

PROFESSOR SHANG-HUA TENG

Department of Computer Science
Boston University
111 Cummington St, Boston, MA 02215
(617) 358-2596, steng@cs.bu.edu

25 Beacon Street
Apartment. 24
Somerville, MA 02143
(617) 616-5777

RESEARCH INTERESTS:

MAIN: Smoothed Analysis of Algorithms and Heuristics, Computational Game Theory, Spectral Graph Theory, Combinatorial Scientific Computing, Combinatorial Optimization, Mathematical Programming, Parallel Scientific Computing, Graph Partitioning and Data Mining, Computational Geometry with Applications in Computer Graphics and Mesh Generation, Graph Embedding.

SECONDARY: Internet Algorithms and Software, On-line Scheduling, Cache-Oblivious Algorithms, Cryptography and Computer Security, Large-scale Information Processing and Organization, Compiler Optimization, VLSI and Circuit Simulation, String Matching, Regression and Robust Statistics, Percolation and Phase Transition, and Bioinformatics.

OVERALL: I like interdisciplinary research and studies that intersect both theory and applications. Although these topics above appear to be diverse, the underlying principle of my research has been the same, that is, to understand the mathematical structure of these problems in order to design efficient algorithms and software.

EMPLOYMENT:

Professor, Computer Science	Boston University (2002 – Present)
Senior Research Scientist, Manager, Analysis and Visualization	Akamai (1999 – Present)
Research Affiliate Professor, Mathematics	MIT (1999 – Present)
Visiting Professor, Computer Science	Tsinghua University (2004 – Present)
Visiting Professor, Theory Group	Microsoft Research Asia (2006 – Present)
Professor, Computer Science	U. Illinois at Urbana-Champaign (2000 – 2002)
Research Scientist	IBM Almaden Research Center (1997 – 1999)
Associate Professor, Computer Science	U. Illinois at Urbana-Champaign (1997 – 1999)
Assistant Professor, Computer Science	Univ. of Minnesota (1994 – 1997)
Research Scientist	Intel Corporation (Summer 1994, 1995)
Faculty, Mathematics and Computer Science	MIT (1992 – 1994)
Computer Scientist	NASA Ames Research Center (Summer 1993)
Research Scientist	Xerox Palo Alto Research Center (1991 – 1992)

EDUCATION:

Ph.D. (Computer Science)	Carnegie Mellon University (1991)
Thesis: “Points, Spheres, and Separators: A Unified Geometric Approach to Graph Partitioning”	
Advisor: Gary Lee Miller	
M.S. (Computer Science)	University of Southern California (1988)
Thesis: “Security, Verifiability, and Universality in Distributed Computing”.	
Advised by Leonard Adleman and Ming-Deh Huang	
B.S. (Computer Science)	Shanghai Jiao-Tong University, China (1985)
B.A. (Electrical Engineering)	Shanghai Jiao-Tong University, China (1985)
Thesis: “Efficient Methods for implementing logic programs.”	Advisor: Yixing Hou

HONORS/AWARDS:

2008 Gödel Prize.

2008 PC Chair, *ACM-SIAM Symposium on Discrete Algorithms (SODA)*

2008 Member of ITCS Chair Professor Team at Tsinghua University

2005 Plenary speaker, *Foundations of Computational Mathematics*.

2005 Invited speaker, *11th Annual International Conference on Computing and Combinatorics*.

2004 Plenary speaker, *First SIAM Workshop on Combinatorial Scientific Computing*.

2003 Plenary speaker, *International Meshing Roundtable*.

2003 Plenary speaker, International Symposium on Computer and Information Sciences, Turkey.

2003 Joint work with Spielman on smoothed analysis was quoted as one of three significant accomplishments funded by the computer science division of the NSF in its 2003 Budget Request to Congress.

2000 List of Teachers Ranked as Excellent by Their Students (University of Illinois at Urbana-Champaign).

2000 PC Chair, *ACM Symposium on Parallel Algorithms and Architectures (SPAA)*

2000 PC Chair, *International Symposium on Algorithms and Computation (ISAAC)*

2000 Keynote Conferencias, Jornadas Chilenas de Computacion, Chile.

1999 Senior Xerox Award for Outstanding Faculty Research (UIUC).

1998 IBM Faculty Development Award.

1996 Alfred P. Sloan Foundation Research Fellowship.

1995 NSF CAREER Award.

1995 Intel Award for Distinguished Visiting Faculty.

1989 Student of Outstanding Academic Achievement (University of Southern California).

1985 Top student of 1981 – 1985 (Shanghai Jiao-Tong University).

PATENTS AWARDED:

“Internet based method for facilitating networking among persons with similar interests and for facilitating collaborative searching for information” (with R. Kraft, M. L. Emens, G. Tewari, and P. C.-S. Yim) United States Patent 6745178, June 1, 2004.

“Metadata search results ranking system” (with R. Kraft, M. L. Emens, S. B. Edlund and J. Myllymaki) United States Patent 6718324, April 6, 2004.

“Graphical user interface to query music by examples” (with R. Kraft and Q. Lu) United States Patent 6674452, January 6, 2004.

“Outbound information analysis for generating user interest profiles and improving user productivity” (with M. Eichstaedt and Q. Lu), United States Patent 6654735. November 25, 2003.

“Method and system for voice guided secure entry of private data in a public setting” (with Q. Lu) United States Patent 6519699, February 11, 2003.

“Efficient large-scale access control for internet/intranet information systems” (with Q. Lu) United States Patent 6,219,667.

“Collaborative team crawling: large scale information gathering over the internet” (with M. Eichstaedt, D. A. Ford, T. J. Lehman, and Q. Lu) United States Patent 6,182,085.

“Method and apparatus for music summarization and creation of audio summaries” (with R. Kraft and Q. Lu) United States Patent 6,225,546.

“Method and apparatus for parallel profile matching in a large scale webcasting system” (with M. Eichstaedt and Q. Lu) NI-133,682.

“Method and apparatus for parallel profile matching in a large scale webcasting system” (with M. Eichstaedt and Q. Lu) United States Patent 6,169,989.

“Automatic user interest profile generation from structured document access information” (M. Eichstaedt and Q. Lu) United States Patent 6,385,619.

“Generation of local address and communication sets for data-parallel programs” (with S. Chatterjee, J. Gilbert, F. J. E. Long and R. Schreiber) United States Patent 5,450,313, Sep. 12, 1995.

PATENTS FILED:

“Locally Computable Spam Detection Features and Robust PageRank” (with R. Andersen, C. Borgs, J. Chayes, K. Gade, J. Hopcroft, K. Jain, V. Mirrokni, and A. Prakash), Microsoft Research, 2007.

“Local Computation of Page Rank Contributions” (with R. Andersen, C. Borgs, J. Chayes, K. Gade, J. Hopcroft, V. Mirrokni, and A. Prakash), Microsoft Research, 2007.

JOURNAL PUBLICATIONS:

“Settling the Complexity of Computing Two-Player Nash Equilibria”, *Journal of ACM*, invited, 2007. This paper merged our conference version “Computing Nash Equilibria: Approximation and Smoothed Complexity” with “Settling the Complexity of Two-Player Nash Equilibrium” of Xi Chen and Xiaotie Deng. Both papers appeared in *IEEE Symposium on Foundations of Computer Science 2006*, respectively, on pages 603-612 and pages 261-272. (with Xi Chen and Xiaotie Deng).

“Spectral Partitioning Works: Planar graphs and finite element meshes”, *Linear Algebra and its Applications*, Volume 421, Issues 2-3, 1, March 2007, 284-305. (with Daniel A. Spielman).

“ k -Nearest-Neighbor Clustering and Percolation Theory”, in *Algorithmica*, 192-211, 49 (3), October 2007. (with Frances Yao)

“Parallel Delaunay Refinement: Algorithms and Analyses”, *International Journal of Computational Geometry & Applications*, Vol. 17, No. 1 (2007) 1-30. 2007, (with Daniel A. Spielman and Alper Ungor).

“Subspace gradient domain mesh deformation”, *ACM Transactions on Graphics (TOG)* 25 (3), July 2006. Conference Version: *Proceedings of ACM SIGGRAPH 2006* Pages: 1126 - 1134, 2006 (with Jin Huang, Xiaohan Shi, Xinguo Liu, Kun Zhou, Li-Yi Wei, Hujun Bao, Baining Guo, Heung-Yeung Shum).

“Lower-Stretch Spanning Trees.” *SIAM Journal on Computing*. Accepted and to appear 2007. Conference Version: *ACM Symposium on Theory of Computing* 2005, pp 494–503, (with Michael Elkin, Yuval Emek, and Daniel A. Spielman)

“Smoothed Analysis of Condition Numbers and Growth Factors of Matrices”, *SIAM Journal on Matrix Analysis and Applications*, 28 (2), 446 - 476, 2006. (With Arvind Sankar and Daniel A. Spielman).

“Smoothed Analysis of Algorithms: The Simplex Algorithm Usually Takes a Polynomial Number of Steps,” *Journal of the Association for Computing Machinery (JACM)*, 51 (3) pp: 385–463, May 2004. Conference Version: *the Annual ACM Symposium on Theory of Computing*, pages 296-305, 2001 (with Dan Spielman).

“Smoothed Analysis of Termination of Linear Programming Algorithms” *Mathematical Programming*, Series B, Volume 97. pp 375-404, July 2003 (with Daniel A. Spielman).

“Smoothed Analysis of Condition Numbers and Complexity Implications for Linear Programming”, *Mathematical Programming*, Series A, accepted and to appear.

“Layer based solutions for constrained space-time meshing”, *Applied Numerical Mathematics*, Vol 46, Issues 3-4, September 2003, Pages 425-443 Special issue of selected papers from 16th IMACS World Congress. (with Alper Ungor, Alla Sheffer, and Robert Haber)

“Recovering mesh geometry from a stiff matrix.” *Numerical Algorithms* 30: 303-322, 2002 (with A. Stathopoulos)

“Sliver Exudation”, *Journal of the Association for Computing Machinery (JACM)*, 47(5): 883-904 (2000). Conference Version: *15th ACM conference on Computational Geometry*, pp 1–13, 1999 (with S.-W. Cheng, T. Dey, H. Edelsbrunner, and M. Facello).

- “Regression depth and center points”, *Discrete Computational Geometry*, 23(3):305-323, 2000 (with N. Amenta, M. Bern, and D. Eppstein).
- “Practical human-machine identification over insecure channels” *Journal of Combinatorial Optimization*, 3(4): 347–361, 1999, (with X.-Y. Li).
- “Geometric mesh partitioning: implementation and experiments.” *SIAM J. Scientific Computing*, 19 (6) 2091–2110, 1998 (with J. R. Gilbert and G. L. Miller). Conference version: In *9th International Parallel Processing Symposium*, page 418–427, 1995.
- “Separators for sphere-packings and nearest neighborhood graphs.” *Journal of the Association for Computing Machinery (JACM)* 44 (1), 1–29, January 1997 (with G. L. Miller, W. Thurston, and S. A. Vavasis).
- “Generating a good quality point set for the meshless methods”, In *the Computer Modeling in Engineering & Sciences (CMES)*, 10–17, 2000 (with X.-Y. Li and A. Ungor).
- “On the radius–edge condition in the control volume method.” *SIAM J. on Numerical Analysis*, 36(6), pp. 1690-1708, 1999, (with G. L. Miller, D. Talmor, and N. Walkington).
- “Simultaneous refinement and coarsening for adaptive meshing”, In *Journal of Engineering with Computers*, (15), 292-302, 1999. Conference Version: In *7th International Meshing Roundtable*, page 101–110, 1998 (with X.-Y. Li and A. Ungor).
- “To generate good triangular meshes: conforming to control spacing requirements”, In *Computer Modeling in Engineering & Sciences (CMES)*, Vol. 2, No. 1, pp. 97-116, 2001. (with X.-Y. Li and P.-J. Wan).
- “Biting: Advancing front meets sphere packing”, In *International Journal of Numerical Methods in Engineering (IJNME)*, 61-81, 2000 (with X.-Y. Li and A. Ungor).
- “Unstructured mesh generation: algorithms, software, and perspectives.” *International Journal of Computational Geometry and Applications*, Vol. 10, No. 3 (2000) 227-266, June, 1999 (with C. W. Wong).
- “Optimal coarsening of unstructured meshes.” *Journal of Algorithms*, 31(1): 29-65 (1999). Conference Version: “Optimal Good Aspect Ratio Coarsening for Unstructured Meshes” In *ACM-SIAM Symposium on Discrete Algorithms*, pp 538–547, January 1997. ACM-SIAM (with G. L. Miller and D. Talmor).
- “Min-Max-Boundary Domain Decomposition” *TCS* 261(2): 253-266 (2001) (with M. Kiwi and D. S. Spielman).
- “Finite-element meshes and geometric separators.” *SIAM J. Scientific Computing*, SISC 19-2 (March 1998), 364–386, (with G. L. Miller, W. Thurston, and S. A. Vavasis).
- “Fault-tolerant properties of pyramid networks” *IEEE Transactions on Computers*, 88-93, Vol. 48, No. 1, January, 1999. Conference Version: International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA’97) (with F. Cao, D. Z. Du, and D. F. Hsu).
- “Moment of inertia and graph separators.” *Journal of Combinatorial Optimization*, 1(1), page 79–105, 1997. Conference version: In *Fifth Annual ACM-SIAM Symposium on Discrete Algorithms*, pp 452–461, January 1994. ACM-SIAM (with K. Gremban and G. L. Miller).

“Parallel construction of quadtrees and quality triangulations.” in *International Journal on Computational Geometry and Applications*, 9(6):517-532 (1999) Conference version: *Workshop on Algorithms and Data Structures, (WADS)*, pp 188–199, 1993 (with M. Bern and D. Eppstein).

“Greedy algorithms for low energy and mutually distant sampling.” *J. Algorithms*, 30: 52–67, January 1999.

“How good is recursive bisection.” *SIAM, J. Scientific Computing*, 18(5) 1436-1445: September, 1997, (with H. Simon).

“Fast nested dissection for Finite Element Meshes”, *SIAM J. Matrix ANAL. and Appl.*, 18 (3), 552–565, July, 1997. Conference version: In the *Second Annual International Conference on Computing and Combinatorics*, page 189–198, Lecture Notes in Computer Science, 1090, Springer, 1996.

“Data Generation for Geometric Algorithms on Non-Uniform Distributions.” *International Journal of Computational Geometry and Applications*, 9(6), 577-598, Dec. 1999 (with G. L. Miller and D. Talmor).

“Provably good partitioning and load balancing algorithms for parallel adaptive N-body simulation.” *SIAM J. Scientific Computing*, 19(2), 635–656, March 1998.

“Approximating shortest superstrings.” *SIAM J. on Computing*, 26 (2), 410–417, April, 1997. Conference version: in *Proceedings of the 34th Annual Symposium on Foundation of Computer Science*, pp 158–167, IEEE, 1993 (with F. F. Yao).

“The Dynamic Parallel Complexity of Computational Circuits.” *SIAM J. on Computing*, 28(5) pp. 1664-1688, 1999. Conference version: *Proceedings of the 19th Annual ACM Symposium on Theory of Computing*, pages 254–263, ACM, 1987 (with G. L. Miller).

“Combinatorial aspects of geometric graphs.” *Computational Geometry: Theory and Applications* (9) 277–287, 1998.

“Optimal evaluation of array expressions on massively parallel machines.” *ACM Transactions on Programming Languages and Systems*, 17(1), January, 123-156 1995. Conference version: In the *Second Workshop on Languages, Compilers, and Run-Time Environments for Distributed Memory Multiprocessors*, Boulder, Colorado, 1992. (with S. Chatterjee, J. Gilbert and R. Schreiber).

“Generating local address and communication sets for data-parallel programs.” *Journal of Parallel and Distributed Computing*, 26(1), April page 72–84, 1995. Conference version: In the *Proceedings Fourth ACM Symposium on Principles and Practice of Parallel Programming*, San Diego, 1993, (with S. Chatterjee, J. Gilbert, F. J. E. Long and R. Schreiber).

“Dynamic scheduling on parallel machines.” *Theoretical Computer Science*, 130 pp 49–72, 1994. Conference version: in *Proceedings of the 32nd Annual Symposium on Foundation of Computer Science*, pages 111–120, IEEE, 1991 (with A. Feldmann and J. Sgall).

“Simple and efficient graph compression schemes for dense and complement graphs.” *Journal of Combinatorial Optimization*, 2(4): 351-359, 1998 (with M.-Y. Kao and N. Occhiogrosso).

“Optimal online scheduling of parallel jobs with dependencies.” *Journal of Combinatorial Optimization*, April, pp393–412, 4(1) 1998. Conference version: in *Proceedings of the 25th Annual ACM Symposium on Theory of Computing*, ACM, 1993 (with A. Feldmann, M.-Y. Kao and J. Sgall). This paper was plagiarized and published by and under the name of Papadopoulos, C.V. in *PARLE '94. Parallel Architectures and Languages Europe. 6th International PARLE Conference Proceedings*, with title “A dynamic algorithm for online scheduling of parallel processes.”

“Functional inversion and communication complexity.” *Journal of Cryptology*, 7, 153-170, 1994. Conference version: In *CRYPTO91, IACR*, 1991.

“Security, verifiability, and universality in distributed computing.” *Journal of Algorithms*, 11, pp 492-521, 1990 (with M-D. Huang).

“Independent sets versus perfect matchings.” *Theoretical Computer Science*, pp 381-390, 1995.

“Complexity of computing the diameter of a polyhedron.” *Journal of Computational Complexity*, 4, 207–219, 1994 (with A. M. Frieze).

“Tree-Based Parallel Algorithm Design.” in *Algorithmica*, 19: 369–389, 1997 (with G. L. Miller).

“Approximating center points with iterated Radon points.” *International Journal of Computational Geometry and Applications*, 6(3):357-377, 1996. Conference version: In the *ACM Symposium on Computational Geometry*, San Diego, 1993, (with K. Clarkson, D. Eppstein, G. Miller and C. Sturtivant).

“A deterministic linear time algorithm for geometric separators and its applications.” *Fundamenta Informaticae*, special issues on Computational Geometry (editor H. Edelsbrunner), 309–330, 1995. Conference version: In the *Proceedings of 9th ACM Symposium on Computational Geometry*, San Diego, 1993, (with D. Eppstein and G. L. Miller).

“Improved parallel depth-first search in undirected planar graphs.” *Algorithmica*, 14(5) 398–408, Nov. 1995. Conference version: In *Workshop on Algorithms and Data Structures, (WADS)*, 1993 (with M.-Y. Kao and K. Toyama).

“The construction of Huffman–equivalent prefix code in NC.” *ACM SIGACT News*, 18 (4), pp 54–63, 1987.

“Adaptive parallel algorithm for integral knapsack problems.” *Journal of Parallel and Distributed Computing*, pp400-406, May 1990.

“Space efficient processor identity protocols.” *Inform. Processing Letter*, pp147-154, 1990.

“Parallel algorithms for message decomposition.” *Journal of Parallel and Distributed Computing*, pp 231–249, 1987, (with B. Wang).

“The strategies for implementing logic programs.” Part I, *Computer Engineering*, 4, pp 62–72, 1986 (with Y. X. Huo).

“The strategies for implementing logic programs.” Part II *Computer Engineering*, 5, pp 63–69, 1986 (with Y. X. Huo).

INVITED BOOK CHAPTERS:

“Smoothed Analysis of Algorithms and Heuristics”, *Foundations of Computational Mathematics*, pp274 – 342. L. Pardo, Pinkus, Suli, M. J. Todd ed. London Mathematical Society, Lecture Note Series 331.

“Coarsening, sampling, and smoothing: elements of the multilevel method.” R. Schreiber ed. The IMA Volumes in Mathematics and Its Applications, Springer-Verlag, pp247-276, 1998.

“Automatic mesh partitioning.” In *Graph Theory and Sparse Matrix Computation*, The IMA Volumes in Mathematics and Its Applications, vol 56, A. George, J. R. Gilbert, and J. W. H. Liu ed., page 57–84, Springer-Verlag, 1993 (with G. L. Miller, W. Thurston, and S.A. Vavasis).

“Mutually repellent sampling”. In *Minimax and its Applications*, Ding-Zu Du and Panos M. Pardalos ed., Kluwer Academic Publishers.

CONFERENCE PUBLICATIONS (not to journal [yet]):

“Paths Beyond Local Search: A Tight Bound for Randomized Fixed-Point Computation”, In *IEEE Symposium on Foundations of Computer Science*, 2007 (with Xi Chen).

“A PSPACE-complete Sperner Triangle Game”. In *3rd international Workshop on Internet and Network Economics*, 2007 (with Kyle Burke).

“Local Computation of PageRank Contributions”. In *the 5th Workshop On Algorithms And Models For The Web-Graph*, 2007 (with Reid Andersen, Jennifer Chayes, Christian Borgs, Vahab Mirrokni Banadaki, and John Hopcroft).

“Algorithm Design and Analysis with Perturbations”, in *the Fourth International Congress of Chinese Mathematicians*, 2007.

“On the Approximation and Smoothed Complexity of Leontief Market Equilibria”, in *Frontiers of Algorithms Workshop*, 96-107, LNCS 4613, Springer 2007, (with Li-Sha Huang)

“The Approximation Complexity of Win-Lose Games”, In *Annual ACM-SIAM Symposium on Discrete Algorithms*, 2007, (with Xi Chen and Paul Valiant).

“Combinatorial and Spectral Aspects of Nearest Neighbor Graphs in Doubling Dimensional and Nearly-Euclidean Spaces”, in the *4th International Conference on Theory and Applications of Models of Computation*, pages 554-565, 2007, (with Yingchao Zhao).

“Truthful Auctions with Optimal Profit”, *2nd international Workshop on Internet and Network Economics*, 27-36, 2006 (with Pinyan Lu and Changyuan Yu).

“Sparse Games Are Hard”, *2nd international Workshop on Internet and Network Economics*, 262-273, 2006 (with Xi Chen and Xiaotie Deng).

“Market Equilibria with Hybrid Linear-Leontief Utilities”, *2nd international Workshop on Internet and Network Economics*, 274-285, 2006 (with Xi Chen and Li-Sha Huang).

“Geometric Separator for d-Dimensional Ball Graphs”, in *the 18th Annual Canadian Conference on Computational Geometry*, 2006 (with Kebin Wang).

“On Trip Planning Queries in Spatial Databases”, in the *9th International Symposium on Advances in Spatial and Temporal Databases*, 273-290, 2005 (with Feifei Li, Dihan Cheng, Marios Hadjieleftheriou and George Kollios).

“Nearly-linear time algorithms for graph partitioning, graph sparsification, and solving linear systems.” *ACM Symposium on Theory of Computing* 2004: 81-90, (with Daniel A. Spielman)

“Time complexity of practical parallel steiner point insertion algorithms.” *ACM Sym. on Parallel Alg. and Architectures* 2004, 267–268, (With Daniel Spielman and Alper Ungor)

“Parallel Delaunay Refinement with Off-Centers”. *Euro-Par 2004*, pp 812-819 (With Daniel A. Spielman and Alper Ungor).

“Solving Sparse, Symmetric, Diagonally-Dominant Linear Systems in Time $O(m^{1.31})$ ” *IEEE Symposium on Foundations of Computer Science*. 2003 (with Daniel Spielman).

“Smoothed Analysis (Motivation and Discrete Models)”. *Algorithms and Data Structures, 8th International Workshop* 2003: 256-270

“Multilevel 3D registration of lung surfaces in computed tomography scan – preliminary experience” In *Proceedings of the International Conference on Diagnostic Imaging and Analysis, ICDIA 2002*, pp. 90–95, August 2002 (with H. Hong, M. Betke, D. Thomas, and J.P. Ko).

“Smoothing and cleaning up slivers.” In the *Proceedings of the 32nd Annual ACM Symposium on Theory of Computing*, page 273-277, ACM, 2000 (H. Edelsbrunner, X.-Y. Li, G. L. Miller, A. Stathopoulos, D. Talmor, S.-H. Teng, A. Ungor, N. Walkington).

“Generating well-shaped delaunay meshes in 3D”, In *12th Annual ACM-SIAM Symposium on Discrete Algorithms*, 2001, (with X.-Y. Li).

“Collaborative team crawling: information gathering/processing over internet” In *HICSS32: the 32nd Hawaii International Conference on System Sciences (the Internet Fundamentals Minitrack in the Internet and Digital Economy Track)*, January 5-8, 1999 (with M. Eichstaedt, Q. Lu, D. Ford, and T. Lehman).

“Efficient large-scale access control for internet/intranet information systems” In *HICSS32: the 32nd Hawaii International Conference on System Sciences (the Internet Fundamentals Minitrack in the Internet and Digital Economy Track)*, January 5-8, 1999 (with Q. Lu).

“Parallel profile matching for large scale Webcasting”, in *5th International Symposium on Solving Irregularly Structured Problem in Parallel (Irregular’98)*, Berkeley, Lecture Notes in Computer Science, 1457, Springer, pp 17–28, 1998 (with M. Eichstaedt and Q. Lu).

“High Performance Fortran for highly irregular problems.” in *Proceedings of the 6th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, Las Vegas, Nevada, June 1997 (with Y. C. Hu and S. L. Johnson).

“Dynamic load balancing for parallel adaptive mesh refinement”, in *5th International Symposium on Solving Irregularly Structured Problem in Parallel (Irregular’98)*, Berkeley, Lecture Notes in Computer Science, 1457, Springer, pp 144–155, 1998 (with X.-Y. Li).

“Control Volume Meshes Using Sphere Packing: Generation, Refinement, and Coarsening”. In the *5th International Meshing Roundtable*, page 47–61, October, 1996 (with G. L. Miller, D. Talmor, N. Walkington, and H. Wang).

“Disk Packings and Planar Separators.” In the *Proceedings of 12th ACM Symposium on Computational Geometry*, Philadelphia, pp 349–358, 1996, (with D. Spielman)

“A Delaunay Based Numerical Method for Three Dimensions: generation, formulation, and partition.” In the *Proceedings of the 27th Annual ACM Symposium on Theory of Computing*, ACM, page 683-692, 1995 (with G. L. Miller, D. Talmor, N. Walkington).

“A Data-Parallel Adaptive N-body Method”. Invited talk at Parallel N-body solver minisymposia of the 8th SIAM Conference on Parallel Processing for Scientific Computing, Minneapolis, MN, March 1997 (with Y. C. Hu and S. L. Johnsson).

“A Data-Parallel Implementation of the Geometric Partitioning Algorithm”. Proceedings of the 8th SIAM Conference on Parallel Processing for Scientific Computing, Minneapolis, MN, March 1997 (with Y. C. Hu and S. L. Johnsson).

“Adaptive N-body simulations in High Performance Fortran”. *High Performance Fortran (HPF) User Group Conference*, February 1997 (with Y. C. Hu and S. L. Johnsson).

“Partitioning unstructured meshes with lines and planes.” In *The Ninth International Conference on Domain Decomposition* 1996, (with F. Cao and J. R. Gilbert)

“A Geometric Approach to Parallel Hierarchical and Adaptive Computing on Unstructured Meshes.” In *Fifth SIAM Conference on Applied Linear Algebra*, pp 51–57, June 1994.

“Automatic array alignment in data-parallel programs.” *Proceedings of the Twentieth Annual ACM Symposium on Principles of Programming Languages*, Charleston, SC, 1993 (with S. Chatterjee, J. Gilbert and R. Schreiber).

“Geometric mesh partitioning and nested dissection.” *12th Householder Symposium on Numerical Algebra*, Plenary talk, June 15; 1993 (with J. R. Gilbert and G. L. Miller).

“A separator-based framework for automated partitioning and mapping of parallel algorithms in scientific computing.” *First Annual Summer Institute on Issues and Obstacles in the Practical Implementation of Parallel Algorithms and the use of Parallel Machines*, 1992, (with G. Blelloch, A. Feldmann, O. Ghattas, J. Gilbert, G. Miller, D. R. O’Hallaron, E. Schwabe, J. Schewchuk).

“A geometric approach to graph separators with applications to sparse matrix computation.” *IMA Workshop on Sparse Matrix Computation: Graph Theory Issues and Algorithms*, Minneapolis, Minnesota, October 1991 (with G. L. Miller, W. Thurston, and S. A. Vavasis).

“A unified geometric approach to graph separators.” *Proceedings of the 32nd Annual Symposium on Foundation of Computer Science*, pages 538–547, IEEE, 1991 (with G. L. Miller and S. Vavasis).

“Separator based divide and conquer in computational geometry.” *Proceedings of the 1992 ACM Symposium on Parallel Algorithms and Architectures*, pages 420–430, 1992 (with A. M. Frieze and G. L. Miller).

“Secure and verifiable schemes for election and general distributed computing problems.” *Proceedings of the Seventh Annual ACM Symposium on Principles of Distributed Computing*, pp 182–196 Toronto, 1988 (with M-D. Huang).

“Constructing tree in parallel.” *Proceedings of the 1989 ACM Symposium on Parallel Algorithms and Architectures*, pp 421–431, 1989 (with M. J. Atallah, S. R. Kosaraju, L. L. Larmore, and G. L. Miller).

“Optimal tree contraction in the EREW model.” *Proceedings 1987 Princeton Workshop on Algorithm, Architecture and Technology: Issues for Models of Concurrent Computation*, pp 139–156, (with H. Gazit and G. L. Miller).

“A universal problem in secure and verifiable distributed computing.” *CRYPTO88, IACR*, 1988, (with M-D. Huang).

SOFTWARE AND PROJECTS INVOLVED:

Akamai Data Analysis Center (AKADAC); Next Generation Internet Mapper.

IBM Grant Central Station and Jcentral.

MESHPART: Matlab Mesh Partitioning and Graph Separator Toolbox (with John Gilbert).

Intel Sharks: A parallel transistor-level circuit simulator (at Intel).

CONFERENCE/WORKSHOP INVITED LECTURER:

“Game and Market Equilibria: Computation, Approximation, and Smoothed Analysis”, invited speaker, *Third International Conference on Algorithmic Aspects in Information and Management*, June 2007, Portland.

“Computing Nash Equilibria”, invited speaker, *Frontiers of Algorithms Workshop*, Lanzhou, China, 2007.

“Smoothed Analysis of Algorithms: Numerical Computing and Optimization”, plenary speaker, *Foundations of Computational Mathematics*, July 2005, Spain.

“Smoothed Analysis of Algorithms and Heuristics”, invited lecture, *11th Annual International Conference on Computing and Combinatorics*, 2005, Kunming, China.

“Smoothed Analysis of Algorithms”, invited plenary speaker, *SIAM Workshop on Combinatorial Scientific Computing*, Feb 27-28 2004, SF.

“Generating Sliver-Free Well-Shaped Delaunay Meshes in Three Dimensions”, 13th International Meshing Roundtable, Santa Fe, Sept. 2003.

“Smoothed Analysis of Algorithms”, invited speaker, ISCIS XVIII - Eighteenth International Symposium on Computer and Information Sciences, November 3-5, 2003 Antalya, Turkey.

“Smoothed Analysis of the Simplex Algorithm”, invited speaker Conference on Typical-Case Complexity, Randomness and Analysis of Search Algorithms, Trieste, Italy, 2002.

“Serving Information to the Edge of the Internet: Information Search and Content Delivery”, Keynote Conferencias, Jornadas Chilenas de Computacion 2000, Santiago, Chile, Nov. 2000.

“Graph Partitioning with Eigenvectors”, Invited speaker, Symposium on Parallel and Distributed Computing, National University of Singapore, July 20–21, 1998.

Invited lecturer, the Summer Institute on “Parallel and Distributed Computing” Center for Applied Science and Engineering and Institute of Information Science Academia Sinica Nankang, Taiwan, Republic of China, July 23–29, 1998.

“Unstructured Mesh Generation, Refinement, and Coarsening: A Unified Approach”, Amy HPC Research Center Workshop on Unstructured Mesh Generation and Partitioning, Oct. 1997.

“Coarsening, Sampling, and Smoothing: Elements of the Multilevel Method” Sixth SIAM Conference on Applied Linear Algebra, October 29-November 1, Snowbird Ski & Summer Resort, Snowbird, UT.

“The Spectral Analysis of Planar Graphs and Finite Element Meshes.” SIAM Annual Meeting, Stanford University, 1997.

“Why Does Spectral Partitioning Work?”. IMA workshop on mathematics in high-performance computing, September 1996.

“Automatic Mesh Coarsening”. Workshop on parallel unstructured grid computations, Argon, September 1996.

“Computational Geometry for Scientific Computing”. International Computational Geometry Software Workshop, Geometry Center, Minneapolis, January 1995.

“Parallel Scientific Computing: Methods, Algorithms, and Algorithms.” an invited tutorial, International Conference on Parallel and Distributed Systems, Taiwan, December, 1994.

“Parallel Hierarchical and Adaptive Computing on Unstructured Meshes.” The Fifth SIAM Conference on Applied Linear Algebra, June, Snowbird, 1994.

LECTURE NOTES

Parallel Scientific Computing, 18.337, (with Alan Edelman)

Geometric Methods and Algorithms, 18.409, MIT/LCS/RSS-26, Research Seminar Series, Spring 1993.

GRANTS:

NSF 0635102, *Collaborative Research: Spectral Graph Theory and Its Applications*, \$300,000, (2007-2010) (with Gary Miller of CMU, Satish Rao of UC Berkeley, and Dan Spielman of Yale).

NSF Grant CCR-0325630, *ITR: Collaborative Research: Smoothed Analysis of Algorithms*, \$500,000, (2003-2008) (1M\$ total with Dan Spielman of MIT).

NSF Grant CCR-0311430, *Spectral Analysis for Graph Partitioning*, \$250,000, (2003-2006).

NSF Grant CCR 99-72532, *The eigenvalue problem in geometry and combinatorial optimization*, \$250,000, (1999-2002).

NSF Grant EIA-0088063, *CRCD: A Cryptography Center for Research and Education*. \$437,349, (2000-2003) (with Nigel Boston and Richard E. Blahut of UIUC)

Automatic Audio Summarization for Distance Learning, \$35,000, IBM Almaden Research Center, 1998–2000.

NSF OPAAL grants: *Center for Process Simulation and Design* (\$2.45 million for the center), 1998 - 2001.

DOE ASCI Initiative: *Center for Simulation of Advanced Rockets*, (\$20 million for the center and \$.5 million for Adaptive Mesh Generation), 1997–2002.

NSF Career Program: *Geometric Methods for Numerical Computing* [CCR-9502540] (\$129,935), 1995–1998.

Alfred P. Sloan Research Fellow (\$35,000), 1996–1998.

Intel Visiting Faculty Program, (\$10,000), 1995–1997.

Hitachi Software Research Grant: *Human-user Identification Method* (\$30,000), 1996 – 1998.

UoM Graduate School (grant-in-aid): *A Geometric Approach to Mesh Partitioning with Application to Parallel Scientific Computing* (\$18,550), 1994–1995.

When I was at MIT, I was part of a team in two grants whose PI was Professor F. Tom Leighton (AFOSR F49620-92-J-0125 and Darpa N00014-92-J-1799).

TEACHING EXPERIENCE:

- *Cryptography*, (undergraduate/graduate), Fall 2006, BU.
- *Geometric Algorithms and Applications*, (undergraduate), Springs 2004, 2005, 2006, 2007, BU.
- *Advanced Computational Geometry*, (graduate), Fall 2004, Bonton University.
- *Algorithms for the New Age*, (graduate), Fall 2002, at Boston University.
- *Algorithms* (undergraduate), Fall of 2007, Spring/Fall of 2003 at Boston University.
- *Geometric Methods and Scientific Computing* (graduate), Spring 2002 at Boston University.
- *Topics in Theoretical Computer Science: Internet Research Problems* (graduate) Fall 2001 at MIT (teaching with Tom Leighton, Danny Lewin, and Bruce Maggs)
- *Cryptography and Network Security* (graduate), Fall, 1997 and 1998, 1999, 2001 at UIUC.
- *Randomized Algorithms and Combinatorial Optimization*, (graduate), Spring, 1999 at UIUC.
- *Numerical Analysis and Scientific Computing* (undergraduate/graduate), Spring, 1998 at UIUC.
- *Introduction to Computational Geometry* (graduate/undergraduate), Spring, 1996 at U. Minnesota.
- *Advanced Algorithms* (graduate), Winter, 1996 at U. Minnesota.
- *High-Performance Scientific Computing* (graduate), Fall 1994, 1995 at U. Minnesota.
- *Introduction to Procedural Programming in C* (undergraduate), Winter 1995 at U. Minnesota.
- *An Introduction to Computer Applications for Scientists and Engineers* (undergraduate), Spring 1995 at U. Minnesota.
- *Parallel Scientific Computing* (graduate), Spring 1994 at MIT.
- *Differential Equations* (undergraduate), Spring 1994 at MIT
- *The Probabilistic Method* (graduate), Fall 1993 at MIT.
- *Computational Geometry* (graduate), Spring 1993 at MIT.
- *Calculus* (first year undergraduate, recitation), Fall 1992 at MIT.
- *A Peek at Parallel Processing from an Applications Perspective* (summer professional program), Summer 1994, 1995, and 1996 at MIT (with Alan Edelman and Robert Schreiber).

STUDENTS SUPERVISED

Ph.D.:

- Alper Ungor, Ph. D. (Computer Science), UIUC 2002. Thesis: *Parallel Delaunay refinement and space-time meshing*.
- Xiang-Yang Li, Ph.D. (Computer Science), UIUC, 2000. Thesis: *Sliver-Free Three Dimensional Delaunay Mesh Generation*.

- John Rachlin, Ph.D. (Computer Science), Boston University 2006. (Simon Kasif is his major advisor, I am his CS advisor). Thesis: *Multi-Node Graphs and their Application to Bioinformatics*.
- Matthias Eichstaedt, Ph.D (Computer Science), University of Hagen, Germany, 1999. Thesis: *Generating and Matching Profiles in Large Scale Webcasting Systems*, (with Professor Gunter Schlageter and Qi Lu).
- Feng Cao, Ph.D. (Computer Science), U. Minnesota, 1997. Thesis: *Fault-tolerance and Mesh Partitioning in Parallel Processing*. (with Professor D.-Z. Du).

Ph.D., whose joint work with me are part of the thesis:

- Xi Chen, Ph.D. (Computer Science), Tsinghua, 2007. Thesis: *The Complexity of Two-Player Nash Equilibria*, (Advisor: Professor Bo Zhang).
- Li-Sha Huang, Ph.D. (Computer Science), Tsinghua, 2007. Thesis: *Algorithms for Computing Market Equilibria*, (Advisor: Professor Bo Zhang and Xiaotie Deng).
- Arvind Sankar, Ph.D. (Mathematics) MIT, 2004. Thesis: *Smoothed analysis of Gaussian elimination*. (Advisor: Professor Daniel Spielman).
- John Dunagan, Ph.D. (Computer Science) MIT, 2002. Thesis: *A Geometric Theory of Outliers and Perturbation* (Advisor: Professor Santosh Vempala).
- Dafna Talmor, Ph.D. (Computer Science) Carnegie Mellon University, 1997. Thesis: *Mesh Coarsening and Three Dimensional Mesh Generation*. (Advisor: Professor Gary L. Miller).
- Jiri Sgall, Ph.D. (Computer Science), Carnegie Mellon University, 1994. Thesis: *On-line scheduling on parallel machines*. (Advisor: Professor Steven Rudich).

M.S.:

- Dihan Cheng, M.S. (Computer Science), Boston University, 2005.
- Mykhaylo Burenkov, M.S. (Computer Science), BU 2005. Thesis: *Adaptive and feature sensitive registration and reconstruction of surfaces from laser range data*.
- Shameek Basu, M.S. (Computer Science), UIUC, 1998. Project: *Automatic audio summarization for distance learning*.
- Andrew O. Forester, M.S. (Computer Science) U. Minnesota. 1998. Thesis: *Algorithms in Network Security*.
- Shuping Zhang, M.S. (Computer Science), U. Minnesota 1997.
- Dongli Su, M.S. (Computer Science) U. Minnesota, 1997. (with Professor A. Sameh).
- Olivier Meirhaeghe, M.S., (Computer Science), U. Minnesota 1996.
- Chris Flis, M.S. (Computer Science) U. Minnesota, 1996. Thesis: *Cryptography and Secure Transaction*.
- John Leo, M.S. (Computer Science), MIT, 1994. Project: *Data Structures for Finite Element Calculations*,

Current Ph.D Students

- Kyle Burke, Ph.D. Candidate, (Computer Science), Boston University. Area of interests: *game theory and complexity*.
- Kebin Wang, Ph.D. Candidate, (Computer Science), Boston University Area of interests: *cache oblivious algorithms*.
- Konstantin Voevodski, Ph. D. Candidate (Computer Science), Boston University, with Simon Kasif. Area of interests: *algorithms in bioinformatics*.

PROFESSIONAL ACTIVITIES

- **Chair of Faculty Search Committee**, Computer Science Department, Boston University, 2004.
- **Chair of Faculty Search Committee**, Computer Science Department, Boston University, 2005.
- **Chair of Faculty Annual Report Evaluation Committee**, Computer Science Department, Boston University, 2007.
- **Manager**, Data Analysis Group, Akamai Technologies Inc, 1999-2000.
- **Editor**: *Journal of Combinatorial Optimization*.
- **Editor**: *Journal of Computer and System Sciences (JCSS)*.
- **Program Committee Member**:
 - Chair, ACM/SIAM Symposium on Discrete Algorithms, January 2008.
 - Co-organizer, Schloss Dagstuhl seminar on Probabilistic Methods in the Design and Analysis of Algorithms, September, 2007.
 - The 3rd International Workshop On Internet And Network Economics, December, 2007.
 - The Eleventh International Computing and Combinatorics Conference, August, 2005.
 - LATIN'06, March 20 - 24, 2006.
 - ACM/SIAM Symposium on Discrete Algorithms, January, 22-24, 2006.
 - The 1st Workshop on Internet and Network Economics, December 15-17, 2005.
 - The Eleventh International Computing and Combinatorics Conference, August 16-19, 2005.
 - SIAM Conference on Computational Science and Engineering (CSE03) February 10-13, 2003.
 - 19th ACM Symposium on Computational Geometry, June 8-10, 2003, San Diego (Video Program Committee).
 - International Conference on Parallel Processing 2003.
 - Co-Chair, 11th Annual International Symposium on Algorithms and Computation (ISAAC 2000), Taipei, Taiwan, December 18–20, 2000.
 - Program Chair, the Twelfth Annual ACM Symposium on Parallel Algorithms and Architectures (SPAA'00), Bar Harbor, Maine, July 9-13, 2000,
 - Panelist of Workshop on “Challenges for Theoretical Computer Science,” address on issues about “Connections of Theoretical Computer Science to Other Sciences” (Dick Karp chair), organized by NSF, SIAM, DIMACS, and SIGACT, May 20, 2000, Portland, Oregon,
 - The 31st Annual ACM Symposium on Theory of Computing, (part of FCRC) Atlanta, 1999.
 - Eleventh Annual ACM Symposium on Parallel Algorithms and Architectures (SPAA'99), France, June 28 to June 30, 1999,
 - Video Committee, Fifteenth Annual ACM Symposium on Computational Geometry, June 13-16, 1999, Miami Beach, Florida
 - Co-Chair (with Horst Simon) of 5th International Symposium on Solving Irregularly Structured Problems in Parallel, Berkeley, Aug. 10-12, 1998.
 - Co-Chair (with Nina Amanda), the Workshop for Geometric Algorithms and Applications, Geometry Center (in conjunction with SCG98) and SCG '98 Planning Committee, June 7–11, Minneapolis, 1998.

- 7th International Meshing Roundtable, Detroit, October, 1998.
 - Ninth International Symposium on Algorithms and Computation (ISAAC-98), December 14–16, 1998, Daejeon, South Korea.
 - Organizer for mini-symposium on “The Multilevel Method” at Sixth SIAM Conference on Applied Linear Algebra, October 29–November 1, Snowbird Ski & Summer Resort, Snowbird, UT., 1997.
 - 6th International Meshing Roundtable, Park City, Utah, October, 1997.
 - Vice-chair for the Workshop on Parallel Discrete Algorithms at EURO-PAR’97, University of Passau, August 26–29, 1997.
 - Third Annual International Computing and Combinatorics Conference Shanghai, China, August 20–22, 1997.
 - The 28th Annual ACM Symposium on Theory of Computing, (part of FCRC) Philadelphia, 1996.
- **Invited Lectures:** Sloan School of MIT, Chinese University of Hong Kong, Harvard University, University of Washington, City University of Kong Kong, Stanford, Notre Dame, Fudan University, Beijing University, University of Wisconsin, Tsinghua University, Microsoft Research, Duke, Williams and Mary, Illinois Institute of Technology, SUNY Buffalo, McMaster, University of New Mexico, Sandia National Lab, Boston University, IBM, MIT, CMU, UCLA, USC, RICE, University of Houston, U. Maryland, Dartmouth College, Cornell, NASA Ames Research Center, Thinking Machine Corporation, UIUC, U. Toronto, York University, UCSB, The Cray Research Center, Intel Corporation, U. C. Berkeley, University de Chile, Oak Ridge National Labs. and Xerox PARC.
 - **Referee:** SIAM J. Scientific Computing, SIAM J. on Matrix Analysis and Applications, SIAM J. Computing, Information Processing Letters, IEEE TOC, Journal of Parallel and Distributed Computing, J. of Algorithms, Algorithmica, Computational Geometry: Theory and Applications, JACM, International Journal of Computational Geometry and Its Applications.