Zongpeng Li

Affiliation

Associate Professor
Department of Computer Science
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Research Interests

Multicast Algorithms, Network Coding, Network Optimization, Network Game Theory, Wireless Networking.

Education

University of Toronto, Toronto, Ontario, Canada
Department of Electrical and Computer Engineering

- ♢ **Ph.D.**, Electrical and Computer Engineering, November 2005
  - ▷ *Dissertation:* "*On Achieving Optimal Throughput in Data Networks*"
  - ▷ *Advisor:* Baochun Li, Department of Electrical and Computer Engineering
  - ▷ *Thesis Committee:* Ian Blake, Ben Liang, Andreas Veneris

University of Toronto, Toronto, Ontario, Canada
Department of Computer Science

- ♢ **M.Sc.**, Computer Science, August 2001
  - ▷ *Dissertation:* "Non-blocking Implementations of Queues in Asynchronous Distributed Shared-memory Systems"
  - ▷ *Advisor:* Vassos Hadzilacos, Department of Computer Science

Tsinghua University, Beijing, People's Republic of China
Department of Computer Science and Technology

- ♢ **B.Eng.**, Computer Science and Technology, July 1999

Honours and Awards

- ♢ Best Paper Award, the Ninth Passive and Active Measurement Conference (PAM), 2008.
- ♢ Nomination for *Sloan Research Fellow*, Alfred P. Sloan Foundation, by the Department of Computer Science, University of Calgary, 2007.
- ♢ *Ingenuity New Faculty Award*, Alberta Ingenuity Fund, 2007.
- ♢ *Edward S. Rogers Sr. Scholar*, Faculty of Applied Science and Engineering, University of Toronto, April 2004.
- ♢ *Outstanding Freshman Award*, Tsinghua University, 1994.

PUBLICATIONS

◇ **Journal Articles**

Shreya Maheshwar, Zongpeng Li, Baochun Li. "Bounding The Coding Advantage of Combination Network Coding in Undirected Networks". *IEEE Transactions on Information Theory (TIT)*, to appear.

Zongpeng Li, Xiaowen Chu. "On Achieving Group Strategyproof Multicast". *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, to appear.

Hanan Shpungin, Zongpeng Li. "Throughput and Energy Efficiency in Wireless Ad Hoc Networks with Gaussian Channels," in *IEEE/ACM Transactions on Networking (TON)*, to appear.

Fajun Chen, Yijie Wang, Jiangchuan Liu, Zongpeng Li. "Probing-based Anypath Forwarding Routing Algorithms in Wireless Mesh Networks." To appear in Elsevier Ad Hoc Networks.

Ajay Gopinathan, Zongpeng Li, Baochun Li, "Group Strategyproof Multicast in Wireless Networks," IEEE Transactions on Parallel and Distributed Systems (TPDS), 22(5), May 2011.

Ajay Gopinathan, Zongpeng Li," Optimal Layered Multicast," ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP), 7(2), May 2011.

Xiaowen Chu, Kaiyong Zhao, Zongpeng Li, Anirban Mahanti, "Auction Based On-Demand P2P Min-Cost Media Streaming with Network Coding," in *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 20(12):1816-1829, December 2009.

Zongpeng Li, Carey Williamson, "Enforcing Minimum-Cost Multicast Routing Against Selfish Information Flows," *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 20(9):1299-1308, September 2009.

Zongpeng Li, Baochun Li, Lap Chi Lau, "A Constant Bound on Throughput Improvement of Network Coding in Undirected Networks." *IEEE Transactions on Information Theory (TIT)*, 55(3):997-1015, March 2009.

Phillipa Gill, Liqi Shi, Anirban Mahanti, Zongpeng Li, Derek L. Eager. "Scalable On-demand Media Streaming for Heterogeneous Clients," *ACM Transactions on Multimedia Computing, Communications and Applications (TOMCCAP)*, 5(1):8:1-8:24, October 2008.

Niklas Carlsson, Anirban Mahanti, Zongpeng Li, Derek L. Eager. " Optimized Periodic Broadcast of Non-Linear Media," in *IEEE Transactions on Multimedia (TMM)*, 10(5):871-884, August 2008.

Chuan Wu, Baochun Li, Zongpeng Li, "Dynamic Bandwidth Auctions in Multi-overlay P2P Streaming with Network Coding," in *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, 19(6):806-820, June 2008.

Jun Yuan, Zongpeng Li, Wei Yu, Baochun Li. "A Cross-Layer Optimization Framework for Multihop Multicast in Wireless Mesh Networks," in *IEEE Journal on Selected Areas of Communication (JSAC)*, 24(11):2092-2103, November 2006.

Zongpeng Li, Baochun Li, Lap Chi Lau. "On Achieving Optimal Multicast Throughput in Undirected Networks," in joint special issue, *IEEE Transactions on Information Theory (IT) and IEEE/ACM Transactions on Networking (TON), 52(6):2467-2485, June 2006*.

Zongpeng Li, Baochun Li. "Improving Throughput in Multi-hop Wireless Networks," in *IEEE Transactions on Vehicular Technology (TVT)*, 55(3):762-773, May 2006.

Zongpeng Li, Baochun Li. "Probabilistic Power Management for Wireless Ad Hoc Networks," in *ACM/Kluwer Mobile Networks and Applications (MONET)*, 10(5):771-782, 2005.

♢ **Conference Papers**

Hongxing Li, Wei Huang, Chuan Wu, Zongpeng Li, Francis C. M. Lau. "Utility-Maximizing Data Dissemination in Socially Selfish Cognitive Radio Networks", in *the Proceedings of the 8th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS)*, Valencia, Spain, October 17-22, 2011 (**acceptance rate: 20%**).

Hanan Shpungin, Zongpeng Li. "Feasible Capacity of Distributed Beamforming in Multi-Hop Wireless Sensor Networks", in *the Proceedings of the 8th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS)*, Valencia, Spain, October 17-22, 2011.

Ruiting Zhou, Zongpeng Li, Chuan Wu, Carey Williamson. "Physical Layer Network Coding with Signal Alignment for MIMO Wireless Networks", in *the Proceedings of the 8th IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS)*, Valencia, Spain, October 17-22, 2011 (**acceptance rate: 20%**).

Song Zhang, Niklas Carlsson, Derek Eager, Zongpeng Li, Anirban Mahanti. "Design of a Dynamic File Bundling System for Large-scale Content Distribution", in *the Proceedings of The 19th IEEE International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems (MASCOTS)*, work in progress, Singapore, July 25-27, 2011.

Xiaowei Chen, Xiaowen Chu, Zongpeng Li. "Improving Sustainability of Private P2P Communities", in *the Proceedings of The 20th IEEE International Conference on Computer Communications and Networks (ICCCN)*, Maui, Hawaii, USA, July 31-August 4, 2011.

Hanan Shpungin, Ajay Gopinathan, Zongpeng Li. "Capacity Bounds for Energy Efficient Data Streaming in Homogeneous Wireless Ad Hoc Networks," in *the Proceedings of The 8th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, Salt Lake City, USA, June 27-30, 2011 (**acceptance rate: 22%**).

Ajay Gopinathan, Zongpeng Li. "Strategyproof Mechanisms for Content Delivery via

Layered Multicast," in *the Proceedings of IFIP Networking 2011*, Valencia, Spain, May 9-13, 2011.

Ajay Gopinathan, Zongpeng Li, Chuan Wu. "Strategyproof Auctions for Balancing Social Welfare and Fairness in Secondary Spectrum Markets," in *the Proceedings of IEEE INFOCOM 2011*, Shanghai, China, April 10-15, 2011 (**acceptance rate: 16%**).

Ajay Gopinathan, Zongpeng Li. "A Prior-Free Revenue Maximizing Auction For Secondary Spectrum Access," in *the Proceedings of IEEE INFOCOM 2011*, mini-conference, Shanghai, China, April 10-15, 2011.

Ajay Gopinathan, Zongpeng Li. "Strategyproof Wireless Spectrum Auctions with Interference," in *the Proceedings of IEEE GlobeCom 2010*, Miami, Florida, December 6-10, 2010.

Emeka Egbogah, Abraham O. Fapojuwo, Zongpeng Li. "On the Performance of Network Coding for Multicast Data Delivery in Large Scale Mobile Ad Hoc Networks," in *the Proceedings of IEEE Vehicular Technology Conference (VTC)*, Ottawa, Canada, September 6-9, 2010.

Nissan Lev-tov, Niklas Carlsson, Zongpeng Li, Carey Williamson, Song Zhang. "Dynamic File-selection Policies for Bundling in BitTorrent-like Systems," in *the Proceedings of IEEE IWQoS 2010*, Beijing, China, June 16-18, 2010.

Fajun Chen, Jiangchuan Liu, Zongpeng Li, Yijie Wang. "Routing with Uncertainty in Wireless Mesh Networks," in *the Proceedings of IEEE IWQoS 2010*, Beijing, China, June 16-18, 2010.

Hanan Shpungin, Zongpeng Li. "Throughput and Energy Efficiency in Wireless Ad Hoc Networks with Gaussian Channels," in *the Proceddings of the 7th IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, Boston, Massachusetts, June 21-25, 2010 (**acceptance rate: 23%**).

Ouldooz Baghban Karimi, Jiangchuan Liu, Zongpeng Li. "Multicast in Multi-Channel Wireless Mesh Networks," in *the Proceedings of IFIP/TC6 Networking 2010*, Chennai, India, May 10-14, 2010.

Ajay Gopinathan, Zongpeng Li, Carey Williamson. " Optimal Multicast in Multi-Channel Multi-Radio Wireless Networks," in *the Proceedings of 16th IEEE/ACM International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, Imperial College London, UK, September 21-23, 2009.

Ajay Gopinathan, Zongpeng Li. "Stochastic Multicast with Network Coding", in *the Proceedings of the 29th IEEE International Conference on Distributed Computing Systems (ICDCS)*, Montreal, Quebec, Canada, June 22-26, 2009 (**acceptance rate: 16%**).

Ajay Gopinathan, Zongpeng Li, Baochun Li. "On Achieving Group Strategyproof Information Dissemination in Wireless Networks", in *the Proceedings of the 1st International*

Conference on Game Theory for Networks (GameNets), Istanbul, Turkey, May 13-15, 2009.

Parthasarathy Ramanujam, Zongpeng Li, Lisa Higham. "Shadow Prices vs. Vickrey Prices in Multipath Routing", in *the Proceedings of IEEE INFOCOM 2009*, Rio de Janeiro, Brazil, April 19-25, 2009 (mini-conference).

Ajay Gopinathan, Zongpeng Li. "Optimal Layered Multicast with Network Coding: Mathematical Model and Empirical Studies", in *the Proceedings of 16th IEEE International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, Baltimore, MD, USA, September 8-10, 2008.

Phillipa Gill, Zongpeng Li, Anirban Mahanti, Jingxiang Luo, Carey Williamson. "Network Information Flow in Network of Queues", in *the Proceedings of 16th IEEE International Symposium on Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS)*, Baltimore, MD, USA, September 8-10, 2008.

Andrew Smith, Bryce Evans, Zongpeng Li, Baochun Li. "The Cost Advantage of Network Coding in Uniform Combinatorial Networks", in *the Proceedings of the First IEEE Workshop on Wireless Network Coding (WiNC)*, San Francisco, California, USA, June 16, 2008.

Phillipa Gill, Martin Arlitt, Zongpeng Li, Anirban Mahanti. "The Flattening Internet Topology: Natural Evolution, Unsightly Barnacles or Contrived Collapse," in *the Proceedings of the Ninth Passive and Active Measurement Conference (PAM 2008)*, Cleveland, Ohio, April 29-30, 2008 (Best Paper Award).

Zongpeng Li. "Cross-Monotonic Multicast", in the Proceedings of *the 27th Annual IEEE Conference on Computer Communications (INFOCOM 2008)*, Phoenix, Arizona, April 15-17, 2008 (**acceptance rate: 21%**).

Phillipa Gill, Martin Arlitt, Zongpeng Li, Anirban Mahanti. "Characterizing User Sessions on YouTube," in the Proceedings of *the Fifteenth Annual Multimedia Computing and Networking Conference (MMCN 2008)*, San Jose, CA, January 30-31, 2008.

Phillipa Gill, Martin Arlitt, Zongpeng Li, Anirban Mahanti. "YouTube Traffic Characterization: A View From the Edge," in the Proceedings of *ACM Internet Measurement Conference (IMC 2007)*, San Diego, CA, October 24-26, 2007 (**acceptance rate: 24%**).

Zongpeng Li, Baochun Li, Mea Wang. "Optimization Models for Streaming in Multihop Wireless Networks," in the Proceedings of *16th IEEE International Conference on Computer Communications and Networks (ICCCN)*, Honolulu, Hawaii, August 13-16, 2007 (**acceptance rate: 29%**).

Zongpeng Li. "Min-Cost Multicast of Selfish Information Flows," in the Proceedings of *the 26th Annual IEEE Conference on Computer Communications (INFOCOM 2007)*, Anchorage, Alaska, May 6-12, 2007 (**acceptance rate: 18%**).

Liqi Shi, Phillipa Sessini, Anirban Mahanti, Zongpeng Li, Derek Eager. "Scalable Stream-

ing for Heterogeneous Clients," in the Proceedings of *ACM Multimedia 2006*, Santa Barbara, CA, October 22-27, 2006 (**acceptance rate: 16%**).

Zongpeng Li, Anirban Mahanti. "A Progressive Flow Auction Approach for Low-Cost On-Demand P2P Media Streaming," in the Proceedings of *the Third International Conference on Quality of Service in Heterogeneous Wired/Wireless Networks (QShine 2006)*, Waterloo, Canada, August 7-9, 2006.

Zongpeng Li, Baochun Li. "On Increasing End-to-end Throughput in Wireless Ad Hoc Networks," in the Proceedings of *the Second International Conference on Quality of Service in Heterogeneous Wired/Wireless Networks (QShine 2005)*, Orlando, Florida, August 22-24, 2005.

Mea Wang, Zongpeng Li, Baochun Li. "A High-Throughput Overlay Multicast Infrastructure with Network Coding," in the Proceedings of *IEEE IWQoS 2005*, Passau, Germany, June 20-23, 2005 (**acceptance rate: 26%**, runner-up for Best Student Paper Award).

Jun Yuan, Zongpeng Li, Wei Yu, Baochun Li. "A Cross-Layer Optimization Framework for Multicast in Multi-hop Wireless Networks," in the Proceedings of *the First IEEE International Conference on Wireless Internet (Wicon 2005)*, Visegrad-Budapest, Hungary, July 10-15, 2005.

Zongpeng Li, Baochun Li, Dan Jiang, Lap Chi Lau. "On Achieving Optimal Throughput with Network Coding," in the Proceedings of *the 24th Annual IEEE Conference on Computer Communications (INFOCOM 2005)*, Miami, Florida, March 13 – 17, 2005 (**acceptance rate: 17%**).

Zongpeng Li, Baochun Li. "Efficient and Distributed Computation of Maximum Multicast Rates," in the Proceedings of *the 24th Annual IEEE Conference on Computer Communications (INFOCOM 2005)*, Miami, Florida, March 13 – 17, 2005 (**acceptance rate: 17%**).

Zongpeng Li, Baochun Li. "Network Coding: The Case of Multiple Unicast Sessions," in the Proceedings of *the 42nd Annual Allerton Conference on Communication, Control, and Computing*, Monticello, Illinois, September 29 – October 1, 2004.

Mea Wang, Baochun Li, Zongpeng Li. "sFlow: Towards Resource-Efficient and Agile Service Federation in Service Overlay Networks," in the Proceedings of *the 24th IEEE International Conference on Distributed Computing Systems (ICDCS 2004)*, Tokyo, Japan, March 23 – 26, 2004 (**acceptance rate: 17%**).

Zongpeng Li, Baochun Li. "Network Coding in Undirected Networks," in the Proceedings of *the 38th Annual Conference on Information Sciences and Systems (CISS 2004)*, Princeton, New Jersey, March 17 – 19, 2004.

Zongpeng Li, Baochun Li, Dongyan Xu, Xin Zhou. "iFlow: Middleware-assisted Rendezvous-based Information Access for Mobile Ad Hoc Applications," in the Proceedings of *the First ACM/USENIX International Conference on Mobile Systems, Applications, and*

Services (MobiSys 2003), San Francisco, CA, May 5 – 8, 2003 (**acceptance rate: 15%**).

BOOK CHAPTERS

Zongpeng Li, Hong Xu, Baochun Li. "Network Coding in Bi-directed and Peer-to-Peer Networks." *Next-Generation Internet Architectures and Protocols*, editors: Byrav Ramamurthy, George Rouskas, Krishna Sivalingam. Cambridge University Press, 2010.

DISSERTATIONS

Zongpeng Li. "On Achieving Optimal Throughput in Data Networks," *Ph.D. Dissertation*, Department of Electrical and Computer Engineering, University of Toronto, September 2005.

Zongpeng Li. "Non-blocking Implementation of Queues in Asynchronous Distributed Shared-memory Systems," *M.Sc. Dissertation*, Department of Computer Science, University of Toronto, August 2001.

SELECTED CONFERENCE SERVICES

- ♢ IEEE INFOCOM, Technical Program Committee, 2011, 2012.
- ♢ Symposium on Network Coding (NetCod), Publicity Chair, 2010, 2011; Technical Program Committee, 2010.

EXTERNAL REFEREEING

Refereeing for Academic Journals

- ♢ IEEE/ACM Transactions on Networking
- ♢ IEEE Transactions on Information Theory
- ♢ IEEE Transactions on Mobile Computing
- ♢ IEEE Transactions on Multimedia
- ♢ IEEE Transactions on Wireless Communications
- ♢ Elsevier Journal of Systems and Software
- ♢ Elsevier Computer Networks
- ♢ EURASIP Journal on Wireless Communications and Networking

RESEARCH GRANTS

- ♢ Start-up research grant, $30,000$ CAD, 2005-2007, Department of Computer Science/Faculty of Science, University of Calgary.
- ♢ Starters Grant, "Coping with Selfish Agents in Internet Information Dissemination", $15,000$ CAD, 2006-2007, Research Services, University of Calgary.
- ♢ Discovery grant, "Optimization Algorithms in Data Networks", $54,000$ CAD, 2006-2009, National Science and Engineering Research Council of Canada (NSERC).
- ♢ Travel grant for IEEE INFOCOM 2007, 1,800 CAD, 2007, Research Services, University of Calgary
- ♢ Ingenuity New Faculty Award, "Internet Information Dissemination: Information Theory Meets Game Theory", 300,000 CAD, 2008-2011, Alberta Ingenuity Fund.
- ♢ Seed Project grant, "Optimizing Information Flows over the Internet: Routing and Coding with Non-Cooperative Users", $80,000$ CAD, 2009-2011, The Mathematics of Information Technology and Complex Systems (MITACS) (joint grant with Dr. Baochun Li from University of Toronto and Dr. Jiangchuan Liu from Simon Fraser University).

- ♢ Discovery grant, "Internet Information Multicast: Algorithms, Mechanisms and Systems", $150,000$ CAD, 2009-2014, National Science and Engineering Research Council of Canada (NSERC).
- ♢ Co-Investigator, Competitive Earmarked Research Grant (CERG), "Autonomous Peer-to-Peer via Auctions: Modeling and Mechanism Design", $598,437$ HKD, 2010-2012, Research Grant Council of Hong Kong (RGC). (Principle Investigator is Dr. Chuan Wu at University of Hong Kong.)

Teaching Experiences

Course Instructor **2010**
Department of Computer Science, University of Calgary

- ♢ *CPSC 235, Advanced Introduction to Computer Science*
- ▷ First-year undergraduate course for Compuer Science majors, on the subject of problem solving using computer programs, with both procedural and object oriented programming studied. This is a small scale class for talented and motivated students. Topics covered include most of those studied in CPSC 231(Introduction to Computer Science I) and CPSC 233 (Introduction to Computer Science II). Two programming languages are introduced: Python and Java.

Course Instructor **2008-2009**
Department of Computer Science, University of Calgary

- ♢ *CPSC 231, Introduction to Computer Science I*
- ▷ First-year undergraduate course for Compuer Science majors, on the subject of problem solving using computer programs. The language of teaching is Python. Topics covered include (1) variables, expressions, statements, (2) functions, (3) conditionals, (4) iterations, (5) strings, lists, dictionaries, tuples, (6) modules and files, (7) recursion and exceptions, (8) classes and objects and (9) Python in research.

Course Instructor **2006-2008**
Department of Computer Science, University of Calgary

- ♢ *CPSC 441, Computer Communications*
- ▷ Third-year undergraduate course on the principles and practices of computer networking. Topics covered include network protocol stack, reliable data transfer, congestion control, routing algorithms, media access control and delay analysis.

Course Instructor **2006, 2007**
Department of Computer Science, University of Calgary

- ♢ *CPSC 599.18/601.18, Network Coding*
- ▷ Cross-listed graduate and undergraduate course on the studies of the theory, algorithms, and applications of network coding, an emerging research area at the intersection of computer science and information theory.

Course Instructor **2007**

Department of Computer Science, University of Calgary

◇ *CPSC 599.20, Special Topics in CS: Algorithmic Game Theory*

▷ Summer course offered jointly by Dr. Lisa Higham and myself in 2007. Topics covered include basic concepts and models in game theory, Nash Equilibrium, Mixed Equilibrium, Mechanism Design, applications of game theory in computer networks.

Course Instructor **2009-2010**
Department of Computer Science, University of Calgary

◇ *CPSC 601.39, Network Flows and Network Information Flows*

▷ Graduate course in computer science. Topics covered include basic concepts and models and algorithms in network flows, multicast trees and network coding, as well as recent research on the optimization and application of network information flows.

Course Instructor **2008**
Department of Computer Science, University of Calgary

◇ *CPSC 503, Project Course, Investigating the Potential of Network Coding in Improving Multicast Throughput*

▷ Project based course offered in Winter 2008 to a team of two undergraduate students, both working for their double major in Computer Science and Pure Mathematics. In this project, the students will exercise theoretical (mathematical proofs), analytical (modelling of computer networks and information flows), and experimental (writing computer programs to create random networks, formulate and solve routing linear programs) skills. Positive results from the project will advance the state-of-the-art knowledge in network coding research.

Teaching Assistant **1999-2005**
Department of Computer Science, University of Toronto
Department of Electrical and Computer Engineering, University of Toronto

◇ *Discrete Mathematics*
◇ *Data Structure and Algorithms*
◇ *The Theory of Efficient Computation*
◇ *Distributed Systems*
◇ *Introduction to Programming*
◇ *Computer Graphics*
◇ *Compilers and Interpreters*
◇ *Computer Organization*