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Research

- General interests: analysis, probability, networking, and algorithms.
- Specialization: randomized algorithms with applications to networking and massive datasets, and statistical analysis and structural modeling of networks.

Education

- Ph.D., Mathematics, Princeton University, June 1997, *Multiresolution homogenization schemes for differential equations and applications*, Professor Ingrid Daubechies, advisor.
- S.B., Mathematics (with honors), University of Chicago, June 1993.

Personal

- Citizenship: U.S.

Positions Held

- Assistant Professor. Department of Mathematics, University of Michigan, 2004–present.
- Principal technical staff member. Internet and Network Systems Research Center, AT&T Labs-Research, 2002–2004.
- Senior technical staff member. Information Sciences Research Center, AT&T Labs-Research, 1998–2002.
- Visiting instructor. Department of Mathematics, Stanford University, Winter quarter 2000.
- Postdoctoral research associate. Yale University and AT&T Labs-Research, 1997–1998.
- Intern. Lucent Technologies Bell Laboratories, summer 1996.
- Research assistant. Princeton University, 1994–1995.
- Intern. AT&T Bell Laboratories, summers 1993–1995.

Publications

Refereed Journal Publications

- A. C. Gilbert and J. A. Tropp, Signal recovery from partial information via Orthogonal Matching Pursuit, *submitted*, 2005.
- J. Zou, A. Gilbert, M. Strauss, and I. Daubechies, Theoretical and Experimental Analysis of a Randomized Algorithm for Sparse Fourier Transform Analysis, *Journal of Computational Physics*, vol. 211, No. 2, 2006, pp. 572–595.
- A. C. Gilbert, M. J. Strauss, and J. .A. Tropp, Algorithms for Simultaneous Sparse Approximation, to appear in special issue on sparse approximations in signal and image processing of *EURASIP J. Signal Processing*, 2005.
- J. Fong, A. C. Gilbert, S. Kannan, and M. Strauss, Better alternatives to OSPF routing, special issue of *Algorithmica* on network design, vol. 43, Nos.1–2, 2005, pp.113–131.

- A. C. Gilbert, Y. Kotidis, S. Muthukrishnan, and M. Strauss, Domain-driven data synopses for dynamic quantiles, *IEEE Transactions on Knowledge and Data Engineering*, vol. 17, no. 7, 2005, pp. 927–938.
- Don Caldwell, Anna Gilbert, Joel Gottlieb, Albert Greenberg, Gísli Hjálmtýsson, Jennifer Rexford, *The cutting EDGE of IP router configuration*, *Computer Communication Review* 34(1): 21–26 (2004).
- A. C. Gilbert, Y. Kotidis, S. Muthukrishnan, and M. J. Strauss, One-pass wavelet decompositions of data streams, *IEEE Transactions on Knowledge and Data Engineering*, vol. 15, no. 3, 2003, pp. 541–554.
- S. Resnick, G. Samorodnitsky, A. Gilbert, and W. Willinger, Wavelet analysis of conservative cascades, *Bernoulli*, 9(1):97–135, 2003.
- A. C. Gilbert, Multiscale analysis and data networks, *Applied and Computational Harmonic Analysis*, vol. 10, no. 3, pp. 185–202, May 2001.
- Y. Joo, V. Ribeiro, A. Feldmann, A. C. Gilbert, and W. Willinger, TCP/IP traffic dynamics and network performance: A lesson in workload modeling, flow control, and trace-driven simulations, *ACM SIGCOMM Computer Communication Review*, 2001.
- A. C. Gilbert, W. Willinger, A. Feldmann, Scaling analysis of random cascades, with applications to network traffic, *IEEE Trans. on Information Theory*, Vol. 45, **3**, 1999, pp. 971–991.
- A. Feldmann, A. C. Gilbert, W. Willinger and T. G. Kurtz, The changing nature of network traffic: Scaling phenomena, *ACM SIGCOMM Computer Communication Review*, Vol. 28, **2**, April 1998, pp. 5–29.
- A. C. Gilbert, A comparison of multiresolution and classical one-dimensional homogenization schemes, *Applied and Computational Harmonic Analysis*, vol. 5, no. 1, January 1998, pp. 1–35.
- G. Beylkin, M. E. Brewster and A. C. Gilbert, A multiresolution strategy for numerical reduction and homogenization of nonlinear ODEs, *Applied and Computational Harmonic Analysis*, vol. 5, no. 4, October 1998, pp. 312–331.

Refereed Conference Publications¹

- K. Herrity, A. C. Gilbert, and J. Tropp, Sparse Approximation via Iterative Thresholding, to appear in *Proceedings of the 2006 IEEE International Conference on Acoustics, Speech, and Signal Processing ICASSP*, Toulouse, France, 2006.
- W. Aiello, A. C. Gilbert, B. Rexroad, and V. Sekar, Sparse Approximations for High Fidelity Compression of Network Traffic Data, in *Proceedings of ACM Internet Measurement Conference IMC 2005*, New Orleans, LA, October 2005.
- A. C. Gilbert and J. A. Tropp, Applications of Sparse Approximations in Communications, in *Proceedings of IEEE International Symposium on Information Theory ISIT 2005*, September 2005.
- A. C. Gilbert, S. Muthukrishnan, and M. J. Strauss, Improved time bounds for near-optimal sparse Fourier representation via sampling, in *Proceedings of SPIE Wavelets XI*, San Diego, CA, 2005.
- J. Tropp, A. C. Gilbert, and M. J. Strauss, Simultaneous sparse approximation via greedy pursuit, invited paper, special session on “Sparse representations in signal processing”, in *Proceedings of the 2005 IEEE International Conference on Acoustics, Speech, and Signal Processing ICASSP*, Philadelphia, PA, March 2005.
- A. R. Calderbank, A. C. Gilbert, K. Levchenko, S. Muthukrishnan, and M. Strauss, Improved range-summable random variable construction algorithms, in *Proceedings of the 2005 SIAM Symposium on Discrete Algorithms SODA*, Vancouver, BC, January 2005.
- J. A. Tropp, A. C. Gilbert, S. Muthukrishnan, and M. J. Strauss, Improved sparse approximation over quasi-incoherent dictionaries, *IEEE International conference on image processing ICIP*, pp. 37–40, 2003.
- A. C. Gilbert, S. Muthukrishnan, and M. J. Strauss, Approximation of Functions over Redundant Dictionaries Using Coherence, in *Proceedings of 2003 SIAM Symposium on Discrete Algorithms SODA*, pp. 243–252, 2003.

¹The recent average acceptance rates for a number of conferences where I have published papers are: VLDB 17%, PODS 22%, STOC 27% , SODA 30%, ICASSP 50%, ISIT 50%, SIGCOMM 10%, and IMC 25%.

- A. C. Gilbert and H. Karloff, On the Fractal Behavior of TCP, *Proc. of the 2003 ACM Symposium on Theory of Computing STOC*, pp. 297–306, 2003.
- A. C. Gilbert, Y. Kotidis, S. Muthukrishnan, M. J. Strauss, How to summarize the universe: Dynamic maintenance of quantiles, in *Proc. of the 2002 Conference on Very Large Databases VLDB*, pp. 454–465, 2002.
- A. C. Gilbert, S. Guha, P. Indyk, Y. Kotidis, S. Muthukrishnan, M. J. Strauss, Fast, Small-Space Algorithms for Approximate Histogram Maintenance, in *Proc. of the 2002 ACM Symposium on Theory of Computing STOC*, pp. 389–398, 2002.
- A. C. Gilbert, S. Guha, P. Indyk, S. Muthukrishnan, M. J. Strauss, Near-Optimal Sparse Fourier Representations via Sampling, *Proc. of the 2002 ACM Symposium on Theory of Computing STOC*, pp. 152–161, 2002.
- A. C. Gilbert, Y. Kotidis, S. Muthukrishnan, M. Strauss, Surfing wavelets on streams: one-pass summaries for approximate aggregate queries, in *Proc. of the 2001 Conference on Very Large Databases VLDB*, pp. 79–88, 2001.
- A. C. Gilbert, Y. Kotidis, S. Muthukrishnan, M. Strauss, Optimal and Approximate Computation of Summary Statistics for Range Aggregates, in *Proc. of the 2001 ACM Principles of Database Systems PODS*, pp. 227–236, Santa Barbara, 2001.
- M. Gupta and A. Gilbert, Nonlinear vector multiresolution analysis, *Proc. of the 34th Asilomar Conference on Signals, Systems, and Computers*, 2000.
- A. Feldmann, A. C. Gilbert, P. Huang, and W. Willinger, Dynamics of IP Traffic: A Study of the Role of Variability and the Impact of Control, in *Proc. of the ACM SIGCOMM'99*, pp. 301–313, Boston, MA, 1999.
- Y. Joo, V. Ribeiro, A. Feldmann, A. C. Gilbert, and W. Willinger, On the impact of variability on the buffer dynamics in IP networks, in *Proc. of the 37th Annual Allerton Conference on Communication, Control, and Computing*, Allerton, IL, 1999.
- A. Feldmann, A. C. Gilbert, and W. Willinger, Data networks as cascades: Investigating the multifractal nature of Internet WAN traffic, in *Proc. of the ACM SIGCOMM'98*, pp. 42–55, Vancouver, B.C., 1998.
- A. C. Gilbert, A. Feldmann, W. Willinger, Visualizing multifractal scaling behavior: A simple scaling heuristic, in *Proc. of the 32nd Asilomar Conference on Signals, Systems, and Computers*, 1998.
- A. Feldmann, A. C. Gilbert, W. Willinger and T. G. Kurtz, Looking behind and beyond self-similarity: Scaling phenomena in measured WAN traffic, in *Proc. of the 35th Annual Allerton Conference on Communication, Control and Computing*, pp. 269–280, 1997.

Refereed Workshop Publications

- A. C. Gilbert and K. Levchenko, Compressing network graphs, in *Proceedings of the LinkKDD workshop at the 10th ACM Conference on KDD*, August 2004.
- J. Fong, A. Gilbert, S. Kannan, and M. Strauss, Better alternatives to OSPF routing, in *Proc. of Workshop on Approximation and Randomized Algorithms in Communication Networks (ARACNE)*, 2001.
- M. Gupta and A. Gilbert, Robust speech recognition using wavelet coefficient features, *Proc. of IEEE Automatic Speech Recognition and Understanding Workshop*, Italy, 2001.
- S. Seuret and A. Gilbert, Pointwise Hölder exponent estimation in data network traffic, *International Teletraffic Congress Workshop*, Monterey, CA, 2000.
- A. C. Gilbert, Y. Joo, and N. McKeown, Congestion control and periodic behavior, *Proc. of IEEE LANMAN Workshop*, Boulder, CO, 2001.

Book Chapters

- Anna C. Gilbert, “Dynamics of congestion control,” in *Complex Dynamics in Communication Networks*, G. Vattay and L. Kocarev, eds., Springer-Verlag, 2005.
- A. C. Gilbert, “Multiresolution homogenization schemes for differential equations and applications,” in *Topics in analysis and its applications: Selected theses*, Ronald Coifman, ed., World Scientific, 2000.

- I. C. Daubechies and A. C. Gilbert, “Harmonic analysis, wavelets, and applications,” in *Hyperbolic Equations and Frequency Interactions*, Luis Cafarelli and Weinan E, eds., IAS/Park City Mathematics Series, Vol. 5, 1998.

Grants

- CAREER: Modeling and Analysis of Data from Massive Graphs, NSF DMS 0547744, May 2006–April 2011, \$400,000.
- DARPA: Theory and Practice of Analog-to-Information Conversion, January 2006–December 2006, \$150,000.
- DDDAS-SMRP: Optimizing Signal and Image Processing in a Dynamic, Data-Driven Application System, NSF CNS 0540154, January 2006–November 2008, \$90,000.
- Elizabeth C. Crosby Research Award, University of Michigan, 2005–2006, \$20,000.
- FRG: Collaborative research in algorithms for sparse data representation, NSF DMS 0354600, September 2004–August 2007, \$317,808.

Ph.D. Students

- Ray Maleh, Department of Mathematics, University of Michigan, expected graduation date 2008.
- Served on the Ph.D. committee of Thiradet Jiarasuksakun, Department of Mathematics, University of Michigan, 2006.
- Served on the Ph.D. committee of Earl Lawrence, Department of Statistics, University of Michigan, 2005.
- Joel Tropp, *Topics in Sparse Approximation*, University of Texas at Austin (joint with Inderjit S. Dhillon, Dept. of Computer Science, UT-Austin), 2004.

REU/Summer Students Supervised

- Yi Wang (Univ. of Michigan, EECS), University of Michigan, 2006.
- Kyle Herrity (Univ. of Michigan, REU), University of Michigan, 2005.
- Daniel Sikora (Univ. of Michigan REU), University of Michigan, 2005.
- Kirill Levchenko (Univ. of California San Diego), AT&T Labs-Research, 2003.
- Joel Tropp (Univ. of Texas), AT&T Labs-Research, 2002.
- Jing Zou (Princeton University), AT&T Labs-Research, 2002.
- Maya Gupta (Stanford University), AT&T Labs-Research, 2000.
- Stephane Seuret (ENST), AT&T Labs-Research, 1999.
- Youngmi Joo (Stanford University), AT&T Labs-Research, 1999.
- Jennifer Steichen (Univ. Illinois), AT&T Labs-Research, 1998.

Courses Taught

- Winter 2006, Math 650, Fourier Analysis, Department of Mathematics, University of Michigan.
- Fall 2005, Math 425, Introduction to Probability, Department of Mathematics, University of Michigan.
- Fall 2005, Math 454, Boundary value problems for partial differential equations, Department of Mathematics, University of Michigan.
- Fall 2004, Math 454, Boundary value problems for partial differential equations, Department of Mathematics, University of Michigan.
- Fall 2004, Math 450, Advanced mathematics for engineers, Department of Mathematics, University of Michigan.
- Winter 2000, Time/Frequency analysis, Department of Mathematics, Stanford University.

Patents

- A. Gilbert, Y. Kotidis, S. Muthukrishnan, and M. Strauss, Dynamic Maintenance of Quantile Summaries. (Filed.)
- A. Gilbert, Y. Kotidis, S. Muthukrishnan, and M. Strauss, Method and Apparatus for Using Wavelets to Produce Data Summaries. (Filed.)
- A. Gilbert, S. Guha, P. Indyk, Y. Kotidis, S. Muthukrishnan, and M. Strauss, Method and Apparatus for Using Histograms to Produce Data Summaries. (Filed.)
- J. Fong, A. Gilbert, S. Kannan, and M. Strauss, Method for Routing Data Using a Fractional Open Shortest Path First Protocol. (Filed.)

Awards

- Awarded Alfred P. Sloan Fellowship, \$40,000, 2006–2008.
- Awarded NSF University-Industry Postdoctoral Research Fellowship, 1997-1999.
- Awarded AT&T Foundation Ph.D. Fellowship, 1995-1997.
- Awarded AT&T Foundation Graduate Research Program for Women grant, 1993–1997.
- Awarded National Physical Science Consortium Graduate Fellowship (1993)—declined to attend Princeton University.
- Phi Beta Kappa, May, 1993.

Invited Talks

- Invited speaker, von Neumann Symposium, Park City, Utah, 2007.
- Invited speaker, Abel Symposium, Ålesund, Norway, 2006.
- Colloquium speaker, Department of Applied Mathematics, Columbia University, New York, NY, 2006.
- Colloquium speaker, Department of Mathematics, Wayne State University, Detroit, MI, 2006.
- Colloquium speaker, Department of Computer Science, Harvard University, Boston, MA, 2005.
- Colloquium speaker, Departments of Mathematics and Statistics, Boston University, Boston, MA, 2005.
- Invited speaker, Sparse Representation in Redundant Systems Conference, Univ. of Maryland, College Park, MD 2005.
- Invited address, AMS Sectional Meeting, Newark, DE 2005.
- Invited speaker, Multiscale Geometry and Analysis in High Dimensions Conference, IPAM, Los Angeles, CA 2004.
- Plenary speaker, SIAM Annual Conference, San Diego, CA 2001.
- Invited speaker, Session on Internet Research As an Experimental Science, AAAS Annual Meeting, Anaheim, CA, January 1999.
- Invited speaker, SIAM Regional Meeting on Mathematics in Industry, Worcester, MA, May 1998.

Professional Service

- Executive Committee, University of Michigan, 2005–2006.
- Computing Committee, University of Michigan, 2004–2005.
- Applied and Interdisciplinary Mathematics (AIM) Graduate Committee University of Michigan, 2004–2005.
- Served on AT&T Labs Fellowship Program committee, 2002–2004.
- Initiated AT&T Shannon Postdoctoral Fellowship and chaired search committee, 2000-2001.

Editorial Service

- Associate editor for *Communications in Mathematical Sciences*.
- Program committee for mini-symposia at ICIAM, Sydney, Australia, 2003.
- Referee for *IEEE Trans. on Information Theory*, *IEEE Trans. on Networking*, *IEEE Trans. on Signal Processing*, *SIAM Journal on Applied Mathematics*, *EURASIP Journal of Signal Processing*.

Popular press

- Barry Cipra, Oh, What a Tangled Web We've Woven..., *SIAM News*, vol. 33, no. 2, 2000.
- Barry Cipra, Sublinear Computing: When Ignorance is Bliss, *SIAM News*, vol. 37, no. 3, 2004.