

# Ross A. Lippert

*Present Address:* MIT Department of Mathematics  
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*(family home)* 386 Washington Street, #1A  
Somerville, MA  
02143, USA

*Date of Birth:* 31<sup>st</sup> January 1971

*Citizenship:* USA

## Education:

Ph.D., 1998 Mathematics  
Thesis title: *Nonlinear Eigenvalue Problems*  
(*Supervisor: Alan Edelman*)  
Massachusetts Institute of Technology

B.Sc., 1993 Physics

B.Sc., 1993 Mathematics

B.Sc., 1993 Computer Science

B.Sc., 1993 Electrical Engineering  
Massachusetts Institute of Technology

## Employment:

Jan 2004-present MIT Department of Mathematics  
Instructor

Oct 2000-Dec 2003 Applied Biosystems/Celera Genomics  
Informatics Research

Jun 1998-Sept 2000 Sandia National Laboratories  
Dept. 9222 (Applied Mathematics)  
von Neumann Fellow

## Teaching Experience

MIT Department of Mathematics  
18.417: Introduction to Computational Molecular Biology (2004F,2005F)  
18.330: Introduction to Numerical Analysis (2004S)  
18.03: Differential Equations (recitations)

MIT Experimental Study Group  
8.012/ESG: Advanced Introduction to Mechanics  
8.022/ESG: Advanced Introduction to Electricity and Magnetism

MIT Educational Studies Program  
ESP: Introduction to C Programming

## Current Research

Scientific and high performance computing: applied to string searching in bioinformatics, eigenvalue problems in solid state physics, large scale kernel regression problems. Also working on eigenvalue perturbation problems.

## Publications and Pre-Prints

(available upon request)

- R. A. Lippert. *A Probabilistic Interpretation of the Hurwitz Zeta Function*, Advances in Mathematics, 97(2):278–284, 1993.
- R. A. Lippert, T. Arias and A. Edelman. *Multiscale Computation with Interpolating Scaling Functions*, Journal of Computational Physics. 140(1):278-310 (Mar 1998).
- R. A. Lippert and A. Edelman. *The Computation and Sensitivity of Double Eigenvalues*, in Chen, et al, **Advances in Computational Mathematics Vol. 202**, Marcel Dekker (1998).
- R. A. Lippert and A. Edelman. *Nonlinear Eigenvalue Problems with Orthogonality Constraints*, in Bai, et al, **Templates for Eigenvalue Problems**, SIAM (2000).
- R. A. Lippert and M. P. Sears. *Asymptotic Convergence for Iterative Optimization in Electronic Structure*, Physical Review B. 61:12772 (2000).
- S. Istrail, A. Hurd, R. Lippert, and B. Walenz. *Prediction of Self-Assembly of Energetic Tiles and Dominos: Experiments, Mathematics and Software*, Technical Report, Sandia National Laboratories, SAND2000-0875 (Apr 2000).
- J. Craig Venter, Mark D. Adams, Eugene W. Myers, ... , Ross A. Lippert, ... *The Sequence of the Human Genome*, Science. 281(5507):1304-1351 (Feb 16 2001).
- G. Lancia, V. Bafna, S. Istrail, R. Lippert and R. Schwartz. *SNPs Problems, Algorithms and Complexity*, European Symposium on Algorithms (ESA), **Lecture Notes in Computer Science**, 2161:182-193, Springer-Verlag eds. (2001).
- D. Raczkowski, C.Y. Fong, P.A. Schultz, R.A. Lippert, and E.B. Stechel, *Unconstrained and constrained minimization, linear scaling, and the Grassmann manifold: theory and application to electronic structure*, Physical Review B. 64:155203 (2001).
- N. T. Trendafilov, R. A. Lippert. *The Multimode Procrustean Problem*, Linear Algebra and Its Applications. 349(1-3):245–264. (May 2002).
- R. A. Lippert, R. Schwartz, G. Lancia and S. Istrail. *Algorithmic Strategies for the Single Nucleotide Polymorphism Haplotype Assembly Problem*, Briefings in Bioinformatics. 3(1):23-31 (Mar 2002).
- N. J. Edwards, R. A. Lippert. *Generating Peptide Candidates from Amino-Acid Sequence Databases for Protein Identification via Mass Spectrometry*, in R. Guigo, D. Gusfield, **Algorithms in Bioinformatics: Second International Workshop, WABI September 2002, Rome, Italy, Proceedings**. LNCS 2452:68-81 (2003).
- R. A. Lippert, H. Huang, M. S. Waterman. *Distributional Regimes for the Number of  $k$ -Word Matches Between Two Random Sequences*, PNAS. 99(22):13980-13989 (Oct 2002).
- Y. Regev, M. Finkelstein-Landau, R. Feldman, M. Gorodetsky, X. Zheng, S. Levy, R. Charlab, C. Lawrence, R. A. Lippert, Q. Zhang, and H. Shatkay. *Rule-based extraction of experimental evidence in the biomedical domain: the KDD Cup 2002 (task 1)*, SIGKDD Explor. Newsl. 4(2):90-92 (2002).
- Bjarni V. Halldórsson, Vineet Bafna, Nathan Edwards, Ross A. Lippert, Shibu Yooseph, Sorin Istrail. *A Survey of Computational Methods for Determining Haplotypes*, Computational Methods for SNPs and Haplotype Inference: DIMACS/RECOMB Satellite Workshop (2002), LNCS 2983:26-47 (2004).
- Ross A. Lippert. *A matrix model for the  $\beta$ -Jacobi ensemble*, J. Math. Phys. 44(10):4807 (01 Oct 2003).

- Bjarni V. Halldórsson, Vineet Bafna, Nathan Edwards, Ross A. Lippert, Shibu Yooseph, Sorin Istrail. *Combinatorial Problems Arising in SNP and Haplotype Analysis*, in **Fourth International Conference on Discrete Mathematics and Theoretical Computer Science, DMTCS 2003, Dijon, France, proceedings.**, LNCS 2731:26-47 (2003).
- Sorin Istrail, Granger G. Sutton, Liliana Florea, Aaron L. Halpern, Clark M. Mobarry, Ross Lippert, et al. *Whole-genome shotgun assembly and comparison of human genome assemblies*, PNAS. 101(7):1916-1921 (17 Feb. 2004).
- Ross A. Lippert, Xiaoyue Zhao, Liliana Florea, Clark Mobarry, Sorin Istrail. *Finding anchors for genomic sequence comparison*, in **Eighth Annual International Conference on Research in Computational Molecular Biology, RECOMB 2004, San Diego, California, proceedings.** extended version in *Journal of Computational Biology*. 12(6):762-776 (2005).
- Olaf Delgado Friedrichs, Aaron L. Halpern, Ross Lippert, Christian Rausch, Stephan C. Schuster, Daniel H. Huson. *Syntenic Layout of Two Assemblies of Related Genomes*, in **the German Conference on Bioinformatics, GCB 2004, proceedings.**
- Bjarni Halldórsson, Vineet Bafna, Ross A. Lippert, Russell Schwartz, Francisco De La Vega, Andrew Clark, Sorin Istrail. *Optimal Haplotype Block-Free Selection of Tagging SNPs for Genome-Wide Association Studies*, *Genome Research* 14:1633-1640 (2004).
- Nathan Edwards and Ross A. Lippert. *Sequence database compression for peptide identification from tandem mass spectra*, in **Algorithms in Bioinformatics: Fourth International Workshop, WABI September 2004, Bergen, Norway, Proceedings.** LNCS 3240:230 (2004).
- Bert Gold, Francis Kalush, Julie Bergeron, Kevin Scott, Nandita Mitra, Kelly Wilson, Nathan Ellis, Helen Huang, Michael Chen, Ross Lippert, Bjarni V. Halldórsson, Beth Woodworth, Thomas White, Andrew G. Clark, Fritz F. Parl, Samuel Broder, Michael Dean and Kenneth Offit. *Estrogen Receptor Genotypes and Haplotypes Associated with Breast Cancer Risk*, *Cancer Research* 64:8891-8900 (15 December 2004).
- Francisco M. De La Vega, Hadar Isaac, Andrew Collins, Charles R. Scafe, Bjarni V. Halldórsson, Xiaoping Su, Ross A. Lippert, et al. *The linkage disequilibrium maps of three human chromosomes across four populations reflect their demographic history and a common underlying recombination pattern*, *Genome Research*. 15(4):454-462 (12 March 2005).
- Ross A. Lippert. *Space-Efficient Whole Genome Comparisons with Burrows-Wheeler Transforms*, *J. of Computational Biology*. 12(4):407-415 (2005).
- Ross A. Lippert, Clark M. Mobarry, Brian P. Walenz. *A space-efficient construction of the Burrows Wheeler Transform for genomic data*, *J. of Computational Biology*. 12(7):943-951 (2005).
- Ross A. Lippert. *Fixing Two Eigenvalues by a Minimal Perturbation*, *Linear Algebra and its Applications*. 406C:177-200 (2005).
- Ross A. Lippert, Ryan M. Rifkin. *Asymptotics of Gaussian Regularized Least Squares*, *Neural Information Processing Systems, NIPS 2005*. To appear (2005).
- Ross A. Lippert and Normand A. Modine *The optimized effective potential with finite temperature*. *J. of Physics: Condensed Matter* (submitted).

## Honors and Awards

Knowledge Discovery and Data Mining Cup (KDD Cup) 2002 (member of the first place team)

Leslie Fox Competition in Numerical Analysis (second prize)

John Von Neumann Research Fellowship (Sandia labs)

Computational Science ACM Programming Contest (regional: New England, 1994, member of second place team)

NSF Graduate Fellowship 1993-1996

## Affiliations

American Mathematical Society

Society for Industrial and Applied Mathematics

## Skills

MATLAB, C, C++, Perl, F77, F90

High-performance and Parallel computing (MPI, PVM, raw sockets)

HTML and CGI scripting abilities

Unix geek