

# Curriculum Vitae

**Name:** Rohit Negi  
**Office:** Department of Electrical and Computer Engg.  
5000 Forbes Avenue  
Carnegie Mellon University  
Pittsburgh, PA 15213  
**Email:** negi@ece.cmu.edu  
**Phone/Fax:** (412) 268-6264 / 2860  
**URL:** <http://www.ece.cmu.edu/~negi>

## RESEARCH INTERESTS

Broadly interested in communication systems, networking, sensor exploitation and information theory, with an emphasis on wireless communications. Research work has included Quality of Service over wireless links, MAC for ad hoc networks, sensor networks, space-time codes for multiple-antenna fading channels, Orthogonal Frequency Division Multiplexing systems.

## RECENT EMPLOYMENT

**July 2005 - present** Carnegie Mellon University, Pittsburgh, Pennsylvania:  
Associate Professor of Electrical and Computer Engineering.  
Research areas: Wireless communications, networking, information theory, communication theory and sensor networks.  
**Sept. 2000 - June 2005** Carnegie Mellon University, Pittsburgh, Pennsylvania:  
Assistant Professor of Electrical and Computer Engineering.

## EDUCATION

**1996-2000** Stanford University, Stanford, CA  
Ph.D. in Electrical Engineering, September 2000  
Thesis: *Power Adaptation Strategies for Delay Constrained Channels*  
Advisor: Prof. John Cioffi  
**1995-1996** Stanford University, Stanford, CA  
M.S. in Electrical Engineering (GPA: 4.15 out of 4)  
**1991-1995** Indian Institute of Technology (IIT), Bombay, India  
Bachelor of Technology in Electrical Engineering (GPA: 9.93 out of 10)  
Thesis: *Convergence and Bias in Lattice Filter Algorithms*  
Advisor: Prof. P.G. Poonacha

## AWARDS AND HONORS

- Best paper award in IEEE International Symposium on Wireless Communication Systems

(ISWCS), Italy, 2005.

- Best paper award in IEEE/ACM Broadband Networks (Broadnets), San Jose, USA, 2004.
- National Science Foundation (NSF) Career award 2004.
- Texas Instruments Award, 1997-2000, and Stanford Engineering Fellowship, 1995-1996.
- Stanford Engineering Graduate Fellowship, 1995-1996.
- **President of India Gold medal, IIT Bombay, 1995.** Awarded for the highest GPA in the graduating engineering class of 400 students.
- Secured the All India 11th Rank at the IIT Joint Entrance Exam, '91, amongst approximately 100,000 students who took the exam.
- Awarded the National Talent Search (NTS) scholarship, instituted by the National Council for Educational Research and Training (NCERT), India.
- Awarded the National Physics Olympiad gold medal, 1990, India.

## **PRIOR EXPERIENCE**

- Summer '98** Intern at Texas Instruments R&D Center, Dallas, Texas  
Developed patented algorithms for antenna arrays, and adapted space-time codes to CDMA, for the Third Generation wireless system solution being developed at Texas Instruments.
- Summer '97** Intern at Amati Communications Corp., San Jose, California  
Designed novel interference cancellation algorithms for VDSL, including a matrix precoded scheme.
- Summer '96** Intern at Bell Laboratories (Lucent Technologies), Crawford Hill, New Jersey  
Performed cellular capacity calculations for wireless local loop using multiple antennas for beamforming.

## **Ph.D. STUDENTS ADVISED**

1. Dapeng Wu, "Quality-of-Service for bursty traffic over fading wireless channels," Ph.D. dissertation, Carnegie Mellon University, Aug. 2003.
2. Xun Zhang, "Detection in perpendicular recording channels," Ph.D. dissertation, Carnegie Mellon University, April 2006.
3. Arjunan Rajeswaran, "Capacity and cross-layer design of ultra-wideband wireless networks," Ph.D. dissertation, Carnegie Mellon University, Jan. 2007.
4. Yaron Rachlin, "On the interdependence of sensing, accuracy and complexity in large-scale detection applications," Ph.D. dissertation, Carnegie Mellon University, Feb. 2007. Co-advised by P. Khosla.
5. Sung Chul Han, "A flexible decoder and performance evaluation for array-structured LDPC codes," Ph.D. dissertation, Carnegie Mellon University, Sept. 2007. Co-advised by M. Pueschel.

6. Gyouhwan Kim, "Scheduling in wireless ad hoc networks: algorithms with performance guarantees," Ph.D. proposal, Carnegie Mellon University, Feb. 2008 (ongoing).
7. Satashu Goel, "Delay constrained communication over fading channels: A queued-code approach," Ph.D. proposal, Carnegie Mellon University, Feb. 2008 (ongoing).
8. Balakrishnan Narayanaswamn, "Detection and estimation in sensor networks," ongoing. Expected graduation Dec. 2009. Co-advised by P. Khosla.
9. Qiao Li, "Ad hoc network analysis," ongoing. Expected graduation May 2011.
10. Eui Seok Hwang, "Timing recovery for data storage," ongoing. Expected graduation May 2010. Co-advised by V. Bhagavatula.

## EDUCATIONAL CONTRIBUTIONS

1. **Course 18-450:** Designed a new course in digital wireless communications, supplemented by extensive course notes, that covers digital modulation, equalization, coding (convolutional) and channel fading. This course explains the basic wireless processing operations, at an undergraduate level, and augments theoretical analysis by Matlab-based experiments. Demonstrations are provided on the concepts of channel impairments (ISI, fading, etc.) and the concept of modulation (mixing, Nyquist pulses, etc.) by means of a ATMEL microcontroller-based communication system designed by me. The emphasis of the course is on making wireless design choices, while the demonstrations are intended to provide a concrete example, by which students understand the theory taught in class (such as the meaning of transmitting a complex number through a channel!)
2. **Course 18-753:** Introduced information theory into the department syllabus, which explains the basics of the field to graduate students (and some undergraduates). Added a large number of examples to demonstrate the application of concepts from this difficult field, beyond the standard text-book.
3. **Course 18-859:** Designed and taught an advanced topics course on ad-hoc networks and ultrawideband communications. This course exposed graduate students to current research topics in wireless networks. Students also do a class project, which could be either theoretical, simulation-based or experimental. Some of the projects done by the students in the class were used as the basis for developing the wireless instructional lab.
4. **Instructional Wireless Lab:** Developed the Intel Instructional Wireless Laboratory. This lab provides students with hands-on experience with state of the art wireless technology, spanning the areas of channel propagation, physical layer, MAC, networking and applications.
5. **Course 18-752:** Taught an existing graduate course on detection, estimation and identification, covering the topics of frequentist testing (Neyman-Pearson theory) and Bayesian detection and estimation.
6. **Course 18-345:** Taught an existing undergraduate course on telecommunication networks. This course introduces undergraduates to the core ideas of networking, including the concept of layering, link layer protocols, MAC, routing in the internet and ATM networks.

## PROFESSIONAL ACTIVITIES

1. Associate Editor of IEEE Transactions on Mobile Computing, 2006 – present.

2. Associate Editor of IEEE Transactions on Wireless Communications, 2003 – 2007.
3. Communication Theory representative to IEEE ICC 2005 and IEEE ICC 2007.
4. Technical Program Committees of over 20 IEEE conferences, including most of the ICC and Globecom conferences in the past few years.
5. Finance Chair of the 12th International Packet Video workshop, Pittsburgh, PA, April 24-26, 2002.
6. Reviewer for over one hundred IEEE conference and journal papers, not including TPC papers.
7. Member of IEEE Information Theory, Vehicular Technology and Communications Societies.
8. Invited participant at the National Science Foundation's wireless networking workshop, Los Angeles, CA, Aug. 2006.
9. Member of the Communications program review panel of the National Science Foundation, Arlington, VA, June 2006.
10. Invited participant at the National Science Foundation's wireless networking workshop, Nashua, NH, Oct. 2004.
11. Invited participant at the National Science Foundation's wireless networking workshop, Charleston, SC, Jan. 2004.
12. Member of the Information Technology Research (FMF) review panel of the National Science Foundation, Arlington, VA, May 2004.
13. Invited participant at the National Science Foundation's advanced networking infrastructure workshop, Reston, VA, Jan. 2003.
14. Member of the Information Technology Research (CCF) review panel of the National Science Foundation, Arlington, VA, May 2002.

## DISSERTATION

**Power Control Strategies for Delay Constrained Channels:** My Ph.D. thesis focused on fading (mobile) channels on which processing delay constraints have been imposed. Algorithms were derived that optimize transmission for such channels under various criteria. In particular, outage capacity issues were explored, and dynamic programs were shown to increase capacity substantially.

## PATENTS

1. X. Zhang, R. Negi, E. Kurtas, X. Yang, "Jitter sensitive maximum-a-posteriori sequence detection," US patent application filed in June 2005.
2. Co-inventor of US patents 6,643,338 and 6,449,314 and 6,424,679, obtained by Texas Instrument Corp.
3. Co-inventor of European patent #EP1999000203293, "Space time block coded transmit antenna diversity for WCDMA," obtained by Texas Instrument Corp.

## BOOK CHAPTERS

1. R. Negi, Y. Rachlin, P. Khosla, "The sensing capacity of sensor networks," in *Wireless Sensor Networks; signal processing and communications perspectives*, edited by A. Swami, Q. Zhao, Y.W. Hong, L. Tong, John Wiley, 2007.

## PUBLICATIONS

1. Satashu Goel and Rohit Negi, "Analysis of delay statistics for the queued-code," submitted to *Proc. IEEE Int. Symp. Information Theory*, 2008.
2. B. Narayanaswamy, Y. Rachlin, R. Negi, and P. Khosla, "An analysis of the computational complexity of sequential decoding of specific tree codes over Gaussian channels," submitted to *Proc. IEEE Int. Symp. Information Theory*, 2008.
3. Euiseok Hwang, Rohit Negi and B. V. K. Vijaya Kumar, "Extended Kalman filter based acquisition timing recovery for magnetic recording read channels," accepted for publication to *IEEE Int. Conf. Communications*, 2008.
4. Gyouhwan Kim, Qiao Li and Rohit Negi, "A polynomial-time approximation algorithm for weighted sum-rate maximization in UWB networks," accepted for publication to *IEEE Int. Conf. Communications*, 2008.
5. Qiao Li, Gyouhwan Kim and Rohit Negi, "Maximal scheduling in a hypergraph model for wireless networks", accepted for publication to *IEEE Int. Conf. Communications*, 2008.
6. Gyouhwan Kim, Qiao Li and Rohit Negi, "A graph-based algorithm for scheduling with sum-interference in wireless networks," in *Proc. IEEE Globecom*, pp. 5059-5063, Washington DC, USA, Nov. 2007.
7. Satashu Goel and Rohit Negi, "A queued-code based on LDPC block codes," in *Proc. IEEE Globecom*, pp. 3255-3259, Washington DC, USA, Nov. 2007.
8. B. Narayanaswamy, Y. Rachlin, R. Negi, and P. Khosla, "The sequential decoding metric for detection in sensor networks," in *Proc. IEEE Int. Symp. Information Theory*, 2007.
9. A. Rajeswaran, G. Kim, R. Negi and N. Sai Shankar, "Interference handling in UWB versus 802.11n networks," in *Proc. IEEE Int. Conf. Commun.*, pp. 4710-4715, Glasgow, Scotland, June 2007.
10. G. Kim and R. Negi, "Dynamic programming for scheduling a single route in wireless networks," in *Proc. IEEE Int. Conf. Commun.*, pp. 3722-3727, Glasgow, Scotland, June 2007.
11. X. Zhang, R. Negi, "A MAP based algorithm for joint timing error and transition jitter estimation," in *Proc. 10th Joint MMM/Intermag Conference*, 2007.
12. X. Zhang, R. Negi, "Biased PRML scheme for transition noise dominant perpendicular recording channels," *Proc. 10th Joint MMM/Intermag Conference*, 2007.
13. S. Goel, R. Negi, "Guaranteeing secrecy using artificial noise," undergoing second round of review in *IEEE Trans. Wireless Comm.*
14. X. Zhang, R. Negi, "A MAP based algorithm for joint timing error and transition jitter estimation," *IEEE Transactions on Magnetics*, vol. 43, pp. 2256-2258, June 2007.

15. Yaron Rachlin, Rohit Negi, Pradeep Khosla, "The sensing capacity of sensor networks," undergoing second round of review in *IEEE Transactions on Information Theory*.
16. A. Rajeswaran, Gyouhwan Kim and R. Negi, "Joint power adaptation, scheduling and routing for ultra wide band networks," *IEEE Trans. Wireless Comm.*, vol. 6, pp. 1964 - 1972, May 2007.
17. A. Rajeswaran and R. Negi, "Capacity of power constrained ad hoc networks," *IEEE Trans. Wireless Comm.*, vol. 6, pp. 1964-1972, May 2007.
18. X. Zhang and R. Negi, "Optimal detection for perpendicular recording channels with transition noise," *Journal of Applied Physics*, vol. 99, No. 8, April 2006.
19. X. Zhang, R. Negi, "A SOVA-based post processing scheme for transition noise dominant recording channels," in *Proc. 17th Magnetic Recording Conference (TMRC)*, 2006.
20. A. Rajeswaran and R. Negi, "PHY-graph model for ad hoc wireless MAC," in *64th Semi-Annual IEEE Vehicular Technology Conference (VTC)*, pp. 1-5, Vancouver, Canada, Sept. 2006.
21. S. Goel, R. Negi, "The queued-code in finite-state Markov fading channels with large delay bounds," in *Proc. IEEE Int. Symp. Information Theory*, pp. 30-34, Seattle, USA, July 2006.
22. Y. Rachlin, N. Balakrishnan, R. Negi, J. Dolan and P. Khosla, "Increasing sensor measurements to reduce detection complexity in large-scale detection applications," in *Proc. IEEE Military Communication (MILCOM)*, pp. 1-7, Oct. 2006.
23. Y. Rachlin, R. Negi and P. Khosla, "On the interdependence of sensing and estimation complexity in sensor networks," in *Proc. Info. Process. Sensor Networks (IPSN)*, pp. 160-167, April 2006.
24. Y. Rachlin, R. Negi, and P. Khosla, "Temporal sensing capacity," in *44th Allerton Conference*, Urbana-Champaign, USA, Sept. 2006.
25. G. Kim, A. Rajeswaran, and R. Negi, "UWB versus 802.11 - a network perspective," in *Proc. IEEE Broadnets*, pp. 1-9, Oct. 2006.
26. A. Rajeswaran, Gyouhwan Kim, and R. Negi, "A scheduling framework for UWB and cellular networks," *Springer Science (formerly Kluwer Academic) Journal on Mobile Networks and Applications Journal (MONET)*, vol. 11, pp. 9-20, Dec. 2005.
27. Dapeng Wu, and R. Negi, "Effective capacity-based quality of service measures for wireless networks," *Springer Science (formerly Kluwer Academic) Journal on Mobile Networks and Applications Journal (MONET)*, vol. 11, pp. 91-99, Dec. 2005.
28. S. Goel and R. Negi, "Secret communication in presence of colluding eavesdroppers," *Proc. IEEE Military Communication (MILCOM)*, Atlantic City, Oct. 2005.
29. Sung-Chul Han and R. Negi, "Early stopping for RAKE receivers," *Proc. IEEE International Symposium on Wireless Communication Systems (ISWCS)*, Italy, pp. 245-249, Sept. 2005.
30. R. Negi and S. Goel, "Secret Communication using Artificial Noise," *Proc. Vehicular Tech. Conf*, Dallas, Sept. 2005.

31. Y. Rachlin, R. Negi, and P. Khosla, "Sensing capacity for Markov random fields," *Proc. IEEE Int. Symp. Information Theory*, pp. 132-136, Sept. 2005.
32. Dapeng Wu and R. Negi, "Effective capacity channel model for frequency-selective fading channels," *Proc. IEEE Int. Conf. on Quality of Service in Heterogeneous Wired/Wireless Networks*, pp. 43, Aug. 2005.
33. Gyouhwan Kim, A. Rajeswaran, and R. Negi, "Joint power adaptation, scheduling and routing framework for wireless ad-hoc networks," *Proc. IEEE Int. Workshop on Signal Processing Advances in Wireless Communications (SPAWC)*, New York, USA, pp. 725-729, June 2005.
34. Dapeng Wu and R. Negi, "Utilizing multiuser diversity for efficient support of quality of service over a fading channel," *IEEE Transactions on Vehicular Technology*, vol. 54, pp. 1198-1206, May 2005.
35. R. Negi and A. Rajeswaran, "DoS analysis of reservation based MAC protocols," *Proc. IEEE Int. Conf. Commun.*, Seoul, pp. 3632-3636, May 2005.
36. Y. Rachlin, R. Negi, and P. Khosla, "Sensing capacity for discrete sensor network applications," *Proc. of Int. Conf. on Info. Proc. in Sensor Networks (IPSN)*, pp. 126-132, April 2005.
37. R. Negi, and A. Rajeswaran, "Scheduling and power adaptation for networks in the ultra wide band regime," *Proc. IEEE Globecom*, pp. 139-145, Dallas, USA, Dec. 2004.
38. R. Negi, and S. Goel, "An information-theoretic approach to queuing in wireless channels with large delay bounds," *Proc. IEEE Globecom*, pp. 116-122, Dallas, USA, Dec. 2004.
39. Y. Rachlin, R. Negi, and P. Khosla, "Sensing capacity of target detection," *Proc. IEEE Information Theory Workshop*, San Antonio, TX, pp. 147-152, Oct. 2004.
40. A. Rajeswaran, Gyouhwan Kim, and R. Negi, "A scheduling framework for UWB and cellular networks," *Proc. IEEE/ACM Broadband Networks*, pp. 386-395, San Jose, Oct. 2004.
41. Dapeng Wu, and R. Negi, "Effective capacity based QoS measures for wireless networks," *Proc. IEEE/ACM Broadband Networks*, pp. 527-536, San Jose, USA, Oct. 2004.
42. Dapeng Wu, and R. Negi, "Downlink scheduling in a cellular network for quality of service assurance," *IEEE Transactions on Vehicular Technology*, vol. 53, pp. 1547-1557, Sept. 2004.
43. A. Rajeswaran, and R. Negi, "Capacity of power constrained ad hoc networks," *Proc. IEEE Infocom*, pp. 443-453, Hong Kong, May 2004.
44. N. Badruddin, and R. Negi, "CDMA capacity increase due to relaying," *Proc. IEEE Wireless Communications and Networking Conf. (WCNC)*, pp. 243-248, March 2004.
45. R. Negi and A. Rajeswaran, "Physical layer effect on MAC performance in ad-hoc wireless networks," *Proc. IASTED Conference on Communications, Internet and Information Technology*, Phoenix, USA, Nov. 2003.
46. Dapeng Wu, and R. Negi, "Downlink scheduling in a cellular network for quality of service assurance," *Proc. IEEE Vehicular Technology Conference*, pp. 1391-1395, Oct. 2003.

47. Dapeng Wu, and R. Negi, "Utilizing multiuser diversity for efficient support of quality of service over a fading channel," *Proc. IEEE International Conference on Communications (ICC)*, pp. 2202-2207, May 2003.
48. Dapeng Wu, and R. Negi, "Effective capacity: A wireless channel model for support of quality of service," *IEEE Transactions on Wireless Communications*, vol. 2, pp. 630-643, July 2003.
49. R. Negi, A. Maleki and J. Cioffi, "Adaptive antennas for space-time codes in outdoor channels," *IEEE Transactions on Communications*, vol. 50, pp. 1918-1925, Dec. 2002.
50. R. Negi, and J. Cioffi, "Delay-constrained capacity with causal feedback," *IEEE Transactions on Information Theory*, vol. 48, pp. 2478-2494, Sept. 2002.
51. R. Negi, and J. Cioffi, "Blind OFDM symbol synchronization in ISI channels," *IEEE Transactions on Communications*, vol. 50, pp. 1525-1534, Sept. 2002.
52. D. Stancil, A. Berson, J. van't Hof, R. Negi, S. Sheth, P. Patel, "Doubling wireless channel capacity using co-polarised, co-located electric and magnetic dipoles," *IEEE Electronics Letters*, vol. 38, pp. 746-747, July 2002.
53. Dapeng Wu, and R. Negi, "Effective capacity: A wireless channel model for support of quality of service," *Proc. IEEE Globecom*, pp. 695-699, San Antonio, USA, 2001.
54. S. Vishwanath, Wei Yu, R. Negi, A. Goldsmith, "Space-time turbo codes: decorrelation properties and performance analysis for fading channels," *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, vol. 2, pp. 1016-1020, San Francisco, USA, Dec. 2000.
55. R. Negi, and J. Cioffi, "Stationary schemes for optimal transmission over fading channels with delay constraint," *Proc. IEEE Vehicular Technology Conference (VTC)*, pp. 358-361, Boston, USA, Sep. 2000.
56. R. Negi, M. Charikar. J. Cioffi, "Minimum outage transmission over fading channels with delay constraint," *Proc. IEEE International Conf. on Communications (ICC)*, vol. 1, pp. 282-286, New Orleans, USA, May 2000.
57. Won-Joon Choi, R. Negi, J. Cioffi, "Combined ML and DFE decoding for the V-BLAST system," *Proc. IEEE International Conf. on Communications (ICC)*, vol. 3, pp. 1243-1248, New Orleans, USA, May 2000.
58. R. Negi, and J. Cioffi, "Transmission over fading channels with channel side information and delay constraint," *Proc. IEEE Globecom*, pp. 2550-2554, Rio de Janiero, Brazil, Nov. 1999.
59. A. Dabak, S. Hosur and R. Negi, "Space time block coded transmit antenna diversity scheme for WCDMA," *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, pp. 1466-1469, New Orleans, USA, Sept. 1999.
60. A. Maleki, R. Negi and J. Cioffi, "Space-time coding over a code division multiple access system," *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, pp. 134-138, New Orleans, USA, Sept. 1999.
61. R. Negi, A. Maleki and J. Cioffi, "Adaptive antennas for space-time coding over block-time invariant multi-path fading channels," *Proc. IEEE Vehicular Technology Conference (VTC)*, pp. 70-74, Houston, USA, May 1999.

62. R. Negi, and J. Cioffi, "Pilot tone selection for channel estimation in a mobile OFDM system," *IEEE Transactions on Consumer Electronics*, vol. 44, pp. 1122-1128, Aug. 1998.
63. R. Negi, and J. Cioffi, "Blind OFDM symbol synchronization in ISI channels," *Proc. IEEE Globecom*, pp. 2812-2817, Sydney, Australia, Nov. 1998.
64. A. Maleki, R. Negi and J. Cioffi, "Space-time coding and transmission optimization for wireless channels," *Proc. Asilomar Conference on Signals, Systems, and Computers*, pp. 1798-1802, Pacific Grove, USA, Nov. 1998.
65. R. Negi, and J. Cioffi, "Pilot tone selection for channel estimation in a mobile OFDM system," *Proc. IEEE International Conference Consumer Electronics*, pp. 466-467, Los Angeles, USA, June 1998.