

VIVEK P. MHATRE

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Education

- Ph.D (May 2005), School of Electrical and Computer Engineering, Purdue University, Indiana, USA (GPA: 3.93/4.0).

Dissertation: Cross-layer Interactions and Optimizations in Wireless Networks

- B.Tech (August 2000), Department of Electrical Engineering, Indian Institute of Technology (IIT) Bombay, India (GPA 9.1/10.0).

Research Interests

Studying the fundamental performance limits of communication networks; in particular, wireless networks. Understanding the interactions between the phenomena at the wireless physical layer, and the protocols used at the higher networking layers, by using mathematical tools for network modeling, and experimentation with real test-beds. Specifically,

- *Wireless LANs:* Experimentally studying the throughput performance, handoff and interference issues in single hop Wireless LANs as well as mesh networks.
- *Cellular Networks:* Interference modeling, power and rate allocation (scheduling) in next generation cellular networks.
- *Ad Hoc Networks:* Scaling laws that govern the capacity of large ad hoc networks.
- *Wireless Sensor Networks:* Optimal clustering, communication and media access protocols in wireless sensor networks.

Work Experience

- *June 2006 to present:* Postdoctoral Research Fellow at Thomson Paris Research Lab, France. Experimental and analytical study of Wireless Mesh Networks with Sectorized Antennas.
- *June 2005 to May 2006:* Postdoctoral Research Fellow at Intel Research Lab, Cambridge, UK. Experimental and analytical study of MAC layer tuning, power control, and handoff problems in self-configurable 802.11 networks using Intel Centrino™ platform.
- *August 2000 to May 2005:* Research assistant at the School of Electrical and Computer Engineering. Studied cross-layer interactions and optimizations in wireless networks.
- *October 2004 to November 2004:* Visiting research scholar in the Department of Electrical and Computer Engineering at the University of Waterloo, Canada.
- *June 2002 to August 2002:* Summer intern at ViaSat Inc., Carlsbad, California, USA. Set up traffic measurement platform for testing the performance of TCP over an Internet-over-Satellite network.
- *May 1999 to July 1999:* Summer intern at Bhabha Atomic Research Center (BARC), Bombay. Developed a C program for controlling the drifting imaging device embedded in a surveillance balloon, to keep it focused on the region of interest.

Graduate Coursework

- *Communication Networks*: Modeling of communication networks and protocols
- *Wireless Communications*: Cellular networks, channel assignment, power control, etc.
- *Internetworking*: Implementing from scratch, the core functionalities of an IP router as per RFC specifications using the XINU operating system
- *Digital Communication*: Modulation and coding schemes, principles of CDMA
- *Probability Theory*: Measure theoretic approach to probability
- *Operating Systems*: XINU as an example operating system
- *Optimization Methods*: Unconstrained and constrained optimization problems
- *Stochastic Processes in Information Systems*: Markov chains, point processes
- *Computational Models and Methods*: Algorithmic complexity, graphs, etc.
- *Real Analysis*: Measure theory and Lebesgue integration
- *Performance Modeling for QoS Support*: Loss networks, Palm theory
- *College Teaching Workshop*: Problems faced by experienced educational personnel, and ways to deal with them

Journal Publications

- V. Mhatre and C. Rosenberg, “Impact of network load on forward link inter-cell interference in cellular data networks,” accepted for publication in *IEEE Transactions on Wireless Communications (TWC)*, February 7th 2006.
- V. Mhatre, C. Rosenberg, D. Kofman, R. R. Mazumdar, and N. B. Shroff, “A minimum cost surveillance sensor network with a lifetime constraint,” *IEEE Transactions on Mobile Computing (TMC)*, 2005, Vol. 4, No. 1, pp 4-15.
- V. Mhatre and C. Rosenberg, “Design guidelines for wireless sensor networks: Communication, clustering and aggregation,” *Ad Hoc Networks Journal, Elsevier Science*, 2004, Vol. 2, Issue 1, pp 45-63.

Conference Publications and Book Chapters

- V. Mhatre and D. Papagiannaki, “Using smart triggers for improved user performance in 802.11 Wireless Networks,” in the proc. of *ACM/USENIX International Conference on Mobile Systems, Applications, and Services (MobiSys 2006)*, Uppsala, Sweden, June 2006.
- V. Mhatre and C. Rosenberg, “The impact of link layer model on the capacity of a random ad hoc network,” in the proc. of *IEEE International Symposium on Information Theory, (ISIT 2006)*, Seattle, WA, USA, July 2006.
- A. Iyer, S. Kulkarni, V. Mhatre, and C. Rosenberg, “A Taxonomy-based approach to design large-scale sensor networks,” invited book chapter in *Wireless Sensor Networks and Applications*, (Y. Li, M. Thai and W. Wu, eds.) in Springer Verlag’s book series *Network Theory and Applications*, 2005, to appear. The names of the authors are in alphabetical order.
- V. Mhatre and C. Rosenberg, “Energy and cost optimizations in wireless sensor networks: A survey,” invited book chapter in *Performance evaluation and planning methods for the next generation Internet* (A. Girard, B. Sanso, and F. Vazquez-Abad, eds.), *25th Anniversary Volumes of GERAD (Group for Research in Decision Analysis)*, Kluwer Academic Publishers, May 2005.

- V. Mhatre and C. Rosenberg, “Homogeneous vs heterogeneous sensor networks: A comparative study,” in the proc. of *IEEE International Conference on Communications (ICC) 2004*, Paris, France, June 2004.
- V. Mhatre, C. Rosenberg, D. Kofman, R. Mazumdar, and N. Shroff, “Design of surveillance sensor grids with a lifetime constraint,” in the proc. of *1st European Workshop on Wireless Sensor Networks (EWSN)*, Berlin, Germany, January 2004.
- V. Mhatre and C. Rosenberg, “Performance improvement of TCP-based applications in a multi-access satellite system,” in the proc. of *IEEE VTC (Vehicular Technology Conference) Fall 2002*, Vancouver, Canada, Sept. 2002.

Publications under review/preparation

- V. Mhatre and C. Rosenberg, “The capacity of random ad hoc networks under a realistic link layer model,” submitted to *IEEE Transactions on Information Theory*, April 21st 2005.
- V. Mhatre and D. Papagiannaki, “Network Design for Optimal Throughput in High Density WLANs,” submitted Feb. 2006.
- V. Mhatre, F. Baccelli and D. Papagiannaki, “Power control and CCA adaptation in 802.11 networks: A cross-layer problem,” under preparation.

Seminars

- *The Capacity of Ad-hoc Networks*, at IISc Bangalore, IIT Bombay, IIT Kanpur, IIT Delhi, IIT Madras and TIFR Bombay, September 2005.
- *Impact of network load on forward link inter-cell interference in cellular data networks*, in the CRI (Computing Research Institute) seminar series, Purdue University, February 2005.
- *Wireless sensor networks: An overview*, in an undergraduate course, *Introduction to Computer Communication Networks*, ECE 495R, Purdue University, December 2004.
- *CDMA 2000: 1xEVDO and 1xEVDV, An overview*, in a graduate course, *Advanced Course on Networking*, ECE 647, Purdue University, April 2004.
- *Structural characteristics of wireless sensor networks*, in the CRI (Computing Research Institute) seminar series, Purdue University, February 2004.

Academic Awards and Affiliations

- Recipient of a Graduate Fellowship award from Purdue University (August 2000 to July 2001).
- Recipient of the SIRG Fellowship award from Computing Research Institute (CRI), Purdue University (August 2002 to May 2005).
- Placed in top 0.2% (All India Rank 165) in the Joint Entrance Exam (JEE) conducted in May 1996 for admission to Indian Institutes of Technology (IITs).

TPC and Reviewing Tasks

- Served as a Technical Program Committee member for International Conference on Wireless and Mobile Communications (ICWMC 2006), Bucharest, Romania. Proceedings published by *IEEE Computer Society Press*.
- Served as a reviewer for technical papers submitted to journals such as IEEE/ACM Transactions on Networking, IEEE Transactions on Information Theory, IEEE Transactions on Mobile Computing, IEEE Transactions on Wireless Communications, IEEE Journal on Selected Areas in Communications (JSAC), Communications Letters, ACM/Kluwer Monet, IEEE Communications Magazine, Electronic Letters, etc., and conferences such IEEE Infocom, Globecom, ICC, WiOpt, Vehicular Technology Conference, etc.

Technical and Computer skills

- Designed, implemented and tested handoff algorithms for the ipw2200 Linux driver for the Intel Centrino™ cards to support roaming in 802.11 networks. Also worked on the firmware of the Intel Centrino™ cards for implementing power control algorithms.
- Have extensively used OPNET simulator for simulating power control and CCA adaptation algorithms in 802.11 Wireless LANs.
- Built a simulator in C to simulate 1xEVDO CDMA-HDR cellular data network with wireless link layer and physical layer functionalities, as well as opportunistic scheduling routine.
- Have extensively used *ns* (Network Simulator), and also added several new modules to *ns* for enhancing satellite networking support.
- Proficient in C, C++. Programming on Linux, UNIX and XINU.

References

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| 1. Prof. Catherine Rosenberg School of Electrical & Computer Engineering, University of Waterloo, Canada Email: cath@ecemail.uwaterloo.ca Tel: +1-519-888-4016 Fax: +1-519-886-0619 | 2. Prof. Ravi Mazumdar School of Electrical & Computer Engineering, University of Waterloo, Canada Email: mazum@ecemail.uwaterloo.ca Tel: +1-519-888-4567 Ext. 7444 Fax: +1-519-746-3077 |
| 3. Konstantina Papagiannaki Intel Research Cambridge, UK Email: dina.papagiannaki@intel.com Tel: +44-1223-763-440 Fax: +44-1223-763-456 | 4. Prof. Ness Shroff School of Electrical & Computer Engineering, Purdue University, USA Email: shroff@ecn.purdue.edu Tel: +1-765-494-3471 Fax: +1-765-494-3358 |