

Alireza Keshavarz-Haddad

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EDUCATION

Rice University, Houston, TX

- PhD in Electrical Engineering, 2007. (GPA: 4.09/4)

Rice University, Houston, TX

- MS in Electrical Engineering, 2003. (GPA: 4.03/4)

Sharif University of Technology, Tehran

- BS in Electrical Engineering, 2001.

RESEARCH INTERESTS

- **Performance Analysis of Wireless Networks:** Fundamental Bounds on Capacity, Throughput and Energy Consumption.
- **Computer Networks:** Routing and Broadcasting Protocols for Mobile Ad Hoc and Wireless Sensor Networks.
- **Percolation Theory:** Applications on Large Scale Wireless Networks.
- **Network Coding:** Fundamental Limitations of Network Coding in Wireless Networks.
- **Network Traffic Modeling:** Traffic Control, Queuing Analysis, and Performance Improvement Techniques for Internet Network.

RESEARCH EXPERIENCES

Research Assistant, ECE Department, Rice University, Houston, TX

- 2004-2007, proposed several broadcast routing protocols in mobile Ad Hoc networks, and also analytical frameworks for computing the throughput of wireless networks.
PhD thesis project: “*On the Capacity of Multihop Wireless Networks: Fundamental Limitations and Efficient Algorithms*”
- 2002-2003, modeled network traffic bursts with self-similar and long-range-dependence random processes, and analyzed effect of the bursts in network queues.
MS thesis project: “*Effect of the Traffic Bursts in the Network Queue*”
- 2001-2002, surveyed, proposed, and analyzed multi-scale multiplicative models for network traffic.
Research qualification: “*Analysis for Multi-scale Multiplicative Traffic Models*”

DISTINCTIONS and HONORS

- Received a fellowship and scholarship for graduate studies in Electrical Engineering from Rice University, 2001.
- Completed a BS study from Sharif University in Tehran in only three years (more than 140 credits), 1998-2001.
- Won a Gold Medal at the 39th International Mathematical Olympiad in Taiwan, 1998.
- Won a Gold Medal at the 14th National Mathematical Olympiad in Iran, 1997.
- Won a Silver Medal at the 13th National Mathematical Olympiad in Iran, 1996.

TEACHING EXPERIENCES

Teacher Assistant, ECE Department, Rice University, Houston, TX

- 2002-2007, assisted with a number of courses in Electrical & Computer Engineering and Statistics Departments such as: Information Theory, Introduction of Random Processes, Applied Stochastic Processes, Mathematical Probability, Digital Logic Systems, Fundamentals of Electrical Engineering.

Instructor of Mathematical Olympiad, Tehran

- 1998-2001, taught courses in Graph Theory, Euclidian Geometry, Number Theory, Combinatorics, Algebra and Calculus to outstanding students in several institutions.

COMPUTER SKILLS

- Languages: Matlab, C++, Pascal, NS-2, Tcl, Assembly Language.
- Operating systems: Windows, Linux, DOS, UNIX.

PROFFESIONAL ACTIVITIES

- Member of: ACM, IEEE, and IEEE Communications Society.
- Reviewer for Journals: IEEE Transactions on Wireless Communications, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Vehicular Technology, IEEE Communications Letters.
- Reviewer for Conferences: INFOCOM 2005, LCN 2005, INFOCOM 2006, Mobile Peer-to-Peer Computing 2006, ICDCS 2007, MobiCom 2007.

RESEARCH OBJECTIVES

- My PhD research interests were concentrated in Ad Hoc and Sensor Networks, specifically on network capacity and performance analysis of routing protocols. In the beginning of the research, I focused on broadcasting for Ad Hoc networks while utilizing energy efficient broadcast protocols. I analyzed the capacity of wireless multihop networks for broadcasting. I was able to extend my work by providing tight bounds on the network capacity for other applications such as unicast, multicast. I also investigated the gain of network coding on the throughput and energy consumption for various

applications. The final goal of my research was to introduce powerful frameworks and useful tools for analyzing the performance of various network operations.

- My MS thesis was concentrated on the network traffic modeling. I investigated the queueing of classical traffic models Poisson, Self-similar, Heavy-tailed, and Multifractal. I focused on “Alpha-Beta” connection level decomposition model, which divides the traffic into two components based on the volume and rate of the connections. I presented a novel queueing analysis for the model, while introducing a technique to increase per user throughput by giving lower priority to strong connections in network queues.

PUBLICATIONS

Published Papers:

- Alireza Keshavarz-Haddad, Rudolf Riedi. “Multicast Capacity of Large Homogeneous Multihop Wireless Networks”; *6th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt)*, Berlin, Germany, April 2008.
- Alireza Keshavarz-Haddad, Rudolf Riedi. “Bounds on the Benefit of Network Coding: Throughput and Energy Saving in Wireless Networks”; *27th Annual IEEE Conference on Computer Communications (IEEE INFOCOM)*, Phoenix, Arizona, USA, April 2008. [acceptance rate: 21%]
- Alireza Keshavarz-Haddad, Rudolf Riedi. “Bounds for the Capacity of Wireless Multihop Networks imposed by Topology and Demand”; *8th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc)*, Montréal, Québec, Canada, September 2007. [acceptance rate: 18%]
- Alireza Keshavarz-Haddad, Rudolf Riedi. “On the Broadcast Capacity of Multihop Wireless Networks: Interplay of Power, Density and Interference”; *4th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, San Diego, California, USA, June 2007. [acceptance rate: 20%]
- Alireza Keshavarz-Haddad, Vinay Ribeiro, Rudolf Riedi. “DRB and DCCB: Efficient and Robust Dynamic Broadcast for Ad Hoc and Sensor Networks”; *4th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, San Diego, California, USA, June 2007. [acceptance rate: 20%]
- Petteri Mannersalo, Alireza Keshavarz-Haddad, Rudolf Riedi. “Broadcast Flooding Revisited: Survivability and Latency”; *26th Annual IEEE Conference on Computer Communications (IEEE INFOCOM)*, Anchorage, Alaska, USA, May 2007. [acceptance rate: 18%]

- Alireza Keshavarz-Haddad, Vinay Ribeiro, Rudolf Riedi. “Broadcast Capacity in Multihop Wireless Networks”; *12th Annual International Conference on Mobile Computing and Networking (MobiCom)*, Los Angeles, California, USA, September 2006. [acceptance rate: 11%]
- Alireza Keshavarz-Haddad, Vinay Ribeiro, Rudolf Riedi. “Color-Based Broadcasting for Ad Hoc Networks”; *4th International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt)*, Boston, Massachusetts, USA, April 2006.
- Rudolf Riedi, Alireza Keshavarz-Haddad, Shirram Sarvotham, Richard Baraniuk. “Fractals in Networking: Modeling and Inference”; *Proceedings of Fractals 2004, Conference on `Fractals and Complexity in Nature`*, Vancouver, Canada, April 2004.

Theses and Technical Repots:

- Alireza Keshavarz-Haddad, Rudolf Riedi. “Bounds on the Benefit of Network Coding for Multicast and Unicast Sessions in Wireless Networks”; TR-2007-09, Rice University, Houston, Texas, USA, October 2007.
- Alireza Keshavarz-Haddad, “On the Capacity of Multihop Wireless Networks: Fundamental Limitations and Efficient Algorithms”; PhD Thesis, Rice University, Houston, Texas, USA, September 2007.
- Alireza Keshavarz-Haddad, Vinay Ribeiro, Rudolf Riedi. “DRB and DCCB: Efficient and Robust Dynamic Broadcast for Ad Hoc and Sensor Networks”; TR-2006-09, Rice University, Houston, Texas, USA, December 2006.
- Alireza Keshavarz-Haddad, “Effect of the Traffic Bursts in the Network Queue”; MS Thesis, Rice University, Houston, Texas, USA, April 2003.

In preparation Journal Papers:

- Alireza Keshavarz-Haddad, Rudolf Riedi. “Broadcast Capacity in Wireless Multihop Networks”; to be submitted to *IEEE/ACM Transactions on Networking*.
- Alireza Keshavarz-Haddad, Rudolf Riedi. “Bounds for the Capacity of Wireless Multihop Networks imposed by Topology and Traffic Pattern”; to be submitted to *IEEE/ACM Transactions on Networking*.
- Alireza Keshavarz-Haddad, Rudolf Riedi. “On the Gain of Network Coding for Multiple Unicast Sessions in Wireless Networks”, to be submitted to *IEEE Transactions on Information Theory*.
- Alireza Keshavarz-Haddad, Rudolf Riedi. “Multicast Capacity of Large Homogeneous Multihop Wireless Networks”, to be submitted to *IEEE Transactions on Communications*.