

PROFESSOR SHANG-HUA TENG

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EMPLOYMENT:

University Professor	USC (2017 –)
Seeley G. Mudd Professor (Computer Science and Mathematics)	USC (2012 –)
Chair and Seeley G. Mudd Professor (Computer Science)	USC (2009 – 2012)
Professor (Computer Science)	Boston University (2002 – 2009)
Research Affiliate Professor (Mathematics)	MIT (1999 – Present)
Visiting Research Scientist	Microsoft Research Asia and New England (2004 – Present)
Senior Research Scientist	Akamai (1997 – 2009)
Visiting Professor (Computer Science)	Tsinghua University (2004 – 2008)
Professor (Computer Science)[Associate Professor before 1999]	UIUC (2000 – 2002)
Research Scientist	IBM Almaden Research Center (1997 – 1999)
Assistant Professor (Computer Science)	Univ. of Minnesota (1994 – 1997)
Research Scientist	Intel Corporation (Summer 1994, 1995)
Instructor (Mathematics)	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: “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) & B.A. (Electrical Engineering) Shanghai Jiao-Tong University, China (1985)
Thesis: “Efficient Methods for Implementing Logic Programs.” Advisor: Yixing Hou

HONORS/AWARDS:

Phi Kappa Phi Faculty Recognition Award	[2020]
for his book, <i>Scalable Algorithms for Data and Network Analysis</i>	
University Professor (USC)	[2017]
Gödel Prize (ACM-EATCS)	[2015, 2008]
Simons Investigator Award	[2014]
ACM STOC Best Paper	[2011]
ACM Fellow	[2009]
Fulkerson Prize (American Mathematical Society/Mathematical Programming Society)	[2009]
NSF Citation in Budget Request to Congress	[2003,2012]
as examples of significant accomplishments funded by the Computer Science Division	
List of Teachers Ranked as Excellent by Their Students (UIUC)	[2000]
Xerox Award for Outstanding Faculty Research (UIUC)	[1999]
IBM Award for Faculty Development	[1998]
Alfred P. Sloan Fellow	[1996]

Intel Award for Distinguished Visiting Faculty [1996]
NSF CAREER Award [1995]
Fifteen United States Patents [1995 - present]
in Internet algorithms, social network analysis, and compiler optimization

PROFESSIONAL LEADERSHIP:

Chair of the Steering Committee: *Symposium on Discrete Algorithms* [2019 - present]
Vice Chair of IEEE Technical Committee on Mathematical Foundations of Computing [2018 - present]
Chair of ACM Donald E. Knuth Prize Committee [2018]
Chair of Computer Science Department, USC [2009 - 2012]

RESEARCH INTERESTS:

MAIN: Scalable Algorithms for Big Data and Network Sciences, Children's Bilingual Learning, Network Analysis, Spectral Graph Theory, Computational Game and Economics Theory, Smoothed Analysis, Scientific Computing, Combinatorial Optimization, Mathematical Programming, Graph Partitioning and Data Mining, Data Analysis, Computational Geometry in Computer Graphics and Mesh Generation, Graph Embedding.

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

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

BOOK:

"Scalable Algorithms for Data and Network Analysis." Published by *Foundations and Trends in Theoretical Computer Science*, 274 pages, 2016.

INVITED BOOK CHAPTERS:

"Network Essence: PageRank Completion and Centrality-Conforming Markov Chains" *A Journey Through Discrete Mathematics, A Tribute to Jiří Matoušek*, the Springer, 2017

"Numerical Thinking in Algorithm Design and Analysis," *Computer Science: The Hardware, Software, and Heart of It*, edited by Edward K. Blum and Alfred V. Aho, The Springer, 2011.

"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 repellant sampling”. In *Minmax and its Applications*, Ding-Zu Du and Panos M. Pardalos ed., Kluwer Academic Publishers.

JOURNAL PUBLICATIONS:

“A Graph-Theoretical Basis of Stochastic-Cascading Network Influence: Characterizations of Influence-Based Centrality,” in *Theoretical Computer Science* (TCS - Elsevier) , accepted, 2019 (with Wei Chen and Hanrui Zhang).

“Nearly-Linear Time Algorithms for Preconditioning and Solving Symmetric, Diagonally Dominant Linear Systems,” *SIAM Journal on Matrix Analysis* (2014) 35 (3) **2015 Gödel Prize**, (with Dan Spielman).

“A Local Clustering Algorithm for Massive Graphs and Its Application to Nearly Linear Time Graph Partitioning”. *SIAM J. Comput.* 42(1): 1-26 (2013) **2015 Gödel Prize**, (with Dan Spielman)

Spectral Sparsification of Graphs. *SIAM J. Comput.* 40(4): 981-1025 (2011) **2015 Gödel Prize**, (with Dan 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 **2008 Gödel Prize, 2009 Fulkerson Prize**,(with Dan Spielman).

“Capturing the interplay of dynamics and networks through parameterizations of Laplacian operators.” In *PeerJ Computer Science* 2:57 (2016) (with Xiaoran Yan, Kristina Lerman, Rumi Ghosh).

“Maximum bipartite matchings with low rank data: Locality and perturbation analysis.” In *Theoretical Computer Science* 621: 82-91 (2016) (with Xingwu Liu).

“Multiscale Matrix Sampling and Sublinear-Time PageRank Computation.” *Internet Mathematics*, 10(1-2): 20-48 (2014) (with Christian Borgs, Michael Brautbar, and Jennifer T. Chayes).

“Bounded Budget Connection (BBC) games or how to make friends and influence people, on a budget”. *J. Comput. Syst. Sci.* 80(7): 1266-1284 (2014) (with Nikolaos Laoutaris, Laura J. Poplawski, Rajmohan Rajaraman, and Ravi Sundaram).

“Spectral sparsification of graphs: theory and algorithms.” *Commun. ACM* 56(8): 87-94 (2013) (with Joshua D. Batson, Daniel A. Spielman, and Nikhil Srivastava)

“Reducibility among Fractional Stability Problems.”. *SIAM J. Comput.*, 42(6): 2063-2113 (2013) (with Shiva Kintali, Laura J. Poplawski, Rajmohan Rajaraman, and Ravi Sundaram)

“Active Clustering of Biological Sequences”, *Journal of Machine Learning Research*, 13: 203-225 (2012) (with Konstantin Voevodski, Maria-Florina Balcan, Heiko Rögl and Yu Xia).

“A compact routing scheme and approximate distance oracle for power-law graphs”. *ACM Transactions on Algorithms* 9(1): 4 (2012), (with Wei Chen, Christian Sommer, and Yajun Wang)

- “Optimal Cache-Oblivious Mesh Layouts”. *Theory Comput. Syst.* 48(2): 269-296 (2011) (Michael Bender, Bradley Kuszmaul, and Kebin Wang).
- “Competitive routing over time”. *Theor. Comput. Sci.* 412(39): 5420-5432 (2011) (with Martin Hoefer, Vahab Mirrokni, and Heiko Rglin)
- “Bounded budget betweenness centrality game for strategic network formations”. *Theor. Comput. Sci.* 412(52): 7147-7168 (2011) (with Xiaohui Bei, Wei Chen, Jialin Zhang, and Jiajie Zhu:)
- “Smoothed analysis of condition numbers and complexity implications for linear programming,” *Mathematical Programming*, 126(2), 315-350 (2011) (with John Dunagan and Dan Spielman).
- “Quantum Separation of Local Search and Fixed Point Computation.” *Algorithmica*, 56(3): 364-382 (2010) (with Xi Chen and Xiaoming Sun).
- “Smoothed Analysis: An Attempt to Explain the Behavior of Algorithms in Practice”, *CACM*, 50 (10) 76–84, 2009 (with Dan Spielman).
- “Settling the Complexity of Computing Two-Player Nash Equilibria”, *Journal of ACM*, 56(3), May 2009. 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).
- “Combinatorial and spectral aspects of nearest neighbor graphs in doubling dimensional and nearly-Euclidean spaces.”, *Theoretical Computer Science*, 410(11): pages 1081 – 1092, 2009 (with Yingchao Zhao). Conference version: In the *4th International Conference on Theory and Applications of Models of Computation*, pages 554-565, 2007, (with Yingchao Zhao).
- “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*. 38 (2): 608–628, 2008. 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 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).

CONFERENCE PUBLICATIONS (not to journal [yet]):

“Optimal Space-Depth Trade-Off of CNOT Circuits in Quantum Logic Synthesis.” *ACM-SIAM SODA*, 2019, (with Jiaqing Jiang, Xiaoming Sun, Bujiao Wu, Kewen Wu, Jialin Zhang)

“Capturing Complementarity in Set Functions by Going Beyond Submodularity/Subadditivity,” *The 10th Innovations in Theoretical Computer Science (ITCS) conference*, 2019, (with Wei Chen and Hanrui Zhang).

“Electrical Flows, Laplacian Systems, and Faster Approximation of Maximum Flow in Undirected Graphs”, *STOC, Best Paper Award*, (2011), (with Paul Christiano, Jonathan A. Kelner, Aleksander Madry, and Daniel A. Spielman).

“Scalable Algorithms in the Age of Big Data and Network Sciences: Characterization, Primitives, and Techniques.”, *Proceedings of the Eleventh ACM International Conference on Web Search and Data Mining, WSDM 2018*.

“Interplay between Social Influence and Network Centrality”, (2017), *International Conference on World Wide Web, WWW 2017*, (with Wei Chen).

“Multi-layer Network Composition Under a Unified Dynamical Process.” *International Conference on Social, Cultural, and Behavioral Modeling (SBP-BRiMS) 2017*: 315-321 (with Xiaoran Yan and Kristina Lerman)

“An Axiomatic Approach to Community Detection.” In *2016 ACM Conference on Innovations in Theoretical Computer Science*, 2016: 135-146 (with Christian Borgs, Jennifer T. Chayes, and Adrian Marple).

“Mixture Selection, Mechanism Design, and Signaling,” *Annual IEEE Symposium on Foundations of Computer Science, FOCS 2015, Berkeley, CA USA* (with Yu Cheng, Ho Yee Cheung, Shaddin Dughmi, Ehsan Emamjomeh-Zadeh, and Li Han).

“Efficient Sampling for Gaussian Graphical Models via Spectral Sparsification” *Conference on Learning*

Theory, Paris, 2015: 364-390 (with Dehua Cheng, Yu Cheng, Yan Liu, and Richard Peng).

“The interplay between dynamics and networks: centrality, communities, and cheeger inequality.” *Conference on Knowledge Discovery and Data Mining (KDD)*, New York, 2014, pages 1406-1415 (with Rumi Ghosh, Kristina Lerman, Xiaoran Yan).

“Faster Canonical Forms for Strongly Regular Graphs”, *FOCS* (2013) (with Laszlo Babai, Xi Chen, Xiaorui Sun, John Wilmes)

“Multi-stage design for quasipolynomial-time isomorphism testing of steiner 2-systems”. *STOC* (2013): 271-280 (with Xi Chen and Xiaorui Sun)

“Finding Endogenously Formed Communities.” (SODA) 2013: 767-783 (with Maria-Florina Balcan, Christian Borgs, Mark Braverman, Jennifer T. Chayes)

“Perturbation Analysis of Maximum-Weighted Bipartite Matchings with Low Rank Data”. *COCOON* 2013: 705-712 (with Xingwu Liu)

“Power SVM: Generalization with exemplar classification uncertainty”. *CVPR* 2012: 2144-2151 (with Weiyu Zhang and Stella X. Yu)

“A Sublinear Time Algorithm for PageRank Computations.” *WAW* 2012: 41-53, (with Christian Borgs, Michael Brautbar, and Jennifer Chayes)

“A Complexity View of Markets with Social Influence”, *ICS*, (2011), (with Xi Chen).

Konstantin Voevodski, Maria-Florina Balcan, Heiko Röglin, Shang-Hua Teng, Yu Xia: Min-sum Clustering of Protein Sequences with Limited Distance Information. *SIMBAD* 2011: 192-206

Zornitsa Kozareva, Konstantin Voevodski, Shang-Hua Teng: Class Label Enhancement via Related Instances. *EMNLP* 2011: 118-128

“Subgraph sparsification and nearly optimal ultrasparsifiers.” *STOC*, (2010): 57-66 (with Alexandra Kolla, Yury Makarychev, and Amin Saberi).

“The Laplacian Paradigm: Emerging Algorithms for Massive Graphs.”, *TAMC*, 2010: 2-14.

“Efficient Clustering with Limited Distance Information”. *UAI* 2010: 632-640 (with Konstantin Voevodski, Maria-Florina Balcan, Heiko Röglin, and Yu Xia)

“Settling the Complexity of Arrow-Debreu Equilibria in Markets with Additively Separable Utilities”. In *FOCS 2009*, (with Xi Chen, Decheng Dai and Ye Du).

“Reducibility Among Fractional Stability Problems”. In *FOCS*. 2009, (with Shiva Kintali, Laura Poplawski, Rajmohan Rajaraman, and Ravi Sundaram).

“Learning and Smoothed Analysis”. In *FOCS* 2009, (with Adam Kalai and Alex Samorodnitsky).

“Smoothed Analysis of Multiobjective Optimization”. In *FOCS*, 2009 (with Heiko Röglin).

- “Higher eigenvalues of graphs”. In *FOCS*, 2009 (with Jonathan Kelner, James Lee, and Gregory Price)
- “Compact Routing in Power-Law Graphs”. In *Distributed Computing, 23rd International Symposium*, 379-391, 2009 (with Wei Chen, Christian Sommer, and Yajun Wang).
- “Agnostic Clustering”. In *Algorithmic Learning Theory, 20th International Conference*, 384-398, 2009 (with Maria-Florina Balcan and Heiko Röglin)
- “On the Stability of Web Crawling and Web Search”. In *Algorithms and Computation, 19th International Symposium ISAAC 2008*: 680-691, (with Reid Andersen, Christian Borgs, Jennifer T. Chayes, John E. Hopcroft, and Vahab S. Mirrokni).
- “The Isolation Game: A Game of Distances”. In *Algorithms and Computation, 19th International Symposium, ISAAC 2008*: 148-158, (with Yingchao Zhao and Wei Chen).
- Spending Is Not Easier Than Trading: On the Computational Equivalence of Fisher and Arrow-Debreu Equilibria. *ISAAC, Best Paper Award*, 2009: 647-656 (with Xi Chen)
- “Bounded budget connection (BBC) games or how to make friends and influence people, on a budget.” In *Proceedings of the Twenty-Seventh Annual ACM Symposium on Principles of Distributed Computing, PODC 2008*: 165-174, (with Nikolaos Laoutaris, Laura J. Poplawski, Rajmohan Rajaraman, and Ravi Sundaram).
- “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).
- “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. Johnsson).

“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).

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 CCF-1815254, *Scalable Algorithms for Data and Network Analysis*, \$500,000 (2018-2021).

Simons Foundation: Investigator Award, September 1, 2014 - August 30, 2024 (\$1,320,000)

NSF AF: Large: Collaborative Research: Algebraic Graph Algorithms: The Laplacian and Beyond, September 1, 2010 - August 30, 2015, USC received \$724,700 (with Dan Spielman of Yale and Jon Kelner of MIT)

NSF CCF 0964481, *AF:Medium:Smoothed Analysis in Multi-Objective Optimization, Machine Learning, and Algorithmic Game Theory*, \$1.1M (2010-2014).

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.

TEACHING EXPERIENCE:

- Cryptography: Secure Communication & Computation (undergraduate), USC
- Introduction and Advanced Algorithms, USC
- Introduction to Algorithms and the Theory of Computing (undergraduate), USC

- Algorithmic Game Theory, USC
- Cryptography (undergraduate), Boston University
- Algorithmic Game Theory and Applications to Computational Economics, Boston University
- Geometric Algorithms and Applications, (undergraduate), Boston University
- Algorithms for the New Age, Boston University
- Advanced Computational Geometry, Boston University
- Internet Algorithms, MIT
- Cryptography and Network Security, (undergraduate), UIUC
- Randomized Algorithms and Combinatorial Optimization, UIUC
- Numerical Analysis, UIUC
- High-Performance and Parallel Scientific Computing, U. Minnesota
- Introduction to Programming in C (undergraduate), U. Minnesota
- An Introduction to Computer Applications for Scientists, U. Minnesota and Engineers and programming in Fortran (undergraduate), U. Minnesota
- Parallel Scientific Computing, MIT
- Differential Equations (undergraduate), MIT
- The Probabilistic Method, MIT
- Computational Geometry, MIT
- Calculus (first year undergraduate, recitation) MIT

STUDENTS

Current Ph.D Students

- Matthew Ferland, USC Computer Science
- Han Li, USC Computer Science (co-advising with Professor Shaddin Dughmi)
- Qiu Ye, USC Mathematics

Ph.D. Supervised:

- Jiaowen Yang, Ph.D. (Mathematics), USC, 2019. Thesis: *Information Geometry and Optimal Transport*.
- Yu Cheng, Ph.D. (Computer Science), USC, 2017. Thesis: *Computational Aspects of Optimal Information Revelation*.
- Konstantin Voevodski, Ph. D., (Computer Science), Boston University, 2011. Thesis: *Clustering and Network Analysis with Biological Applications*.

- Kebin Wang, Ph.D., (Computer Science), Boston University, 2009. Thesis: *Cache Oblivious Scientific Computing*.
- Kyle Burke, Ph.D. (Computer Science), Boston, University. Thesis: *Science For Fun: New Impartial Board Games*.
- Yingchao Zhao Ph.D. (Computer Science), Tsinghua University, 2008, Thesis: *Geometric Problems in Games Theory and Network Design*, (With Professor Bo Zhang).
- 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).

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).

Postdoctoral Fellows:

- Jialin Zhang (2010-2012), now an associate professor at Chinese Academy of Sciences - Institute of Computing Technology
- Xi Chen (2009-2010), now an asistant professor of computer science at Columbia University
- Heiko Röglin (2008-2009), now a professor of computer science at Universität Bonn, Germany
- Alla Sheffer (1999-2000), now a professor of computer science at University of British Columbia

PROFESSIONAL ACTIVITIES

- Board Member, USC *Woman in Science and Engineering* (2014 - present)
- Steering Committee: SIAM-ACM SODA (2014 – present)
- Program Committee Chair: SIAM-ACM SODA (2008), ACM SPAA (2000), ISAAC (2000), ACM SOCG (Video Committee, 1999), Schloss Dagstuhl Workshop on Probabilistic Methods in the Design and Analysis of Algorithms (2007), International Meshing Roundtable (1997,1998)
- Program Committee Member: STOC (1996), FOCS (1999), SODA (2006), SPAA (1999), ISAAC (1997,1998, 2005,2007) WINE (2005, 2007, 2014), LATIN (2006), SIAM CSE (2003)
- Editor: *Journal of Combinatorial Optimization* and *Journal of Computer and System Sciences*