primary schools. Organized volunteers; taught weekly courses; solicited donations of laboratory equipment and other materials.

RELEVANT COURSEWORK

Harvard Medical (Preclinical)

Human Functional Anatomy
Musculoskeletal Pathophysiology
Human Pathology
Mechanisms of Microbial Pathogenesis
Endocrinology
Human Reproductive Biology
Hematology
Cardiovascular Pathophysiology
Respiratory Pathophysiology
Renal Pathophysiology
Gastroenterology
Introduction to Neuroscience
Human Biochemistry and Metabolic Diseases
Principles of Pharmacology
Molecular Biology and Genetics in Modern Medicine
Cellular and Molecular Immunology
Psychopathology and Introduction to Clinical Psychiatry
Introduction to Clinical Medicine I
Introduction to Clinical Medicine II

Harvard Medical (Clinical)

Core Clerkship in Women's and Children's Health (Obstetrics/Gynecology and Pediatrics)
Core Clerkship in Medicine I
Core Clerkship in Surgery
Core Clerkship in Radiology
Core Clerkship in Psychiatry
Core Clerkship in Neurology
Core Clerkship in Medicine II
Clinical Clerkship in Pathology
Tumor Immunology in Gynecologic Malignancy
Family Medicine Clerkship

MIT Graduate Computer Science

Machine Learning
Techniques in Artificial Intelligence
Medical Artificial Intelligence
Analyzing Complicated Systems

UC Berkeley Upper Division/Graduate Biology/Biomedical Sciences

General Biochemistry
Molecular Immunology
Immunology Laboratory
Public Health Immunology
Principles of Infectious Disease
Infectious Disease: Host-Parasite Interactions
Infectious Disease Laboratory
Tumor Virology
Virology Laboratory
Introduction to Epidemiology
Epidemiology of Infectious Diseases
Human Anatomy

UC Berkeley Upper Division/Graduate Mathematics

Intermediate Linear Algebra
Introductory and Intermediate Analysis
Abstract Algebra
Theory of Functions of a Complex Variable
Mathematical Models in Physics and Engineering
Numerical Analysis
Differential Geometry
Probability and Statistics
Topology and Analysis
Mathematical Biophysics
Mathematical Models and Methods in Biology