

# Li (Erran) Li

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- Research Interests**
1. Wireless networking and mobile computing, e.g. high performance mesh networking using network coding, superposition coding and zero forcing.
  2. Computer networking, e.g. inter-domain routing, traffic engineering and measurement
  3. Network security, e.g. botnet detection
- Visa Status** US Permanent Resident
- Education**
1. **Cornell University** **Ithaca, NY**  
Ph.D. in Computer Science, August 2001, minor in EE. GPA 3.9/4.0  
Advisor: Prof. Joseph Y. Halpern  
Other Committee Members: Zygmunt Haas and Stephen B. Wicker  
Thesis Title: Routing and Topology Control in Multi-hop Wireless Ad Hoc Networks
  2. **Institute of Automation, Chinese Academy of Sciences** **Beijing, China**  
M.S.E in Pattern Recognition, June 1996.  
Advisor: Prof. SongDe Ma  
Thesis Title: 3D Object Reconstruction Based on Higher-Order Geometric Curves
  3. **Beijing Polytechnic University** **Beijing, China**  
B.S.E in Automatic Control, June 1993.  
Advisor: Prof. NingShou Xu  
Thesis Title: Associative Memory Based Intelligent Process Control
- Research Experience**
1. **Bell Labs, Alcatel-Lucent** **Murray Hill/Holmdel, NJ**  
Member of Technical Staff *August 2001 – present*  
My research is currently focused on (1) wireless networks, e.g. exploiting techniques such as network coding, superposition coding, zero-forcing, MIMO for high performance mesh networking; spectrum agile communication. (2) inter-domain routing and traffic engineering, e.g. routing from a social choice theory perspective; network measurements, e.g. scalable algorithms using data streaming techniques to obtain per-flow traffic measurement, detect common traffic content and estimate cardinality distribution; (3) network security, e.g. techniques to defend against DDoS, detect botnets in wide-area wireless data networks.
  2. **Computer Science Department, Cornell University** **Ithaca, NY**  
Research Assistant (PhD Thesis) *September 1996 – August 2001*  
I designed and evaluated algorithms for gossiping-based ad hoc routing, algorithms for minimum energy topology control, and a decision-theoretic framework for resource allocation in wireless multimedia networks.

3. **Microsoft Research** **Redmond,WA**  
 Research Intern *May 2000 – August 2000*  
 I worked on the Panorama project with Dr. Yi-Min Wang, Paramvir Bahl and Roger Wattenhofer in the Systems and Networking Group. We designed and evaluated a cone-based topology control algorithm for wireless networks that overcome the problem associated with pre-configuring a fixed transmission power for all nodes in multi-hop wireless networks.
4. **AT&T Center for Internet Research at ICSI** **Berkeley, California**  
 Visiting Student *October 1999 – January 2000*  
 I worked on cost sharing of multicast transmissions with Dr. Scott Shenker. I investigated the performance of two *strategyproof* cost sharing mechanisms, Marginal Cost (MC) and Shapley Value (SH), given different multicast trees and user utility distribution.
5. **Bell Labs, Lucent Technologies** **Homdel,NJ**  
 Research Intern *May 1999 – August 1999*  
 I worked on the HAWAII project with Dr. Ramachandran Ramjee and Tom La Porta in the Networking Techniques Department. We designed and implemented a novel router service called IP paging, which enables one common IP-based infrastructure to support different wireless interfaces such as CDMA, GPRS (General Packet Radio Service), and Wireless LAN.
6. **Microsoft Research** **Redmond,WA**  
 Research Intern *May 1998 – August 1998*  
 I worked on the Millennium project with Dr. Yi-Min Wang in the Systems and Networking Group. We built an architecture for high-performance commercial distributed objects.
7. **Cornell Ensemble Group and jointly with AT&T Research** **Ithaca,NY**  
 Research Assistant *September 1997 – January 1998*  
 I worked on the COMERA project with Dr. Yi-Min Wang at AT&T Research. We built an extensible architecture for fault-tolerant distributed objects.
8. **Cornell Ensemble Group** **Ithaca,NY**  
 Research Assistant *May 1997 – August 1997*  
 I ported Electra (a fault tolerant ORB based on OMG CORBA 2.0) from UNIX to NT.

**Teaching Experience**

1. Teaching Assistant for Cornell CS211: *Computers and Programming*, Fall 1998  
 Responsibilities include designing and giving lectures in recitation sessions, holding office hours, grading and setting exams.
2. Teaching Assistant for Cornell CS222: *Introduction to Scientific Computing*, Spring 1998  
 Responsibilities include holding office hours, grading and setting exams.
3. Teaching Assistant for Cornell CS414: *Introduction to Operating Systems*, Fall 1996  
 Responsibilities include holding office hours, grading and setting exams.

**Journal Publications**

1. M. Sung, J. Xu, J. Li, and L. Li, “Large-Scale IP Traceback in High-Speed Internet: Practical Techniques and Theoretical Foundation”, *To appear IEEE/ACM Transaction on Networking(ToN)*, 2008

2. L. Li, M. Mahdian, and V. Mirrokni, "Secure Overlay Network Design", *To appear Algorithmica*
3. H. Luo, X. Meng, R. Ramjee, P. Sinha and L. Li, "The Design and Evaluation of Unified Cellular and Ad-Hoc Networks", *IEEE Trans. on Mobile Computing (TMC)* Pages 1060-1074, Volume 6, Issue 9, Sept. 2007.
4. Y. Bejerano, S.J. Han and L. Li, "Fairness and Load Balancing in Wireless LANs", *IEEE/ACM Transaction on Networking (ToN)*, Pages 560-573, Volume 15, Issue 3, June, 2007.
5. S. Zhong, L. Li, Y.R. Yang and Y. Liu, "On Designing Incentive-Compatible Routing and Forwarding Protocols in Wireless Ad-Hoc Networks — An Integrated Approach Using Game Theoretical and Cryptographic Techniques", *Wireless Networks (WINET) journal*, Pages 799-816, Volume 13, Issue 6, Feb. 2007.
6. Z. Haas, J. Y. Halpern, and L. Li, "Gossiping-based Ad Hoc Routing", *IEEE/ACM Transaction on Networking (ToN)*, Pages 479-491, Volume 14, Issue 3, June 2006.
7. M. Alicherry, R. Bhatia and L. Li, "Joint Channel Assignment and Routing for Throughput Optimization in Multi-radio Wireless Mesh Networks", *IEEE JSAC Special issue on Multi-hop Wireless Mesh Networks*, Pages 1960-1971, Volume 24, Issue 11, Nov. 2006.
8. R. Bhatia, L. Li, H. Luo and R. Ramjee, "ICAM: Integrated Cellular and Ad-Hoc Multicast", *IEEE Trans. on Mobile Computing (TMC)*, Pages 1004-1015, Volume 5, Issue 8, August, 2006.
9. M. Goemans, L. Li, V.S. Mirrokni and M. Thottan, "Market Sharing Games Applied to Content Distribution in Ad Hoc Networks", *IEEE JSAC Special issue on Price-Based Access Control and Economics for Communication Networks*, Pages 1020-1033, Volume 24, Issue 5, May 2006.
10. L. Li, M. Buddhikot, C. Chekuri and K. Guo, "Routing Bandwidth Guaranteed Paths with Local Restoration in Label Switched Networks", *IEEE JSAC Special Issue on Intelligent Services and Applications in Next Generation Networks*, Pages 437-449, Volume 23, Issue 2, Feb 2005.
11. L. Li, J. Y. Halpern, V. Bahl, Y. M. Wang and R. Wattenhofer, "Analysis of a Cone-Based Distributed Topology Control Algorithms for Wireless Multi-hop Networks", *IEEE/ACM Transaction on Networking (ToN)*, Pages 147-159, Volume 13, Issue 1, Feb. 2005.
12. L. Li and J. Halpern, "A Minimum-Energy Preserving Topology Control Algorithm", *IEEE Transaction on Wireless Communications*, Pages 910-921, Volume 3, Issue 3, May 2004.
13. R. Ramjee, L. Li, T. LaPorta and S. Kasera, "IP Paging Service for Mobile Hosts", *Wireless Networks (WINET) journal*, Pages 427-441, Volume 8, Issue 5, Sept. 2002.

## Conference Publications

1. R. Alimi, L. Li, R. Ramjee, H. Viswanathan and Y. R. Yang, "High Throughput Wireless Mesh Networks by In-Network Transmitter Packet Mixing", *to appear IEEE INFOCOM*, 2008.
2. L. Li, M. Pal and Y. R. Yang, "Proportional Fairness in Multi-Rate Wireless LANs", *to appear IEEE INFOCOM*, 2008.

3. X. Hu, L. Li, M. Mao and Y. R. Yang, "Wide-Area IP Network Mobility", *to appear IEEE INFOCOM*, 2008.
4. L. Li, R. Alimi, R. Ramjee, J. Shi, Y. Sun, H. Viswanathan and Y. R. Yang "Extended Abstract: Superposition Coding for Wireless Mesh Networks", *ACM MobiCom*, 2007.
5. L. Li, R. Ramjee, M. Buddhikot and S. Miller, "Network-Coding Based Broadcast in Mobile Ad-hoc Networks", *Proc. IEEE INFOCOM*, April 2007.
6. R. Bhatia, A. Kashyap, L. Li, "The Power Balancing Problem in Energy Constrained Multi-hop Wireless Networks", *Proc. IEEE INFOCOM*, April 2007.
7. R. Bhatia, L. Li, "Characterizing Cross-layer Optimization Gains in Wireless Mesh Networks with MIMO Links", *Proc. IEEE INFOCOM Minisymposium*, April 2007.
8. T. Bu, L. Li and R. Ramjee, "Generalized Proportional Fair Scheduling in Third Generation Wireless Data Networks", *Proc. IEEE INFOCOM*, April 2006.
9. M. Taghi Hajiaghayi, L. Li, Vahab Mirrokni and Marina Thottan "Bandwidth Sharing Network Design for Multi-class Traffic", *Proc. IEEE INFOCOM*, April 2006.
10. L. Li, M. Mahdian, and V. Mirrokni, "Secure Overlay Network Design", *International Conference on Algorithmic Aspects in Information and Management*, June 2006.
11. M. Sung, A. Kumar, L. Li, J. Wang and J. Xu, "Scalable and Efficient Data Streaming Algorithms for Detecting Common Contents in Internet Traffic", *IEEE International Workshop on Networking Meets Databases (NetDB)*, April 2006.
12. N. Immorlica, L. Li, V. Mirrokni, and A. Schulz. "Coordination Mechanisms for Selfish Scheduling", *Workshop on Internet and Network Economics (WINE)*, December, 2005.
13. H. Wang, H. Xie, Y. R. Yang, L. Li, Y. Liu and A. Silberschatz, "On the Stability of Rational, Inbound-dependent Interdomain Route Selection", *IEEE International Conference on Network Protocols (ICNP)*, November 2005.
14. H. Wang, H. Xie, Y. R. Yang, L. Li, Y. Liu and A. Silberschatz, "Stable Egress Route Selection for Interdomain Traffic Engineering: Model and Analysis" *IEEE International Conference on Network Protocols (ICNP)*, November 2005.
15. M. Alicherry, R. Bhatia and L. Li, "Joint Channel Assignment and Routing for Throughput Optimization in Multi-radio Wireless Mesh Networks", *Proc. International Conference on Mobile Computing and Networking (MobiCom)*, August 2005.
16. S. Zhong, L. Li, Y.R. Yang and Y. Liu, "On Designing Incentive-Compatible Routing and Forwarding Protocols in Wireless Ad-Hoc Networks — An Integrated Approach Using Game Theoretical and Cryptographic Techniques", *Proc. International Conference on Mobile Computing and Networking (MobiCom)*, August 2005.
17. R. Bhatia and L. Li, "Characterizing Achievable Multicast Rates in Multi-Hop Wireless Networks", *Proc. ACM MobiHoc*, May 2005.
18. N. Hu, L. Li, M. Mao, P. Steenkiste, and J. Wang, "A Measurement Study of Internet Bottlenecks", *Proc. IEEE INFOCOM*, March 2005.

19. Y. Bejerano S.J. Han and L. Li, "Fairness and Load Balancing in Wireless LANs", *Proc. International Conference on Mobile Computing and Networking (MobiCom)*, September 2004.
20. N. Hu, L. Li, M. Mao, P. Steenkiste and J. Wang, "Locating Internet Bottlenecks: Algorithms, Measurements, and Implications", *Proc. ACM SIGCOMM*, August 2004.
21. M. M. Halldórsson, J. Y. Halpern, L. Li, V. S. Mirrokni "On Spectrum Sharing Games", *Proc. ACM Symposium on Principle of Distributed Computing (PODC)*, July 2004
22. M. Goemans, L. Li, V.S. Mirrokni and M. Thottan, "Market Sharing Games Applied to Content Distribution in Ad Hoc Networks", *Proc. ACM MobiHoc*, May 2004.
23. J. Li, M. Sung, J. Xu and L. Li, "Large-Scale IP Traceback in High-Speed Internet: Practical Techniques and Theoretical Foundation", *Proc. IEEE Symposium on Security and Privacy*, May 2004.
24. A. Kumar, J. Xu, J. Wang, O. Spatschek and L. Li, "Space-Code Bloom Filter for Efficient Traffic Flow Measurement", *Proc. IEEE INFOCOM*, March 2004.
25. M. Thottan, L. Li, B. Yao, V. S. Mirrokni and S. Paul, "Distributed Network Monitoring For Evolving IP Networks", *Proc. IEEE ICDCS*, March 2004.
26. H. Luo, R. Ramjee, P. Sinha, L. Li and S. Lu, "UCAN: A Unified Cellular and Ad-Hoc Network Architecture", *Proc. International Conference on Mobile Computing and Networking (MobiCom)*, pages 353-367, September, 2003.
27. L. Li and P. Sinha, "Throughput and Energy Efficiency in Topology-Controlled Multihop Wireless Networks", *Proc. ACM International Workshop on Wireless Sensor Networks and Applications (WSNA)*, pages 132-140, September, 2003.
28. L. Li, M. Thottan, B. Yao and S. Paul, "Distributed Network Monitoring with Bounded Link Utilization in IP Networks", *Proc. IEEE INFOCOM*, 2003.
29. L. Li, M. Buddhikot, C. Chekuri and K. Guo, "Routing Bandwidth Guaranteed Paths with Local Restoration in Label Switched Networks", *IEEE International Conference on Network Protocols (ICNP)*, pages 110-120, November, 2002.
30. Z. Haas, J. Y. Halpern, and L. Li, "Gossiping-based Ad Hoc Routing", *IEEE INFOCOM*, pages 1707-1716, June 2002.
31. R. Ramjee, L. Li, T. LaPorta and S. Kasera, "IP Paging Service for Mobile Hosts", *International Conference on Mobile Computing and Networking (MobiCom)*, pages 332-344, July 2001.
32. L. Li, J. Y. Halpern, V. Bahl, Y. M. Wang and R. Wattenhofer, "Analysis of Distributed Topology Control Algorithms for Wireless Multi-hop Networks", *ACM Symposium on Principle of Distributed Computing (PODC)*, pages 264-273, August 2001.
33. R. Wattenhofer, L. Li, V. Bahl and Y. M. Wang, "Distributed Topology Control for Power Efficient Operation in Multihop Wireless Ad Hoc Networks", *in Proc. IEEE INFOCOM*, pages 1388-1397, April 2001.
34. L. Li and J. Y. Halpern, "Self-reconfiguring Minimum Energy Mobile Wireless Networks", *in Proc. IEEE International Conference on Communications (ICC)*, pages 278-283, June 2001.

35. Z. Haas, J. Y. Halpern, L. Li and S. B. Wicker, "A Decision-Theoretic Approach to Resource Allocation in Wireless Multimedia Networks", *Proc. 4th international workshop on Discrete algorithms and methods for mobile computing and communications (dialM)*, pages 86-95, August 2000.
36. A. Forin, G. Hunt, L. Li, and Y. M. Wang, "High-Performance Distributed Objects over System Area Networks", *Proc. 3rd USENIX Windows NT Symp.*, pp. 21-30, July 1999.
37. L. Qiu and L. Li, "Contour Extraction of Moving Objects", *Proc. of the 14th International Conference on Pattern Recognition (ICPR)*, Australia, 1998.
38. S. D. Ma and L. Li, "Ellipsoid Reconstructing from Three Perspective Views", *Proc. the 13th International Conference on Pattern Recognition (ICPR)*, Austria, 1996.
39. L. Li and S. D. Ma, "3D Pose Estimation from a N-degree Planar Curve in Two Perspective Views", *Proc. the 13th International Conference on Pattern Recognition (ICPR)*, Austria, 1996.

**Internet  
Drafts**

1. R. Ramjee, L. Li and T. LaPorta, "Paging support for IP mobility using HAWAII", Internet Draft, Jul, 2000

**Patents**

1. L. Li, T. LaPorta and R. Ramjee, "IP Paging Service for Mobile Hosts", US Patent 7,120,453
2. V. Bahl, L. Li, Y.M. Wang and R. Wattenhofer, "Distributed Topology Control for Multihop Wireless Sensor Networks Using Directional Information", US Patent 6,990,080
3. L. Li, R. Ramjee, M. Buddhikot and S. Miller, "Network-coding based broadcast in Mobile Ad-hoc Networks", US patent pending, 2007
4. T. Bu, L. Li and R. Ramjee, "Generalized Proportional Fair Scheduling in Third Generation Wireless Data Networks", US patent pending, 2006
5. M. Alicherry, R. Bhatia and L. Li, "Joint Channel Assignment and Routing for Throughput Optimization in Multi-radio Wireless Mesh Networks", US Patent Pending, 2005
6. Y. Bejerano, S.J. Han and L. Li, "Fairness and Load Balancing in Wireless LANs Using Association Control", US Patent Pending, 2004
7. L. Li, M. Thottan, B. Yao, S. Paul, "Distributed Network Monitoring with Bounded Link Utilization in IP Networks" US Patent Pending, 2003
8. K. Guo, L. Li, S. Mukherjee and S. Paul, "Provisioning Network-Based Mobile VPN", US Patent Pending, 2003
9. M. Buddhikot, C. Chekuri, K. Guo and L. Li, "Routing Bandwidth Guaranteed Paths with Local Restoration in Label Switched Networks", US Patent Pending, 2002

**Professional  
Activities**

Guest Editor, JSAC special issue on non-cooperative behavior in networking

Editor, Wireless Networks (WINET) Journal

Technical Program Committee Member for

1. ACM Int. Conf. on Mobile Computing and Networking (MobiCom), 2004, 2005, 2006 and 2007
2. ACM Int. Symp. on Mobile Ad Hoc Networking and Computing (MobiHoc), 2004, 2005 and 2006
3. IEEE INFOCOM, 2005, 2006 and 2008
4. IEEE Int. Conf. on Network Protocols (ICNP), 2004, 2006, 2007 and 2008
5. IEEE Int. conf. on Distributed Computing Systems (ICDCS), 2004, and 2008

Session chair for

1. Security, MobiHoc'05
2. Sensor networks, MobiCom'04
3. Analytical Models of Wireless Networks, MobiCom'05
4. New Topics, MobiCom'06