

Andréa Werneck Richa

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Research Interests

Design and analysis of algorithms: algorithms for distributed, wireless, and mobile networks, graph algorithms, randomized algorithms, approximation algorithms; combinatorial optimization; distributed resource allocation; parallel network architectures.

Education

- Ph.D. in Algorithms, Combinatorics and Optimization, School of Computer Science, Carnegie Mellon University, Pittsburgh PA, September 1992 to August 1998. **Ph.D. Thesis Advisor:** Bruce M. Maggs. Ph. D. Thesis: *On Distributed Network Resource Allocation*, Technical Report CMU-CS-98-146, Pittsburgh, PA, August 1998.
- M.Sc. in Algorithms, Combinatorics and Optimization, School of Computer Science, Carnegie Mellon University, Pittsburgh PA, 1995.
- M.Sc. in Systems and Computer Engineering, COPPE, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, emphasis in Algorithms/Combinatorics, 1992. **M.Sc. Thesis Advisor:** Jayme L. Szwarcfiter. M.Sc. thesis: *Generation and Enumeration of Linear Extensions of Partially Ordered Sets*.
- B.Sc. cum laude in Computer Science, Universidade Federal do Rio de Janeiro, 1989.

Professional Experience

- Associate professor at the Computer Science and Engineering Department at Arizona State University, August 2004 to present, Tempe, AZ.
- Assistant professor at the Computer Science and Engineering Department at Arizona State University, August 1998 to July 2004, Tempe, AZ.
- Member of Telecommunication Research Center (TRC), and of Center for Ubiquitous Computing (CUbiC), 1999 to present, Arizona State University, Tempe, AZ.
- Visiting researcher at DIMACS (Center for Discrete Mathematics and Theoretical Computer Science), hosted by Dr. Satish Rao, November/December 1996, NEC Research Institute, Princeton NJ.
- Visiting researcher at the Computer Science Department, The University of Texas at Austin, hosted by Prof. Greg Plaxton, June to September 1996, Austin TX.
- Visiting researcher at DIMACS (Center for Discrete Mathematics & Theoretical Computer Science), hosted by Prof. R.E. Tarjan, June to September 1994, Princeton University, Princeton NJ.
- Research assistant at the Universidade Federal do Rio de Janeiro (NCE/UFRJ), Brazil, July 1989 to July 1992.
- Guest professor at the Computer Science Department, Universidade Federal do Rio de Janeiro, Brazil, January 1990 to July 1992.

Grants and Awards

- NSF–CISE. Title: CAREER: Accessing Shared Objects in Distributed Environments, PI: A.W. Richa, Duration: 06/15/00 – 06/15/06. Amount: \$ 273,598.00.
- Los Alamos National Laboratories (LANL). Title: LANL Internship: Efficient Shortest Path Computation In Planar Graphs. PI: A.W. Richa, Duration 08/06 – 01/07. Amount: \$ 20,964.00.
- NSF. Title: Academic And Professional Development For Upper-Division Computer Science; Engineering; And Mathematics Students. PIs: M. Rowland-Anderson, A. Rodriguez, A. Richa, C. Castillo-Chavez. Duration: 09/15/06 – 08/31/10. Amount: \$ 500,000.00.
- NSF. Title: Academic And Professional Development For Computer Science; Engineering; And Mathematics Students: Transitioning To Upper Division Research. PIs: A. Rodriguez, A. Richa, C. Castillo-Chavez. Duration: 8/01/04 – 7/31/08. Amount: \$ 399,968.00.
- NSF–CISE. Title: Parallel Elimination Orders with Applicaitons in Operations Research and Scientific Computing. PI: G.L. Miller (CMU), Co-PIs: A.W. Richa, R. Ravi (CMU), B.M. Maggs (CMU). Duration: 10/01/99 – 10/01/02. Amount: \$ 40,000.00¹.
- Consortium for Embedded and Internetworking Technologies (ASU/Motorola/Intel). Title: Packet Processing in a QoS Constrained Environment, PIs: A. Sen, A. Richa, M. Reisslein. Duration: 06/11/01—06/10/02. Amount: \$ 70,794.00.
- Consortium for Embedded and Internetworking Technologies (ASU/Motorola/Intel). Title: Development of an iSCSI Storage MAnager with Virtualization for eLinux on Intel80321 Processor, PIs: A. Sen, A. Richa. Duration: 07/01/02–06/30/03. Amount: \$ 77,032.00.
- Consortium for Embedded and Internetworking Technologies (ASU/Motorola/Intel). Title: Hardware Software Co-Design of Network Processors and Packet Classification, PIs: A. Sen, A. Richa. Duration: 01/01/03–12/31/03. Amount: \$ 81,357.00.
- Consortium for Embedded and Internetworking Technologies (ASU/Motorola/Intel). Title: A Case for an Inexpensive, Highly Available iSCSI Storage Solution, PIs: A. Sen, A. Richa. Duration: 06/11/01—06/10/02. Amount: \$ 85,357.00.
- NSF. Title: Computer Science, Engineering, and Mathematics Scholarship Program at Arizona State University, PI: J. Bustoz, Co-PIs: A.W. Richa, A.A. Rodriguez, B. Gannod, J. Turner. Duration: 08/1/00 – 07/31/02. Amount: \$ 220,000.00.
- NSF. Title: Computer Science, Engineering, and Mathematics Scholarship Program at Arizona State University, PI: J. Bustoz, Co-PIs: A.W. Richa, A.A. Rodriguez. Duration: 01/09/01–01/01/03. Amount: \$ 270,000.00.

Journal Publications ²

1. L. Ritchie, H.-S. Yang, A. Richa and M. Reisslein. MANET Routing with Provably Low Complexity Through Constant Density Clustering and Route Request Broadcast. To appear in *Wireless Communications*.
2. L. Ritchie, H.-S. Yang, A.W. Richa, and M. Reisslein. Cluster Overlay Broadcast (COB): MANET Routing with Complexity Polynomial in Source-Destination Distance. *IEEE Transactions on Mobile Computing*, Volume 5, Issue 6, pages 653–667, June 2006.
3. Hai Huang, Andra W. Richa, Michael Segal. Dynamic Coverage in Ad-Hoc Sensor Networks. *ACM Baltzer Journal on Mobile Networks and Applications (MONET)* 10(1–2): 9–17 (2005).
4. S. Oh, Y. Huh, B. Kulapala, G. Konjevod, A.W. Richa, M. Reisslein. A modular algorithm-theoretic framework for the fair and efficient collaborative prefetching of continuous media. *IEEE Transactions on Broadcasting*, volume 51 issue 2, pages 200–215, 2005.

¹The total amount of the grant is \$ 200,000.00, of which \$ 40,000.00 are budgeted to A.W. Richa (ASU).

²In all of the Algorithms/Theory publications below, the authors are always listed in alphabetical order.

5. S. Rao and A.W. Richa. New Approximation Techniques for Some Linear Ordering Problems. *SIAM Journal of Computing*, Volume 34, Number 2, pages 388 - 404, 2005.
6. H. Huang, A.W. Richa, and M. Segal. Approximation Algorithms for the Mobile Piercing Set Problem with Applications to Clustering in Ad-Hoc Networks. *ACM Baltzer Journal on Mobile Networks and Applications (MONET)*, Volume 9, Number 2, pages 151-161, April 2004.
7. A. Ferreira, S. Perennes, A.W. Richa, H. Rivano, and N. Stier. Models, complexity, and algorithms for the design of multifiber WDM networks. *Telecommunication Systems* 24(2-4): 123-138 (2003) (invited submission).
8. C. G. Plaxton, R. Rajaraman, and A. W. Richa. Accessing Nearby Copies of Replicated Objects in a Distributed Environment. *Theory of Computing Systems*, 32:241-280, 1999.
9. F. T. Leighton, B. M. Maggs, and A. W. Richa. Fast Algorithms for Finding $O(\text{Congestion} + \text{Dilation})$ Packet Routing Schedules. *Combinatorica*, 19(2):1-27, 1999.
10. B. Ghosh, F. T. Leighton, B. M. Maggs, S. Muthukrishnan, C. G. Plaxton, R. Rajaraman, A. W. Richa, R. E. Tarjan, and D. Zuckerman. Tight Analysis of Two Local Load Balancing Algorithms. *SIAM Journal on Computing*, 29(1), pages 29-64, 1999.

Conference Publications ³

1. Goran Konjevod, Andra W. Richa, and Donglin Xia. Optimal scale-free compact routing schemes in doubling networks . To appear in *Proceedings of ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2007.
2. Melih Onus, Andrea W. Richa, and Christian Scheideler,. Linearization: Locally Self-Stabilizing Sorting in Graphs. To appear in *Proceedings of ALENEX'07*, 2007.
3. G. Konjevod, A.W. Richa, D. Xia. Optimal Stretch Name-Independent Compact Routing in Doubling Metrics . In *Proceedings of 18th ACM Symposium on Principles of Distributed Computing (PODC)*, pages 198-207, 2006.
4. T-H. H. Chan, D. Xia, G. Konjevod, A. Richa. A Tight Lower Bound for Steiner Point Removal Problem on Trees. In *Proceedings of APPROX-RANDOM*, pages 70-81, 2006.
5. D. Xia, G. Konjevod, and A. Richa. On sampling in higher-dimensional peer-to-peer systems. In *Proceedings of LATIN'06*, pages 641-652, 2006.
6. Kishore Kothapalli, Christian Scheideler, Melih Onus, Andrea W. Richa. Constant density spanners for wireless ad-hoc networks. In *Proceedings of the 17th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, pages 116-125, 2005.
7. K. Kothapalli, M. Onus, A. Richa and C. Scheideler. Efficient Broadcasting and Gathering in Wireless Ad Hoc Networks. In *Proceedings of the IEEE International Symposium on Parallel Architectures, Algorithms and Networks(ISPAN)*, pages 346-351, 2005.
8. Liang Yang, Tushar Gohad, Pavel Ghosh, Devesh Sinha, Arunabha Sen, Andrea Richa. Resource mapping and scheduling for heterogeneous network processors. In *Proceedings of the 2005 ACM Symposium on Architecture for networking and communications systems (ANCS)*, pages 19-28, 2005.
9. A. Ferreira, S. Perennes, A.W. Richa, H. Rivano, and N. Stier. Models, complexity, and algorithms for the design of multifiber WDM networks. In *Proceedings of IEEE International Conference on Telecommunications (ICT)*, pages 12-18, 2003.
10. H. Huang, A.W. Richa, and M. Segal. Approximation Algorithms for the Mobile Piercing Set Problem with Applications to Clustering in Ad-Hoc Networks. In *Proceedings of Sixth ACM Workshop on Discrete Algorithms and Method for Communication (DIAL-M)*, pages 52-61, August 2002.
11. G. Konjevod, S. Oh, and A.W. Richa. Finding Most-Sustainable Paths in Networks with Time-Dependent Edge-Reliabilities. In *Proceedings of Latin American Theoretical Informatics (LATIN)*, pages 435-450, 2002.

³In all of the Algorithms/Theory publications below, the authors are always listed in alphabetical order.

12. A. Ferreira, S. Perennes, A.W. Richa, H. Rivano, and N. Stier. On the design of multifiber WDM networks. In *Proceedings of AlgoTel*, pages 25–32, 2002.
13. R. Rajaraman, A.W. Richa, B. Voeking, and G. Vuppuluri. A data tracking scheme for general networks. In *Proceedings of the 13th Annual ACM Symposium on Parallel Algorithms and Architectures (SPAA)*, pages 247–254, July 2001.
14. A.W. Richa, K. Obraczka, and A. Sen. Application-oriented Self-organizing Hierarchical Clustering in Dynamic Networks. In *Proceedings of 1st ACM Workshop on Principles of Mobile Computing (POMC)*, pages 57–65, August 2001.
15. A.W. Richa, A. Sen, B.H. Shen, and S. Bandyopadhyay. On Routing and Wavelength Assignment in Optical Networks. In *Proceedings of the Thirty-Eighth Annual Allerton Conference on Communication, Control and Computing*, pages 1305–1313, October 2000.
16. R. Cole, A. Frieze, B. M. Maggs, M. Mitzenmacher, A. W. Richa, R. K. Sitaraman, and E. Upfal. On Balls and Bins with Deletions. In *Proceedings of 2nd. International Workshop on Randomization and Approximation Techniques in Computer Science (RANDOM)*, number 1518 in Lecture Notes in Computer Science, pages 145–158, October 1998.
17. R. Cole, B. M. Maggs, F. Meyer auf der Heide, M. Mitzenmacher, A. W. Richa, K. Schröder, R. K. Sitaraman, and B. Voeking. Randomized Protocols for Low-Congestion Circuit Routing in Multistage Interconnection Networks. In *Proceedings of 30th ACM Symposium on the Theory of Computing (STOC)*, 1998.
18. S. Rao and A. W. Richa. New Approximation Techniques for Some Ordering Problems. In *Proceedings of Ninth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 211–218, January 1998.
19. C. G. Plaxton, R. Rajaraman, and A. W. Richa. Accessing Nearby Copies of Replicated Objects in a Distributed Environment. In *Proceedings of the 9th Annual ACM Symposium on Parallel Algorithms and Architectures (SPAA)*, pages 311–320, June 1997.
20. B. Ghosh, F. T. Leighton, B. M. Maggs, S. Muthukrishnan, C. G. Plaxton, R. Rajaraman, A. W. Richa, R. E. Tarjan, and D. Zuckerman. Tight Analysis of Two Local Load Balancing Algorithms. In *Proceedings of 27th ACM Symposium on the Theory of Computing (STOC)*, pages 548–558, May/June 1995.

Other publications

1. A.W. Richa and C. Scheideler. Overlay Networks for Peer-to-peer systems. To appear in *Handbook on Approximation Algorithms and Metaheuristics*, edited by S. Sahn.
2. M. Mitzenmacher, A.W. Richa, and R. Sitaraman. The Power of Two Random Choices: A Survey of Techniques and Results. In S. Rajasekaran, P.M. Pardalos, J.H. Reif, and J. Rolim (eds.), *Handbook on Randomized Algorithms, Volume I*, chapter 9, pages 255–294, Kluwer, 2001.

Program Committees (most recent)

- ACM Symposium of Parallel Algorithms and Architectures (SPAA)'00
- ACM International Workshop on Discrete Algorithms and Methods for Mobile Computing & Communications (DIAL-M)'00,'01, and '02
- International Conference on High-Performance Computing (Hi-PC)'01
- WiOpt'05
- ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc)'05
- IEEE ColaborateCom'05 and '06
- 1st International Workshop On Foundations And Algorithms For Wireless Networking (FAWN)'06
- IEEE Intl. Conf. on Distributed Sensor Systems (DCOSS)'06 and '07

- Fun with Algorithms (FUN)'07
- T2PWSN 2007 (From Theory to Practice in Wireless Sensor Networks)
- ACM Workshop on Foundations of Mobile Computing (DIALM-POMC)'04 and '07
- Latin American Theoretical Informatics (LATIN)'04 and '08
- ACM Symposium on Discrete Algorithms (SODA)'08

- **General Program chair** of ACM DIALM-POMC Joint Workshop on Foundations of Mobile Computing, September 2003.

Other Professional Activities

- Guest Editor of Special Issue on Foundations of Mobile Computing, ACM Baltzer Journal on Mobile Networks and Applications (MONET), 2006
- Served as referee for several journals, including SIAM Journal on Computing, Combinatorica, Algoritmica, IEEE Transactions on Computers, and Theoretical Computer Science.
- Organizer of the First Arizona Workshop on Algorithms, October 2001, Arizona State University.

Advisees

Melih Onus, PhD, 2002– ;
 Donglin Xia, PhD, 2003– ;
 Jim Higgins, MCS, 2006;
 Soohyun Oh, MSc 2001, PhD 2005 ;
 Hai Huang, MSc 2003;
 Shiva Sundararaman, MSc 2003 ;
 Anshul Dawra, MSc 2001 ;
 Gayathri Vuppulluri, MSc 2000.

Recent Graduate Teaching

- CSE 550: Combinatorial Algorithms and Intractability
- CSE 450/598: Design and Analysis of Algorithms
- CSE 591: Special Topics: Algorithms for Distributed and Parallel Networks