Jay Sethuraman

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
    PhD in Operations Research, August 1999
    Thesis title: Scheduling Job Shops and Multiclass Queueing Networks
            using Fluid and Semidefinite Relaxations

Indian Institute of Science, Bangalore, India
    M.Sc. in Computer Science and Engineering, May 1994
    Thesis title: Essays in Applied Combinatorics

Birla Institute of Technology and Science, Pilani, India
    B.E. (Honors) in Electrical and Electronics Engineering, May 1991
    Thesis title: Studies in Combinatorial Coding Theory

APPOINTMENTS

IEOR Department, Columbia University

    Associate Professor
    July 2005 - present

    Assistant Professor
    January 2000 - June 2005

RESEARCH INTERESTS

- Dynamic optimization; applications to computer and manufacturing systems.
- Scheduling theory and its applications
- Algorithmic and strategic questions in matching markets
- Applications of optimization methods in economics

HONORS and AWARDS

- IBM Faculty Award, 2005
- Meritorious Service Award, *Operations Research*, 2001
- NSF CAREER Award, 2000
- Honorable Mention, George Nicholson student paper competition, 2000
- IBM University Partnership award, 1999, 2001, 2002
- Participant, INFORMS Doctoral Colloquium, 1998
- IBM Cooperative Fellowship, 1998
- Writing and Humanistic Studies Prize, MIT, 1997

PUBLICATIONS

Journals:

J1. (with C-P. Teo) The geometry of fractional stable matchings and its applications. *Mathematics of Operations Research*, 23(4):874–891, November 1998.

J2. (with C-P. Teo) A cutting-plane algorithm for the stable roommates problem and its applications. *European Journal of Operational Research*, 123(1):195–205, 2000.

J3. (with C-P. Teo and W-P. Tan) Gale-Shapley stable marriage problem revisited: Strategic issues and applications. *Management Science*, 47(9):1252-1267, September 2001.

J4. (with J. L. Wolf, P. S. Yu, J. Turek, and M. S. Squillante) Scheduling algorithms for the broadcast delivery of digital products. *IEEE Transactions on Knowledge and Data Engineering*, 13(5):721–741, September/October 2001.

J5. (with C-P. Teo) A polynomial-time algorithm for the bistable roommates problem. *Journal of Computer and Systems Sciences*, 63(3):486–497, 2001.

J6. (with D. Bertsimas) From fluid relaxations to practical algorithms for job shop scheduling: the makespan objective. *Mathematical Programming*, 92(1):61–102, 2002.

J7. (with C-P. Teo and R. V. Vohra) Integer Programming and Arrovian Social Welfare Functions, *Mathematics of Operations Research*, 28(2):309–326, 2003.

J8. (with E. G. Coffman Jr. and V. Timkovsky) Ideal preemptive scheduling on two processors, *Acta Informatica*, 39(8):597–612, 2003.

J9. (with D. Bertsimas and D. Gamarnik) From fluid relaxations to practical algorithms for job shop scheduling: the holding cost objective, *Operations Research*, 51(5):798–813, 2003.

J10. (with A-K. Katta) A note on bandits with a twist, *SIAM Journal on Discrete Mathematics*, 18(1):110–113, 2005.

J11. (with C-P. Teo) Effective Scheduling and Routing in Adversarial Queueing Networks, *Algorithmica*, 43(1-2):133–146, 2005.

J12. (with L. Fleischer) Efficient Algorithms for SCLP: the Multicommodity Flow Problem with Holding Cost and Extensions, *Mathematics of Operations Research*, 30(4):916–938, 2005.

J13. (with C-P. Teo and R. V. Vohra) Anonymous and Monotonic Social Welfare Functions, *Journal of Economic Theory*, 128:232–254, 2006.

J14. (with A-K. Katta) A solution to the random assignment problem on the full preference domain, *Journal of Economic Theory*, 131(1):231–250, 2006.

J15. (with C-P. Teo and L. Qian) Many-to-one stable matching: Geometry and Fairness, *Mathematics of Operations Research*, 31(3):581–596, 2006.

J16. (with J. N. Tsitsiklis) Stochastic search in a forest revisited, *Mathematics of Operations Research*, 32(3):589–593, 2007.

J17. (with U. G. Rothblum) Stochastic scheduling in an in-forest, *Discrete Optimization*, 5(2):457–466, 2008.

J18. (with Stergios Athanassoglou and Steven J. Brams) "A Note on the Inefficiency of Bidding over the Price of a Share," *Mathematical Social Sciences*, 60(3):191–195, 2010.

J19. (with Parag Pathak) "Lotteries in student assignment: An equivalence result," *Theoretical Economics*, 6(1):1–17, 2011.

J20. (with Stergios Athanassoglou) "House Allocation with Fractional Endowments," *International Journal of Game Theory*, (to appear)

Refereed Conferences:

C1. (with C-P. Teo) LP based approach to optimal stable matchings. *Proceedings of the Eighth Annual ACM-SIAM Symposium On Discrete Algorithms*, pp. 710–719, January 1997.

C2. (with M. S. Squillante) Optimal scheduling of multiclass parallel machines. *Proceedings of the Tenth Annual ACM-SIAM Symposium On Discrete Algorithms*, pp. 963-964, January 1999.

C3. (with M. S. Squillante) Optimal stochastic scheduling in multiclass parallel queues. *Proceedings of the ACM SIGMETRICS conference on measurement and modeling of computer systems*, pp. 93–102, May 1999.

C4. (with C-P. Teo and W-P. Tan) Gale-Shapley stable marriage problem revisited: Strategic issues and applications. *Seventh Conference on Integer Programming and Combinatorial Optimization*, pp. 429–438, June 1999.

C5. (with C. C. Aggarwal, M. S. Squillante, J. L. Wolf, and P. S. Yu) Optimizing profits in the broadcast delivery of multimedia products. *Proceedings of the fifth International Workshop on Multimedia Information Systems*, Indian Wells, pp. 88–95, October 1999.

C6. (with M. Dawande and J. Kalagnanam) Variable-sized bin packing with color constraints. Brazilian Symposium on Graphs, Algorithms and Combinatorics, Extended abstract in *Electronic Notes in Discrete Mathematics*, 7, 2001.

C7. (with C-P. Teo and R. V. Vohra) Integer Programming and Arrovian Social Welfare Functions. *Ninth Conference on Integer Programming and Combinatorial Optimization*, LNCS 2337, 194–211, May 2002.

C8. (with J. L. Wolf, L. Ozsen, M. S. Squillante, and P. S. Yu) Optimal Crawling Strategies for Web Search Engines. *Eleventh International World Wide Web Conference*, 136–147, May 2002.

C9. (with M. S. Squillante) Analysis of Parallel-Server Queues under Spacesharing and Timesharing Disciplines. *Matrix Analytic Methods in Stochastic Models*, Adelaide, Australia, July 2002.

C10. (with L. Fleischer) Approximately Optimal Control of Fluid Networks. *Proceedings of the Fourteenth Annual ACM-SIAM Symposium On Discrete Algorithms*, pp. 56–65, January 2003.

C11. (with C-P. Teo) Effective Routing and Scheduling in Adversarial Queueing Networks, *Proceedings of RANDOM-APPROX 2003*, LNCS 2764, 153–164, August 2003.

C12. (with F. Li and C. Stein) An optimal online algorithm for packet scheduling with agreeable deadlines, *Proceedings of the Sixteenth Annual ACM-SIAM Symposium On Discrete Algorithms*, pp. 801-802, January 2005.

C13. (with F. Li and C. Stein) Better online buffer management, to appear in the *Proceedings of the Sixteenth Annual ACM-SIAM Symposium On Discrete Algorithms*, pp. 191–208, January 2007.

C14. (with R. Khandekar, K. Hildrum, S. Parekh, D. Rajan and J. L. Wolf) "Bounded Graph Clustering with Applications to Stream Processing," *FSTTCS 2009*, 275–386.

Expository/Survey:

E1. (with C-P. Teo) Linear programming brings marital bliss. *Singapore Mathematical Medley*, January 1999. A preliminary version of this essay was awarded the writing and humanistic studies prize (second place) at MIT.

E2. (with D. Bertsimas and I. Popescu) Moment problems and semidefinite optimization. *Handbook on Semidefinite Programming: Theory, Algorithms, and Applications*, Kluwer Academic Publishers, January 2000.

E3. Convex Relaxations in Scheduling. *Handbook of Scheduling*, CRC press, January 2004.

E4. "Mechanism Design for House Allocation Problems: A Short Introduction," *Optima*, 82, 2010.

Submitted for publication:

S1. (with A-K. Katta) Cooperation in Queues, Submitted to *Games and Economic Behavior*.

S2. (with A-K. Katta) Pricing strategies and service differentiation in an M/M/1 queue: A profit maximization perspective, Submitted to *Operations Research*.

S3. (with Stergios Athanassoglou and Steven Brams) Minimizing Regret in Partnership Dissolution, Submitted for publication, April 2009.

S4. (with L. Jez, F. Li, and C. Stein) Online Scheduling of Packets with Agreeable Deadlines, Submitted to *Transactions on Algorithms*, August 2010.

S5. (with O. Bochet, R. Ilkilic, and H. Moulin) Clearing supply and demand under bilateral constraints, Submitted to *Theoretical Economics*, November 2010.

S6. (with H. Moulin) Fair division of a flow, Submitted for publication, February 2011.

Working papers:

P1. A new solution to the house allocation problem with existing tenants.

P2. School choice with indifferences.

P3. (with Uri Rothblum) The Union Branching Bandit Model.

P4. (with Jiawei Zhang and Simai He) Joint Replenishment Games.

P5. (with Jiawei Zhang) The serial cost sharing rule for group-buying.

P6. (with Rene Caldentey) Matching rates in the FCFS Infinite Matching Model.

P7. (with Thiam Lee) Equivalence results in school choice: a unified view

P8. (with Shyam Chandramouli) Groupstrategyproofness of the egalitarian mechanism in rationing problems with constraints.

SELECTED PRESENTATIONS

- Seminar on scheduling in communication and manufacturing systems, Dagstuhl, June 2002.

- INFORMS Applied Probability Conference, 2001

- INFORMS meetings: 1998, 1999, 2000, 2003, 2005, 2006

- International Symposium on Mathematical Programming: 2000, 2003

- Game Theory and Social Choice conference, Wallis Institute of Political Economy, Rochester, 2004.

- Conference on Resource allocation and Game Theory, Wallis Institute of Political Economy, Rochester, 2006.

- Mini-course on Combinatorial Optimization and its applications to Economics, Yonsei University, Summer 2009.

- Workshop on Matching Theory and Mechanism Design, March 2010.

- NSF conference on Behavioral and Quantitative Game Theory, May 2010.

- Matching Conference in Celebration of the 20th anniversary of Roth and Sotomayor (1990), Duke University, May 2010.

- Invited seminars at Northwestern (IEMS), Northwestern (Kellogg), Rutgers, Columbia, Penn, Wisconsin (Math), Carnegie-Mellon, NYU, Rice (Economics), MIT, Caltech, Berkeley, University of Illinois, Duke, Maryland, Georgia Tech, Ohio State, National University of Singapore, Indian Institute of Science, Tata Institute of Fundamental Research, Indian Institute of Technology (Chennai), and IBM T. J. Watson Research center.

Research Grants

- NSF grant (Mechanism Design) (2009-2012), $354,639
- IBM Faculty Award (2005-2006), $20,000
- IBM University Partnership Award (2002-2003), $30,000
- NSF CAREER Award (2001-2006), $375,000
- IBM University Partnership Award (2001-2002), $10,000
- IBM University Partnership Award (1999-2000), $40,000

Patents

- (with C. C. Aggarwal, M. S. Squillante, J. L. Wolf, and P. S. Yu) Optimizing method for digital content delivery in a multicast network, US Patent 6,477,180, November 2002.

Professional Service

- Associate Editor, *Management Science*, June 2004-December 2008.
- Associate Editor, *Networks*, December 2002-present
- Editorial Review Board, *Production and Operations Management*, January 2004-present.
- Program Committee member, SODA 2006
- Organizing Committee member, IPCO 2004
- Judge, Junior Faculty Interest Group paper competition, INFORMS
- External Reviewer, South Carolina Department of Defense
- External Reviewer, U.S. Civilian Research and Development Foundation
- External Reviewer, Israeli Science Foundation
- External Reviewer, Research Grants Council, Hong-Kong.
- Panelist, National Science Foundation
- Cluster chair for Scheduling, INFORMS Atlanta meeting, 2003
- Referee for *ACM Transactions on Internet Technology*, *Discrete Mathematics*, *IEEE Transactions on Automatic Control*, *IEEE Transactions on Signal Processing*, *IIE Transactions*, *International Journal of Game Theory*, *Journal of Algorithms*, *Journal of Heuristics*, *Journal of Scheduling*, *Management Science*, *Mathematical Programming*, *Mathematical Social Sciences*, *Mathematics of Operations Research*, *Naval Research Logistics*, *Networks*, *Operations Research*, *Operations Research Letters*, *Performance Evaluation*, *SIAM Journal on Discrete Mathematics*, *Social Choice and Welfare*, and various conferences.

Administrative Service

- Member of the PhD committee, 2005-present
- Member of the Undergraduate curriculum committee, 2003-2006, 2009-present
- IEOR/DRO seminar series coordinator, 2001-2003
- Academic adviser for 3-2 students, 2001-present
- Sophomore adviser, 2000-present

Teaching

- IEOR 8100: Computational Mechanism Design, Spring 2009. IEOR 6400 Scheduling: Deterministic Models, Fall 1999, Spring 2004
- IEOR 6610 Approximation Algorithms, Fall 2000
- IEOR 4700 Introduction to Financial Engineering, Fall 2008.
- IEOR 3402 Production-Inventory Planning and Control, Spring 2000-2004, Spring 2008
- IEOR 4003 Industrial Economics, Fall 2000
- IEOR 4004 Introduction to Operations Research: Deterministic Models, Fall 2001-2006, Spring 2004, Spring 2008, Fall 2010, Spring 2011
- IEOR 6401 Scheduling: Stochastic Models, Spring 2002
- IEOR 6609 Dynamic Programming, Spring 2003
- IEOR 4405 Production Scheduling, Spring 2006-2007
- IEOR 4505 O.R. in Public Policy, Spring 2006, Fall 2007
- IEOR 4407 Game Theoretic Models of Operations, Fall 2006, Fall 2008-2010

Doctoral Students

- Anton Riabov (2004): *Efficient information dissemination systems*, jointly supervised with Daniel Bienstock; currently at IBM T. J. Watson Research Center.
- Akshay-Kumar Katta (2005): *Efficiency, fairness, and incentives in resource allocation*, currently at Amazon
- Fei Li (2008): *Online algorithms for packet scheduling*, jointly supervised with Cliff Stein.
- Stergios Athanassoglou (2008): *Fair allocation over time.*
- Shyam Chandramouli (2010)

Doctoral Committees Served

- Aliza Heching (Business)
- Yiqing Lin (IEOR)
- Fernando Bernstein (Business)
- Itir Karaesmen (Business)
- Haicho Hu (IEOR)
- Ben Wang (Business)
- Pankaj Batra (Electrical Engineering)
- Zheng Wang (IEOR)
- Nuri Sercan Ozbay (IEOR)
- Eyjo Asgeirsson (IEOR)
- Abhinav Verma (IEOR)