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Nan Liu

Education

- 08/01–08/07 **Ph.D. Electrical Engineering**, *University of Maryland*, College Park.
Thesis: Capacity Results for Wireless Networks: Effects of Correlation, Cooperation and Interference
Advisor: Dr. Sennur Ulukus
GPA: 4.0/4.0
- 09/97–07/01 **B.Eng. Electrical Engineering**, *Beijing Univ. of Posts and Telecom.*, China.
Thesis: Static Timing Analysis with Crosstalk
Advisor: Dr. Huazhong Yang (Tsinghua University, China)
GPA: 93/100

Experience

- 09/07–present **Postdoctoral Scholar**
Wireless Systems Lab, Department of Electrical Engineering, Stanford University
Investigation of the fundamental limits of wireless networks, how interference between wireless nodes impacts these fundamental limits, and transmission/reception strategies to either exploit or mitigate interference
- 01/03–08/07 **Graduate Research Assistant**
University of Maryland, Department of Electrical and Computer Engineering
University of Maryland, The Institute for Systems Research
Investigation of the fundamental limits of wireless networks, how cooperation, correlation, interference between wireless nodes and the varying nature of the wireless medium impact these fundamental limits
- 08/01–01/03 **Graduate Teaching Assistant**
University of Maryland, Department of Electrical and Computer Engineering
Leading recitation classes and lab sessions for undergraduate as well as graduate courses, such as Signal and System Theory, Advanced Digital Signal Processing, Fundamental Electric and Digital Circuit Laboratory, Electronic Circuits Design Laboratory

06/05-08/05 **Graduate Mentor**

University of Maryland, Maryland Engineering Research Internship Teams (MERIT)
Serving as a mentor for an undergraduate student of Pennsylvania State University in the MERIT program. During this project, scaling laws of large networks were studied and simulated, and a variety of schemes were proposed to improve the performance of the network.

Awards and Honors

- 2003-2007 Full research assistantship from the Institute for Systems Research, UMCP
- 2001-2003 Full teaching assistantship from the department of ECE, UMCP
- 1998 First Prize in Mathematics Contest of Beijing
- 1998 Third Prize in Physics Contest of Beijing
- 1998 Outstanding Prize in English Contest of China
- 2000 First-class Elite Academic Scholarship of Beijing
- 1998,1999, 2001 First-class Excellent Academic Scholarship of Beijing University of Posts and Telecommunications

Research Interests

Network information theory, wireless communication theory, networking and signal processing for wireless communication networks; with a current emphasis on the capacity region of the interference channel and its applications in interference management in wireless ad-hoc networks, efficient transmission of correlated data using cooperation in sensor networks, wireless communication networks with secrecy constraints in the presence of wire-tapper, and resource allocation for wireless communications.

Journal Publications

- 1 N. Liu and A. Goldsmith, "Capacity Regions and Bounds for a Class of Z-interference Channels", submitted to *IEEE Trans. on Information Theory*, May 2008.
- 2 S. Shafiee, N. Liu and S. Ulukus, "Towards the Secrecy Capacity of the Gaussian MIMO Wire-tap Channel: The 2-2-1 Channel", submitted to *IEEE Trans. on Information Theory*, September 2007.
- 3 N. Liu and S. Ulukus, "The Capacity Region of a Class of Discrete Degraded Interference Channels", to appear at *IEEE Trans. on Information Theory*, September 2008.

- 4 N. Liu and S. Ulukus, "Scaling Laws for Dense Gaussian Sensor Networks and the Order Optimality of Separation", *IEEE Trans. on Information Theory*, 53(10): 3654-3676, October 2007.
- 5 N. Liu and S. Ulukus, "Capacity Region and Optimum Power Control Strategies for Fading Gaussian Multiple Access Channels with Common Data", *IEEE Trans. on Communications*, 54(10):1815-1826, October 2006.

Conference Publications

- 1 N. Liu, D. Gunduz, A. Goldsmith and H. V. Poor, "Interference Channels with Correlated Receiver Side Information", submitted to *46th Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, July 2008.
- 2 I. Maric, N. Liu and A. Goldsmith, "Encoding against an Interferer's Codebook", submitted to *46th Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, July 2008.
- 3 N. Liu and A. Goldsmith, "Superposition Encoding and Partial Decoding is Optimal for a Class of Z-interference Channels", *IEEE International Symposium on Information Theory*, Toronto, Canada, July 2008.
- 4 S. Shafiee, N. Liu and S. Ulukus, "Secrecy Capacity of the 2-2-1 Gaussian MIMO Wire-tap Channel", *3rd International Symposium on Communications, Control and Signal Processing*, St. Julians, Malta, March 2008.
- 5 N. Liu and S. Ulukus, "The Capacity Region of a Class of Discrete Degraded Interference Channels", *44th Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, September 2006.
- 6 N. Liu and S. Ulukus, "Optimal Distortion-Power Tradeoffs in Gaussian Sensor Networks", *IEEE International Symposium on Information Theory*, Seattle, WA, July 2006.
- 7 N. Liu and S. Ulukus, "Optimal Distortion-Power Tradeoffs in Sensor Networks: Gauss-Markov Random Processes", *IEEE International Conference on Communications*, Istanbul, Turkey, June 2006.
- 8 N. Liu and S. Ulukus, "On the Capacity Region of the Gaussian Z-channel", *IEEE Global Communications Conference*, Dallas, TX, November 2004.
- 9 N. Liu and S. Ulukus, "Ergodic Capacity Region of Fading Gaussian Multiple Access Channels with Common Data", *42nd Annual Allerton Conference on Communications, Control and Computing*, Monticello, IL, September 2004.

Graduate Courses Taken

Communications	Random Processes in Communication and Control, Estimation and Detection Theory, Digital Communications, Multi-user Communication, Wireless Communication Theory, Multiuser Detection
Information & Coding Theory	Information Theory, Error Correcting Codes, Multiuser Information Theory, Advanced Topics in Coding Theory
Signal Processing	Advanced Digital Signal Processing, Statistical and Adaptive Signal Processing
Control	System Theory, Optimal Control
Mathematics	Real Analysis I, Real Analysis II

Professional Activities

- TPC member of Information and Coding Theory Symposium, Chinacom 2008
- Reviewer for international journals and conferences:
 - IEEE Transactions on Information Theory, Communications, Signal Processing,
 - IEEE Communication Letters
 - Major IEEE conferences such as ISIT, ITW, Globecom, ICC, VTC
- Member of IEEE