Sandra S. Irani

Information and Computer Science
University of California, Irvine
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Education

Ph.D. in Computer Science, August 1991
University of California, Berkeley, California
Thesis title: "Competitive On-line Algorithms".
Thesis supervisor: Prof. Richard M. Karp.

B.S.E. in Electrical Engineering and Computer Science, June 1986.
Princeton University, Princeton, New Jersey.
Graduated Magna Cum Laude.

Academic Appointments

Professor
Information and Computer Science Department, University of California, Irvine:
July 1, 2002 - present.

Associate Professor
Information and Computer Science Department, University of California, Irvine:
July 1, 1997 - July 1, 2002.

Assistant Professor
Information and Computer Science Department, University of California, Irvine:
July 1, 1991 - June 30, 1997. On leave July 1, 1991 - June 30, 1992 and July 1,
1994 - December 31, 1994.

Postdoctoral Fellow
Department of Computer Science and Engineering, University of California, San
Diego: April 1, 1992 - June 30, 1992.
Postdoctoral supervisor: Prof. Michael Saks.

Postdoctoral Fellow
DIMACS, Princeton University: September 1, 1991 - March 31, 1992.

Professional Interests

Analysis of Algorithms, On-line Algorithms, Algorithms for Resource Allocation in Computer Systems, Transportation Logistics, Image Processing, Computational Biology.

Honors and Awards

Outstanding Professor Award, as voted by the graduating class of 1997.

Golden Floppy Award, June 1997 for outstanding teaching as voted by the ICS student chapter of the Association for Computing Machinery.

NSF Visiting Professorship for Women to visit Columbia University: July 1994 - December 1994.

NSF Research Initiation Award: June 1993 - June 1996.

University of California President's Postdoctoral Fellowship: July 1991 - June 1992.

IBM Graduate Fellowship: September 1989 - May 1991.

Publications   **A.** *Refereed Journal Articles*

1. **Reversing Trains: A Turn of the Century Sorting Problem.** Nancy Amato, Manuel Blum, Sandy Irani and Ronitt Rubinfeld, *Journal of Algorithms,* vol.38, no.6, 28 June 1991, pp.301-6.

2. **A Competitive 2-server Algorithm**. Sandy Irani and Ronitt Rubinfeld. *Information Processing Letters,* vol.39, no.2, 31 July 1991, pp.85-91.

3. **Two Results on the List Update Problem.** Sandy Irani. *Information Processing Letters,* vol.38, no.6, 28 June 1991, pp.301-6.

4. **On the Time and Space Complexity of Using Write-Once Memory.** Sandy Irani, Moni Naor and Ronitt Rubinfeld. *Mathematical Systems Theory,* vol.25, no.2, 1992, pp.141-59.

5. **Coloring Inductive Graphs On-Line.** Sandy Irani. *Algorithmica,* vol.11, no.1, Jan. 1994, pp.53-72.

6. **Competitive Paging with Locality of Reference.** Allan Borodin, Sandy Irani, Prabhakar Raghavan and Baruch Schieber. *Journal of Computer and System Science, special issue devoted to STOC 1991,* vol. 50, no.2, April 1995, pp. 244-258.

7. **Strongly Competitive Algorithms for Paging with Locality of Reference.** Sandy Irani, Anna Karlin and Steven Phillips. *SIAM Journal on Computing,* vol.25, no.3, June 1996, pp.477-97.

8. **On the Value of Coordination in Distributed Decision Making.** Sandy Irani and Yuval Rabani. *SIAM Journal on Computing,* vol.25, no.3, June 1996, pp.498-519.

9. **On Algorithm Design for Metrical Task Systems.** William Burley and Sandy Irani. *Algorithmica,* vol.18, no.4, Aug. 1997, pp.461-85.

10. **Bounding the Power of Preemption in Randomized Scheduling.** Ran Canetti and Sandy Irani. SIAM Journal on Computing, vol.27, no.4, Aug. 1998, pp.993-1015.

11. **Randomized Algorithms for Metrical Task Systems.** Sandy Irani and Steve Seiden. *Theoretical Computer Science,* vol.194, no.1-2, 10 March 1998, pp.163-82.

12. **Combinatorial and Experimental Results for Randomized Point Matching Algorithms.** Sandy Irani and Prabhakar Raghavan. *Computational Geometry Theory and Applications,* vol.12, no.1-2, Feb. 1999, pp.17-31.

13. **Page Replacement with Multi-Size Pages and Applications to Web Caching.** Sandy Irani. *Algorithmica,* vol.33, no.3, July 2002, pp.384-409.

14. **Randomized Weighted Caching with Two Page Weights.** Sandy Irani. *Algorithmica,* vol.32, no.4, April 2002, pp.624-40.

15. **An Analysis of System Level Power Management Algorithms and Their Effects on Latency** Dinesh Ramanathan, Sandy Irani and Rajesh Gupta. In *IEEE Transactions on Computer-Aided Design of Integrated Circuits & Systems,* vol.21, no.3, March 2002, pp.291-305.

16. **Scheduling with Conflicts on Bipartite and Interval Graphs** Sandy Irani and Vitus Leung. *Journal on Scheduling,* vol.6, no.3, May-June 2003, pp.287-307.

Publications, Cont.

A. *Refereed Journal Papers, Cont.*

17. **On-Line Algorithms for the Dynamic Traveling Repair Problem** Sandy Irani, Xiangwen Lu and Amelia Regan. *Journal of Scheduling*, vol.7, no.3, May-June 2004, pp.243-58.

18. **Probabilistic Analysis for Scheduling with Conflicts** Sandy Irani and Vitus Leung. *Theoretical Computer Science*, to appear.

19. **Online Strategies for Dynamic Power Management in Systems with Multiple Power Saving States**. Sandy Irani, Sandeep Shukla and Rajesh Gupta. *ACM Transactions on Embedded Computing Systems, special issue on Power Aware Embedded Computing,* vol 2, issue 3, August 2003, pp. 325-346.

20. **Algorithms for Power Savings**. Sandy Irani, Sandeep Shukla, and Rajesh Gupta. *Journal of Algorithms, special issue for selected papers from SODA 2003,* to appear.

21. **An Overview of the Competitive and Adversarial Approaches to Designing Power Management Strategies**. Sandy Irani, Gaurav Singh, Sandeep Shukla, and Rajesh Gupta, *IEEE Transactions on Very Large Scale Integration Systems*, to appear.

B. *Refereed Conference Papers*

1. **Coloring Inductive Graphs On-Line.** Sandy Irani. In the *Proceedings for for the 31st Symposium on the Foundations of Computer Science,* 1990, pp. 470–479. Preliminary version of A.5.

2. **Randomized Competitive Algorithms for the List Update Problem.** Sandy Irani, Nicholas Reingold, Jeffrey Westbrook and Daniel Sleator. In *the Proceedings of the 2nd Annual Symposium on Discrete Algorithms,* 1991, pp. 251–260. Later revised to be A.3.

3. **Competitive Paging with Locality of Reference.** Allan Borodin, Sandy Irani, Prabhakar Raghavan and Baruch Schieber. In the *Proceedings for the 23rd Symposium on the Theory of Computing,* 1991, pp. 249–259. Preliminary version of A.6.

4. **Strongly Competitive Algorithms for Paging with Locality of Reference.** Sandy Irani, Anna Karlin and Steven Phillips. In the *Proceedings for the 3rd Symposium on Discrete Algorithms,* 1992, pp. 228-236. Preliminary version of A.7.

5. **On the Value of Coordination in Distributed Decision Making.** Sandy Irani and Yuval Rabani. In *Proceedings for the 34th Symposium on the Foundations of Computer Science,* 1993, pp. 12-21. Preliminary version of A.8.

6. **Universal Algorithms for Metrical Task Systems.** William Burley and Sandy Irani. In the *Proceedings for the 6th Symposium on Discrete Algorithms,* 1995, pages 420-429. Preliminary version of A.9.

7. **Bounding the Power of Preemption in Randomized Scheduling.** Ran Canetti and Sandy Irani. In the *Proceedings for the 27th Symposium on the Theory of Computing,* 1995, pages 606-615. Preliminary version of A.10.

8. **A Randomized Algorithm for Uniform Task Systems.** Sandy Irani and Steve Seiden. In the *Proceedings for the 4th Fourth Workshop on Algorithms and Data Structures,* 1995, pages 159-170. Preliminary version of A.11.

B. *Refereed Conference Papers, Cont.*

9. **Scheduling with Conflicts, and Applications to Traffic Signal Control.** Sandy Irani and Vitus Leung. In the *Proceedings for the 7th Symposium on Discrete Algorithms*, 1996, pages 85-94. Preliminary version of A.15.

10. **Combinatorial and Experimental Results for Randomized Point Matching Algorithms.** Sandy Irani and Prabhakar Raghavan. In the *Proceedings for the 12th ACM Symposium on Computational Geometry*, 1996, pages 68-77. Preliminary version of A.12.

11. **Probabilistic Analysis for Scheduling with Conflicts.** Sandy Irani and Vitus Leung. In the *Proceedings for the 8th Symposium on Discrete Algorithms*, 1997, pages 286 − 296.

12. **Logo Detection in Document Images.** Steve Seiden, Michael Dillencourt, Sandy Irani, Roland Borrey and Tim Murphy. In *Proceedings of the International Conference on Imaging Science, Systems, and Technology*, June 1997, pages 446-449.

13. **Page Replacement with Multi-Size Pages and Applications to Web Caching.** Sandy Irani. In the *Proceedings for the 29th Symposium on the Theory of Computing*, 1997, pp. 701-710. Preliminary version of A.13.

14. **Cost-Aware WWW Proxy Caching Algorithms.** Pei Cao and Sandy Irani. In the *Proceedings of the USENIX Symposium on Internet Technologies and Systems*, 1997, pp. 193-206.

15. **Latency Effects of System Level Power Management Algorithms.** Dinesh Ramanathan, Sandy Irani and Rajesh Gupta. In *the ACM/IEEE Proceedings of the International Conference on Computer Aided Design*, 2000, pp. 350-6. Preliminary version of A.15.

16. **Efficient Algorithms for Optimum Cycle Mean and Optimum Cost to Time Ratio Problems.** Ali Dasdan, Sandy Irani and Rajesh Gupta. In the *Proceedings of the 36th Design Automation Conference,* June 1999, pages 37-42.

17. **Experimental Results on Statistical Approaches to Page Replacement Policies.** Vitus Leung and Sandy Irani. In Proceedings of *the 3rd Workshop on Algorithm Engineering and Experimentation*, 2001, pages 61-77. Preliminary version of A.16.

18. **Dynamic and Stochastic Fleet and Freight Management: Algorithm Development and Performance Analysis**. Xiangwen Lu, Amelia Regan and Sandy Irani. In the *Proceedings of the fourth Triennial TRISTAN conference*, Portugal, June, 2001.

19. **Semi-continuous transmission for cluster-based video servers.** Sandy Irani and Nalini Venkatasubramanian. In the *IEEE International Conference on Cluster Computing,* 2001, pp.303-12.

20. **A Multi-Queue Branch-and-Bound Algorithm for Anytime Optimal Search with Biological Applications.** Richard H. Lathrop, Anton Sazhin, Ye Sun, Nick Steffen, and Sandra S. Irani In the *Proceedings for Genome Informatics,* 2001, pp. 74-82. Winner of the Best Paper Award.

21. **On-Line Algorithms for the Dynamic Traveling Repair Problem** Sandy Irani, Xiangwen Lu and Amelia Regan. In *the Proceedings of the 13th Symposium on Discrete Algorithms*, 2002, pp. 517-524. Preliminary version of A.17.

Publications, Cont.

B. *Refereed Conference Papers, Cont.*

22. **An Asymptotically Optimal Algorithm for Dynamic Traveling Repair Problem.** Xiangwen Lu, Amelia Regan and Sandy Irani. In the *Proceedings of the 81st Meeting of the Transportation Research Board,* 2002.

23. **Competitive Analysis of Dynamic Power Management Strategies for Systems with Multiple Power Saving States.** Sandy Irani, Sandeep Shukla and Rajesh Gupta. In the *Proceedings of the 2002 Design, Automation and Test in Europe Conference and Exhibition,* pp. 117-123. Preliminary version of A.19.

24. **Algorithms for Power Savings.** Sandy Irani, Sandeep Shukla and Rajesh Gupta. *Proceedings of the 14th Symposium on Discrete Algorithms,* 2003, pp. 37-46. Preliminary version of A.20.

25. **Formal methods for Dynamic Power Management.** Rajesh Gupta, Sandy Irani, Sandeep Shukla. *Proceedings of the International Conference on Computer Aided Design,* 2003, pp.874-81.

26. **Time-Sensitive Computation of Aggregate Functions over Distributed Imprecise Data.** Qui Han, M. Ba Nguyen, S. Irani, N. Venkatasubramanian. *Workshop on Parallel and Distributed Real-Time Systems (In conjunction with IPDPS 2004),* 2004.

27. **Optimal power-down strategies.** John Augustine, Sandy Irani, Chaitanya Swamy. *Proceedings of the 45th Annual IEEE Symposium on Foundations of Computer Science,* 2004, pp. 530-9.

28. **Greedy Algorithm for Local Contrast Enhancement of Images.** Kartic Subr, Aditi Majumder and, Sandy Irani. *Proceedings of the 13th International Conference on Image Analysis and Processing,* 2005.

29. **Contrast Enhancement of Images Using Human Contrast Sensitivity.** Aditi Majumder and Sandy Irani. *Proceedings of the Symposium on Applied Perception in Graphics and Visualization,* 2006.

30. **Strip Packing with Precedence Constraints and Release Times.** John Augustine, Sudarshan Banerjee and Sandy Irani. *Proceedings of the 18th ACM Symposium on Parallelism in Algorithms and Architectures,* 2006.

Publications, Cont.

C. *Invited Chapters.*

1. **Online Computation.** Sandy Irani and Anna Karlin. A chapter in *Approximation Algorithms,* edited by Dorit Hochbaum. PWS publishing company.

2. **Competitive Analysis of Paging: A Survey**. Sandy Irani In the *Proceedings of the Workshop on Online Algorithms,* Dagstuhl, Germany. Springer-Verlag lecture notes in computer science.

Funding

Funding, cont.   Department of Defense: Multidisciplinary Research Program of the University Research Initiative (MURI) UC Irvine Co-PI's: Rina Dechter and Sandy Irani. Project title: An Integrated Approach to Decision Making Under Uncertainty. July 2000 - July 2005. Award amount for UC Irvine: $798,000. This is a $2,934,000 grant split between a group of scientists at three different universities.

University of California Transportation Center. Co-PI's: Amelia Regan and Sandy Irani. Project title: Online verses Rolling Horizon Algorithms for Dynamic Service Fleet Operations August 1999 - August 2000. Award amount: $57,789.

University of California Transportation Center. Co-PI's: Amelia Regan and Sandy Irani. Project title: Online verses Rolling Horizon Algorithms for Dynamic Service Fleet Operations August 1999 - August 2000. Award amount: $57,789.

University of California Transportation Center. Co-PI's: Amelia Regan and Sandy Irani. Project title: Online algorithms for dynamic dispatching of commerical vehicle operations. August 1998 - August 1999. Award amount: $53,064.

NSF, Division of Computer and Computation Research. Jointly funded by the program for the Theory of Computing and the program for Operating Systems and Systems Software. Project title: 'Competitive analysis of problems in resource allocation.' August 1996 - August 1999. Award amount: $166,809.

Micro-electronics Innovation and Computer Research Opportunities. Jointly funded by Kofax Image Products. Co-PI's: Michael Dillencourt and Sandy Irani. Project title: 'Pattern recognition in business documents.' July 1, 1996 - June 30, 1999. Award amount: $95,000.

Funding source: Testbed Research Implementation Program, Institute for Transportation Studies, University of California, Irvine. Co-PI's: Michael Dillencourt and Sandy Irani. Project title: 'An Implementation of adaptive traffic signal control'. March 1 1996 - December 31, 1996. Award amount: $38,940.

NSF Visiting Professorship for Women to visit Columbia University. Project title: 'Algorithms for online and distributed systems.' July 1994 - December 1994. Award amount: $72,000.

NSF Research Initiation Award. Project title: 'Algorithms for online systems.' June 1993 - June 1996. Award amount: $54,000.

Graduate Students   Steve Seiden. Completion date of PhD: June 1997.

Vitus Leung. Completion date of PhD: June 1997.

John Augustine. Completion date of PhD: August 2006.

Professional Activities

NSF Panel to select grant recipients for ths NSF Broadening Participation in Computing program, 2005.

Program Committee for the 36th Annual Symposium on the Theory of Computing 2004.

Program Committee for the 5th Workshop on Algorithm Engineering and Experiments (ALENEX 03).

CCR Career Panel to select grant recipients NSF Theory of Computing Program, March 2000.

Program Committee for the 11th Annual Symposium on Discrete Algorithms, January 2000.

CCR Career Panel to select grant recipients NSF Theory of Computing Program, January 1998.

CCR Career Panel to select recipients of the NSF Faculty Early Career Developmen t Awards, December 1995.

Program Committee for the 37th Annual Symposium on the Foundations of Computer Science, November 1996.

Work Experience

CombiChem, Inc.
May 1997 - September 1997: Consultant. Design and implementation of Hypothesis Generator for Rational Drug Design.

IBM Tokyo Research Laboratories
July 1991: Summer Intern. Theoretical Computer Science Group. Taught seminar in On-line Algorithms. Research in On-line Algorithms and Analysis of Algorithms.

IBM T.J. Watson Research Center
July 1990: Summer Intern. Applied Mathematics Group. Research in Computational Complexity, On-line Algorithms, and Analysis of Algorithms.

University of California, Berkeley, California
May 1987 - December 1987, June 1988 - August 1988: Research Assistant. Research in Design and Analysis of Algorithms, and On-line Algorithms.

University of California, Berkeley, California
August 1986 - December 1987: Teaching Assistant. Assisted in courses in Data Structures, Analysis of Algorithms, Combinatorics and Graph Theory.

IBM T.J. Watson Research Center
June 1986 - August 1986, June 1985 - August 1985: Summer Intern. Research in Network Performance Analysis for the Research Parallel Programming Project.

Bell Laboratories, Naperville, Illinois
May 1984 - August 1984: Summer Intern. Developed System Software in C++.