# Professional Statement of Muriel Médard

The motivation of my work is the fact that communications have moved away from point-to-point, or link, models, to networked models. Moreover, the nature of these networks is increasingly heterogeneous, relying on a federation of different physical layers, ranging from optical fiber communications to wireless links. This heterogeneity allows for flexibility and quasi-ubiquitous access to networked systems, but often at the expense of robustness and reliability. Growing societal reliance on networked services renders an interruption or degradation of service, whether by malicious attack or inherent variability of the physical layer, particularly grievous. I seek to determine, in my research, a means of providing effective and reliable networked communications, with strong consideration of the physical layer.

My goals in the areas of research and education are to:
- Contribute to the understanding of the fundamental limits of reliable communications in networked environments,
- Establish, based upon theoretical understanding, applications to enhance the reliability of networks,
- Provide teaching and research services which will train our future engineers in a way that directly connects theoretical understanding to practical implementations.

My research interests lie in three main areas: wireless communications, particularly the information-theoretic investigation of fading channels; high-speed networks, particularly in the areas of robustness and security; and network coding, which brings together coding and networking to change dramatically the way in which networks operate. All three of these areas relate to end-to-end transmission reliability and efficient use of resources. My main contributions in the investigation of fading channels is establishing explicitly how channel estimation fundamentally affects channel capacity and how channel estimation crucially determines what type of signaling can be used in wide band channels. This research has crucially affected the design of signaling for wide-band channels. In the area of high-speed networks, my main contributions are characterizing the effects that physical layer phenomena have on security and reliability of optical networks and establishing novel protection mechanisms for wide-area and local area networks that do not use traditional ring-based approaches. This work has led to a whole new direction in optical network security, particularly for government and military applications. In the area of network coding, my main contributions are in the establishment of network coding as an algebraic problem, and using this powerful framework to show that multicast network systems can be operated optimally using at network nodes random and distributed approaches. The impact of this work has been very rapid, having immediately spawned industry demonstrations and major Department of Defense efforts.

My research style lies at the juncture of theory and practice. While much of my work tends to be mathematical in terms of the tools I use, the problems I seek to solve originate from practical engineering considerations in communications and networks. I am particularly interested in determining the theoretical limitations of systems, and in determining how these theoretical limitations guide the architecture of new communication systems.

The transition from link-based system design to network-based design has posed for me an unique opportunity to merge communications and networking. My work in the area of fading channels has led to better understanding of the fundamental limits of wireless channels. My work on the effect of channel estimation error was recognized by the IEEE Leon K. Kirchmayer Prize Paper Award 2002 for my paper, "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel," IEEE Transactions in Information Theory. The IEEE Leon K. Kirchmayer Prize Paper Award was established in 1997 as the successor to the Browder J. Thompson Memorial Prize Award. It is presented by the IEEE Board of Directors for the most outstanding paper by an author(s) under 30 years of age, at the date of submission of the original manuscript. The paper established a relation among channel estimation error, channel variation, and the fundamental limits of wireless channels. This work showed that communications in wireless environments are governed by the fact that changes in the transmission

conditions lead to unavoidable uncertainty in the measurement of the channel. Channel variations are therefore as intrinsic as energy or spectrum in determining the limitations of wireless networks. An excerpt of the IEEE announcement of the prize reads that I am "credited by her colleagues with changing the fundamental understanding of communication difficulties over wireless, time-varying channels."

I have continued to study how time variations affect the fundamental limits of communications. For communications at high carrier frequency, where the traditional decoupling of inter-symbol interference and channel variations no longer hold, my work with A. Goldsmith at Stanford has given a framework for designing codes that withstand both ISI and time variations. My work with R. Srikant at the University of Illinois Urbana-Champaign (UIUC) has analyzed the effect of coupled fast and slow fades. My joint work, with U. Madhow at UC Santa Barbara and I. Abou-Fayçal at American University of Beirut, in the area of signaling to adapt to channel error has for the first time shown that significant gains can be reaped from adapting to channel error at the receiver, even in the absence of feedback.

A second significant area of my research in wireless communications is my work with R. G. Gallager at MIT on wideband channel capacity, which is widely recognized as being the first to show that ultra-wideband fading channels, when used with the type of signals that achieve optimum results in non-fading channels, perform very poorly. These results in particular mean that the types of systems that are currently in use for commercial wireless applications cannot be extended to ultra-wideband systems. This work showed that ultra-wideband channels require an entirely different approach, using impulsive signals. My work in ultra-wideband channels has led to extensive follow-on work at the University of California at Berkeley, Bell Labs and UIUC. My joint work with D. Tse at UC Berkeley and my student C. Zheng at MIT in signaling over ultra-wideband channels established, from an information-theoretic point of view, the region in which current commercial spread-spectrum systems can achieve good results. My work in this area, with my students C. Luo and D. Lun and with postdoctoral lecturer I. Abou-Fayçal, and with J Huang and S. Meyn, both at UIUC, has included proposing practical near-optimal schemes and showing that optimal schemes designed for the infinite-bandwidth regime are not applicable in practical regimes. Recently, my work, with L. Zheng at MIT and D. Tse at UC Berkeley, has characterized in terms of both energy and channel characteristics the capacity of channels in the low energy regime. We have extended this work, with our student S. Ray, to multiple-input, multiple-output channels.

My interests do not only lie in characterizing the performance, but also in determining practical means of attaining near-optimal performance. My work with L. Zheng and our students, C. Luo, S. Jing and S. Ray, has shown that performance of the order of the theoretical optimal can be achieved over wideband channels using multi-tone frequency-shift keying with simple coding, even with multiple input-output antennas or feedback. This method, which differs sharply from the current schemes for wideband channels, may provide a new and effective manner to use such channels effectively. We demonstrated its effectiveness in collaboration with A. Chandrakasan and his student. Recently, with S Meyn at UIUC and other collaborators, we have shown that new optimization approaches can enable the construction of receivers which, under some general conditions, can operate without channel knowledge with no penalty. This new line of work may altogether change the way in which we build wireless receivers.

A third area for my research in wireless networks capacity of packetized wireless networks. The theoretical literature in the area of multi-user systems is concerned almost exclusively with systems in which there is a constant stream of bits to be communicated at any time. However, the vast majority of wireless data systems rely on packetized schemes, which are intrinsically bursty. One of my contributions in this area, in conjunction with my students and my collaborators (A. Goldsmith at Stanford and S. Meyn at UIUC), has been to show that burstiness does not affect capacity. This research combines coding, information theory and control to solve a problem which connects the practice of packetized networks with the study of fundamental limitations of networks.

In the area of network reliability, I am an author of much of the original work in the area of optical network reliability and security. I am a frequent invited speaker, invited author, conference organizer and editor in this area, as well as a consultant to the industry. I am the author of several widely referenced papers in optical network reliability. In particular, my collaborators and I were the first to introduce generalized loopback and thereby show that mesh networks may recover from link failures without the use of rings, in a bandwidth-efficient manner (joint work with R. Gallager at MIT, R. Barry of Sycamore Networks S. Finn of MIT LL, S. Lumetta at UIUC and our students Y.C. Tseng and W. He of UIUC).Until then, network recovery was done through the use of rings or overlay of rings, leading to very complicated solutions and placing significant restrictions on the physical topology of networks. My contributions in this area have blended practical applications with different areas of graph theory. This work, along with my work in reliable trees solutions (joint work with R. Gallager at MIT, R. Barry of Sycamore Networks and S. Finn of MIT LL), has been the source of much follow-on work at several universities and Bell Labs, as well as leading to patents. My work in high-speed networking has considered robust and reliable access to optical networks, such as robust optical local area networks (LANs) with simple access (joint work with S. Lumetta at UIUC), robust access overlay networks (joint work with my student A. Libarikian). With V. Chan and our student G. Weichenberg, I have considered the reliability of optical LANs under stress, for such applications as airplane networks. Our work received the Best Paper award at the Fourth International Workshop on the Design of Reliable Communication Networks (DRCN 2003).

My contributions in the area of optical network security have shown how physical layer parameters affect the reliability of networks and have shown how countermeasures can alleviate the deleterious effects induced by lower layers. With my student P. Saengudomlert at MIT, I developed theoretical limits to the detectability of security attacks at the physical layer rather than the software layer, with which almost the entirety of the security work is concerned. My work in countermeasures encompasses devices to detect failures algorithms to localize failures and to recover from failures. The latter class of countermeasures has significant impact in the management of high-speed networks

I have combined my interests in network reliability and in information theory to work in the area of network coding. My work in this area has led, with my former students T. Ho, D. Lun, S. Ray at MIT, with my Postdoctoral Researcher S. Deb, my colleagues D. Karger at MIT, R. Koetter (formerly at UIUC, now at Technical University of Munich), M. Effros at Caltech, to my taking a fresh look at the issue of network capacity, using an algebraic approach. Our approach allows the succinct characterization of the load that a network can carry in an optimized environment. This work moves away from using the network simply to route traffic and allows coding to be performed within the network. Moreover, with T. Ho, we have found clear conditions for network recovery, protection against network failures, and the amount of overhead necessary to protect a network from failing links. My work with R. Koetter on an algebraic approach to network capacity has received much attention and was selected as one of the two top papers of the 2002 IEEE Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM). One of our reviewers pointed out that: “it could be one of the papers which will eventually lead to a whole area of network algebraic theory.”

We recently have created the concept of random network coding, by having nodes independently take random algebraic combinations of their inputs over large enough fields and mapping those combinations to their outputs, they can with probability very close to one equal or outperform any multicast routing scheme. This approach entirely radically differs from previous approaches for disseminating information. Instead of coordination and control, it allows complete decentralization and randomness. In October 2003, a few months after our presentation at the International Symposium of Information Theory, Microsoft demonstrated their implementation of distributed random network coding over several networks. Such a very rapid turn-around from theory to practice is very unusual. We have demonstrated the usefulness of

such random codes in wireless settings. Our work in this area received the Best Student Paper Award at the 2004 International Workshop on Wireless Ad-hoc Networks.

We have recently shown that this distributed coding approach can be combined with a distributed cost minimization algorithm. This algorithm not only outperforms, through the use of the properties of coded networks, optimum multicast trees, but is computationally simple and distributed, while multicast trees require centralized processing and are known to be NP-complete and difficult to solve in practice. Random network coding does not only lend itself to new optimization but to new approaches to network security. Recently with my students and collaborators in network coding (along with D Katabi, M. Lanberg at the Open University of Israel, S. Jaggi at the Chinese University of Hong Kong), we have shown that network coding allows new approaches to security for combating both wiretapping and Byzantine attackers – nefarious users that operate within the network to disrupt communications. Our results surprisingly showed that, using network coding, the errors induced by Byzantine attackers can be countered as long as the attackers do not control a critical fraction of the network resources, even if they have full visibility into the traffic in the network. We have also shown (with T. Kalker at HP Labs, my student F. Zhao and T. Ho at Caltech) new algebraic approaches for cryptographic approaches to counter Byzantine attackers.

There are now whole sessions at several major conferences devoted to the subject of network coding. Almost every paper that appears in this topic since 2002 credits our work for setting the algebraic framework for network coding. DARPA has initiated a major program, with BAE, my research group and network coding collaborators, to develop network coding for mobile ad-hoc networks.

My research in network coding has naturally led me, along with my students T. Coleman (graduated, now on the faculty at UIUC), A. Lee and my colleague M. Effros at Caltech, to investigate new ways of implementing compression in networks. Our work uses random coding approaches, as well as recent developments in channel coding, to establish new ways to perform compression in a parallelized and distributed way. We were able to demonstrate the first practical distributed coding, on data gathered from the International Space Station. Recently, with D. Shah and our student V. Doshi, we have derived new results to achieve not only compression of the entire data, but for a specific function. From our new theory, we have been able to demonstrate benefits using data from the Army Blue Force Tracking exercises.

Recently, with S. Licht in the Chemistry Department, J. Meldrim and D. Lun (both at the Broad Institute), R Koetter (Technical University of Munich - TUM) and students, I have begun to apply techniques from communications, coding and signal processing to problems in analytic chemistry and DNA sequencing. Using experimental data, we have developed a new method to use deconvolution in chromatography and multiple user detection methods to allow simultaneous reading of two strands of DNA.

My research program is tightly integrated with my educational activities. At the graduate level, my students have received recognition for their work both within MIT and outside MIT. My students publish widely and contribute to the intellectual life of our research community. I also regularly oversee research with MIT undergraduate students and am involved in research projects with high school students through the Center for Excellence in Education, to encourage promising students to pursue careers in science and engineering. I have recently been recognized as an Outstanding Mentor by Siemens for my work with high school students. I strive to play a strong role in mentoring my students' careers and encourage interaction with industry, other faculty at MIT, and other universities.

My three main goals in teaching and advising are to:
- Create intrinsic motivation for performance,
- Encourage collaboration while maintaining individual accountability,
- Recognize the different learning styles of students.

I play a very active role in the teaching activities of the Department. In particular, I have taught and am currently teaching 6.041/6.431 (Probabilistic Systems Analysis and Applied Probability), one of the largest classes in EECS, with an enrollment of about 200 undergraduate students and 50 graduate students. This class is of particular importance to the Institute at large, as it is taken not only by most students in EECS, but is also a required class for undergraduate students in the Department of Management and in the Department of Aeronautics and Astronautics. At the graduate level, I am in charge of 6.441 (Transmission of Information), and have done significant curriculum development for the class. In particular, I have changed the approach of the class so that it integrates tightly our curriculum in the areas of communications and of estimation theory. I have also introduced much material from the recent research literature in a way that is simple, yet rigorous, so that our students are aware of some of the most exciting areas of current research in information theory. These changes have led to my revising, with L. Zheng, the curriculum fundamentally and creating a full set of notes for the class, as well as an extensive set of supplementary readings of research papers in the topic, thematically linked to different lectures and arranged according to difficulty. I am significantly involved with students in 6.441, personally supervising all individual projects. With D. Katabi, I have significantly revised the material for 6.263 (Data Networks), introducing new material, readings and student projects, some of which have led to publications.

Recently, a significant aspect of my teaching has taken place outside of MIT. In collaboration with Ralf Koetter of TUM (formerly of UIUC), I have developed a course on network coding, which I have taught, usually in collaboration with Ralf Koetter, and sometimes with Phil Chou of Microsoft, at several venues, such as the University of Oulu in Finland, the Information Theory and Applications Center at the University of California at San Diego, the International Symposium on Information Theory in Adelaide, Australia, among others. This course, the first one of its kind, has been very instrumental in making network coding known and in developing the field, not only within the information theory community, but also within wireless communications and networking communities.

My mentoring role to both undergraduate and graduate students extends well beyond the classroom. My husband and I are Housemasters at Next House since August 2006 and were previously Associate Housemasters at Simmons Hall, the newest undergraduate dormitory, in whose opening I was heavily involved. We live in the dormitory, along with our three daughters and our son. We are able to have the type of general, open-ended discussions, with undergraduates that would very seldom occur in the context of a class or of academic advising. We hold weekly events for undergraduates, assist in supervising graduate resident tutors and are always available to support and advise them on how to balance their academic and personal lives. While at Simmons, we also worked with the visiting scholars program, in which five scholars visiting MIT live at Simmons and participate in the life of the undergraduates, to establish weekly residence-based academic and cultural events. I have also been House Fellow for Green Hall, the women's graduate dormitory, holding discussion events regarding several topics of interest to women in science and engineering. My various contributions to the MIT community were recognized by my being a co-recipient of the Harold E. Edgerton Faculty 2004 Achievement Award, established in 1982 to honor junior faculty members "for distinction in research, teaching and service to the MIT community,"

I have also been very active in my service to the profession, both in the information-theoretic and optical networking arenas, serving both as a regular associate editor and as a guest editor for special issues in both areas. I have also served on very many program committees for conferences in information theory and in networks, and was the technical program co-chair for the 2007 IEEE Symposium on Information Theory. I assist the profession in non-technical areas, for instance as Treasurer of the IEEE Information Theory Society for three years and, recently, as an elected member of its Board of Governors. Finally, I am active in advising industry and government in technical matters, for instance as a member of the Information Science and Technology group (ISAT), or providing briefings for DARPA or the Pentagon

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY**
**School of Engineering Faculty Personnel Record**

Date: August, 2007

Name: Muriel Médard
Department: Electrical Engineering and Computer Science

1. Date of Birth: February 1, 1968

2. Citizenship: US

3. Education:

| School | Degree | Date |
|---|---|---|
| MIT | Bachelor of Science in Electrical Engineering | 1989 |
| MIT | Bachelor of Science in Mathematics | 1989 |
| MIT | Master of Science in Electrical Engineering | 1991 |
| MIT | Bachelor of Science in Humanities (Russian Studies) | 1991 |
| MIT | Doctor of Science in Electrical Engineering (minor in Management) | 1995 |

4. Title of Sc.D. Thesis:

   The Capacity of Multiple User Time Varying Channels in Wireless Communications.

5. Principal Fields of Interest:

   Information Theory. Networks, Communications.

6. Name and Rank of Other Faculty in the Same Field:

   Vincent W. S. Chan, Professor
   Robert G. Gallager, Professor
   Jeffrey H. Shapiro, Professor
   G. David Forney, Adjunct Professor
   David Karger, Professor
   Gregory W. Wornell, Professor
   Lizhong Zheng, Associate Professor (without tenure)
   Devavrat Shah, Assistant Professor

7. Name and Rank of Faculty in Other Departments in the Same Field

   Eytan Modiano, Associate Professor (Aeronautics and Astronautics)
   Moe Win, Associate Professor (Aeronautics and Astronautics)

8. Non-MIT experience:

| Employer | Position | Beginning | Ending |
|---|---|---|---|
| University of Illinois Urbana-Champaign | Assistant Professor | August 1998 | December 1999 |
| NYNEX Science & Technology | Intern/consultant | June 1989 | December 1989 |

9. History of MIT Appointments:

| Rank | Beginning | Ending |
|---|---|---|
| MIT Lincoln Laboratory Staff Member | September 1995 | June 1998 |
| Assistant Professor | January 2000 | January 2003 |
| Associate Professor (without tenure) | January 2003 | May 2005 |
| Associate Professor (with tenure) | May 2005 | present |

10. Consulting Record:

| Firm | Beginning | Ending |
|---|---|---|
| NYNEX Science and Technology | September 1989 | December1989 |
| Sycamore Networks | March 2000 | June 2000 |
| Pebbles Technologies/Malachite Technologies | June 2000 | January 2004 |
| Vanu Incorporated | June 2002 | September 2003 |

11. Department and Institute Committees, Other Assigned Duties:

| Activity | Beginning | Ending |
|---|---|---|
| Graduate Counselor (Dept) | September 2000 | present |
| Graduate Admissions Reader (Dept) (domestic and international, for different years: Africa and Australia; Korea; China and Taiwan) | December 2000 | January 2006 |
| House Fellow, Green Hall (Institute) | September 2001 | August 2002 |
| Associate House Master, Simmons Hall (Institute) | March 2002 | June 2006 |
| Undergraduate Admissions Reader (Institute) | January 2004 | January 2004 |
| Organized “Meet Course VI” outreach event (Dept) | yearly since 2003 | |
| Lemelson Prize Committee (Institute) | Fall 2000 | |
| Sprowls Award Committee (Dept) | Spring 2003, Spring 2005 | |
| Baker Housemaster Search Committee (Institute) | Fall 2004 | |
| EECS Graduate Admissions Coordinator | Fall 2004 | Spring 2005 |
| for Areas I and VII (Dept) | Fall 2007 | Spring 2008 |
| EECS Graduate Admissions Co-Coordinator for Area I (Dept) | Fall 2005 | Spring 2006 |
| Search Committee Member (Dept) | Spring 2006 | Spring 2006 |
| Simmons Hall Associate Housemaster Search Committee (Institute) | Fall 2005 | Spring 2006 |
| Associate Director, Laboratory for Information and Decision Systems (Institute) | Fall 2005 | Fall 2007 |
| Next House Housemaster (Institute) | Fall 2006 | Present |
| Member of the Committee on Student Life (Institute) | Fall 2006 | Present |
| Member of the Search Committee for the Dean for Student Life (Institute) | Fall 2007 | Present |
| Member of the Committee on Outside Professional Activities | Fall 2007 | Present |
| Dean for Undergraduate Education Faculty Advisory Committee | Spring 2008 | Present |

12. Professional Service:

| Activity | Beginning | Ending |
|---|---|---|
| Program Committee Member for International Society for Optical Engineering (SPIE), Conference on Computer and Network Security | 1996 | 1997 |
| Co-organizer of session for Miniconference on Information Theory at the 1999 International Conference on Communications | 1998 | 1999 |
| Co-organizer of the new optical networking track for the Allerton Conference on Communication, Control, and Computing | 1998 | 2003 |
| Associate Editor for Networks, Journal of Optical Networks of the Optical Society of America | 2001 | 2002 |
| Member of the Information Science and Technology (ISAT) study group for DARPA on "Robust Networks for Critical Missions and Critical Infrastructure" | 2002 | 2002 |
| Organizer of the Optical Networks session for the 17$^{th}$IEEE Computer Communications Workshop | 2002 | 2002 |
| Technical Program Committee member for the High Speed Networking Conference, 2002 | 2001 | 2002 |
| Technical Program Committee member for the 2004 IEEE International Symposium on Information Theory | 2002 | 2004 |
| Session Organizer, Wireless Communications and Networking Conference, 2003 | 2002 | 2002 |
| Technical Program Committee member for the International Workshop on Design of Reliable Communication Networks (DCRN) 2003 (IEEE) | 2002 | 2003 |
| Technical Program Committee member for ITCom 2003 (SPIE) | 2002 | 2003 |
| Guest Editor, IEEE Journal of Lightwave Technology Special Issue on Optical Networks | 2002 | 2003 |
| NSF Career review panelist | 2002, 2003, 2006 | |
| Co-organizer of the new network coding track for the Allerton Conference on Communication, Control, and Computing | 2003 | present |
| Program Committee Member, 2003 International Workshop on Optical Networks Control and Management (ONCM'03) (in conjunction with the 32nd International Conference on Parallel Processing) | 2003 | 2003 |
| Associate Editor, Optical Communications and Networking Series of the IEEE Journal on Selected Areas in Communications | 2003 | 2007 |
| Technical Program Committee Member, 2004 International Workshop on Wireless Ad-hoc Networks (IWWAN) | 2003 | 2004 |
| Associate Editor, Communications, for the IEEE Transactions on Information Theory | 2003 | 2006 |
| Treasurer, IEEE Information Theory Society | 2004 | 2007 |
| Co-organizer of an invited session on Network Coding for the 38th Annual Conference on Information Sciences and Systems, Princeton University | 2003 | 2004 |

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| Co-organizer of an invited session on Network Coding for the Communication Theory Workshop | 2003 | 2004 |
| Member of the Information Science and Technology (ISAT), an advisory group to DARPA | 2003 | 2006 |
| Technical Program Committee member for Globecom 2004 Workshop on GMPLS | 2004 | 2004 |
| Technical Program Committee Member for the 2004 Information Theory Workshop | 2003 | 2004 |
| Technical Program Committee Member, 2005 International Workshop on Wireless Ad-hoc Networks (IWWAN) | 2004 | 2005 |
| Guest Editor, Joint Special Issue of the IEEE Transactions on Information Theory and the IEEE/ACM Transactions on Networking on Networking and Information Theory | 2004 | 2006 |
| Technical Program Committee Member, Symposium on Information Theory of Wireless Networks, as part of IEEE WirelessCom 2005 | 2004 | 2005 |
| Technical Program Committee Member for the 2006 IEEE International Symposium on Information Theory | 2005 | 2006 |
| Technical Program Committee member for the International Workshop on Design of Reliable Communication Networks (DCRN) 2005 (IEEE) | 2004 | 2005 |
| Technical Program Committee member for Broadnets 2005 | 2005 | 2005 |
| Co-chair of Netcod 2006 (Second Workshop on Network Coding, Theory, and Applications) in combination with WiOpt | 2005 | 2006 |
| Technical Program Committee member for the 2006 Information Theory Workshop | 2005 | 2006 |
| Session Organizer for the 2006 International Zurich Seminar on Communications (IZS) | 2005 | 2006 |
| Technical Program Committee member for the 2006 IEEE International Conference on Ultra Wideband (ICUWB) | 2005 | 2006 |
| Technical Program Committee Co-Chair for the 2007 IEEE International Symposium on Information Theory | 2005 | 2007 |
| Optics East 2006 ITCom Technical Program, Committee Member | 2005 | 2006 |
| IEEE International Symposium on Personal, Indoor And Mobile Radio Communications (PIMRC '06) Technical Program Committee Member | 2005 | 2006 |
| IEEE Alexander Graham Bell Medal Committee | 2006 | present |
| Invited Session organizer for INFORMS 2006 | 2006 | 2006 |
| Co-organizer of the Network Optimization track for the Allerton Conference on Communication, Control, and Computing | 2006 | 2006 |
| Technical Program Committee of Netcod 2006 (Third Workshop on Network Coding, Theory, and Applications) | 2006 | 2006 |
| Technical Program Committee Member RAWNET 2007, the third workshop on Resource Allocation in Wireless | 2006 | 2007 |
| Member of the Board of Governors for the IEEE | 2006 | present |

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| Information Theory Society | | |
| Associate Editor, IEEE Journal on Lightwave Communications | 2007 | present |
| Technical Program Committee Member, INFOCOM 2008 | 2007 | 2008 |
| Technical Program Committee Member International Symposium on Information Theory and its Applications | 2007 | present |
| Audit Committee Member for the School Computer and Communication Sciences of Ecole polytechnique fédérale de Lausanne (EPFL) | 2007 | present |
| Technical Program Committee Member International Communications Conference Optical Network Symposium | 2007 | present |
| Tutorial co-chair PIMRC '08 | 2007 | present |
| Guest Editor in Chief IEEE Transactions on Information Forensics and Security: Special Issue on Statistical Methods for Network Security and Forensics | 2007 | present |
| Technical program member, International Symposium on Information Theory and its Applications 2008 | 2008 | present |
| Technical program member, IEEE International Workshop on Wireless Network Coding 2009 | 2008 | present |
| Technical program co-chair for IEEE/IFIP WiOpt (International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks) 2009 | 2008 | 2009 |

13. Awards Received:

| Award | Date |
|---|---|
| NSF Career Award | 2001 |
| IEEE Leon K. Kirchmayer Prize Paper Award, presented by the IEEE Board of Directors for the most outstanding paper by an author(s) under 30 years of age, at the date of submission of the original manuscript for M. Médard, "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel," *IEEE Transactions on Information Theory*, Vol. 46 Issue 3, May 2000, Pages: 935-946. | 2002 |
| Recipient of a 2003 Esther and Harold E. Edgerton MIT Chair | 2002 |
| Best Paper Award for G. Weichenberg, V. Chan, M. Médard, "Reliable Architectures for Networks Under Stress," Fourth International Workshop on the Design of Reliable Communication Networks (DRCN 2003), October 2003, Banff, Alberta, Canada | 2003 |
| Co-recipient of the Harold E. Edgerton Faculty Achievement Award, established in 1982 to honor junior faculty members "for distinction in research, teaching and service to the MIT community." | 2004 |
| Recognized in 2004 as a Siemens "outstanding mentor" for my work with high school students in science and engineering | 2004 |
| Gilbreth Lectureship, National Academy of Engineering | 2007 |

14. Current Organization Membership:

| Organization | Offices Held |
|---|---|
| IEEE Information Theory Society | Treasurer, January 2004-January 2007<br>Member, Board of Governors, started January 2007 |
| IEEE (Fellow) | |
| Eta Kappa Nu | |
| Tau Beta Pi | |
| Sigma Xi | |

15. Patents and Patent Applications Pending:

1. M. Médard, S.G. Finn, R.A. Barry, R.G. Gallager., "Method and Apparatus for Automatic Protection Switching," Patent # 6,047,331
2. M. Médard et al. "A Pseudorandom Noise Sequence Noise Generator," patent # 6,201,870
3. M. Médard, S.R. Chinn., "Method and Apparatus for Detecting Security Attacks in Communication Networks," Patent # 6,507,012 and # 6,507,012 B1
4. M. Médard, S.R. Chinn., "Method and Apparatus for Detecting Security Attacks in Communication Networks," Patent # 6,603,112
5. R. Bergman, M. Médard, "Fault Isolation for Communication Networks for Isolating the Source of Faults Comprising Attacks, Failures, and Other Network Propagating Errors," Patent # 6,442,694
6. S. Lumetta, M. Médard, "Fault Tolerant Optical Data Communication Network," filed 2002, Application #10/186,178
7. S.R. Chinn, S. Lumetta, M. Médard, "An Integrated System and Method for Controlling Telecommunication Network Data Communicated over a Local Area Network and Storage Data Communicated over a Storage Area Network," filed 2002, patent pending
8. G. Ciancaglini et al., "Fault Tolerant Optical Data Communication Network Having Auto Discovery," filed 2002, patent pending
9. M. Garofalo et al., "Multiple Switch Protected Architecture," filed 2002, patent pending
10. M. Médard et al., "Method and Apparatus for Medium Access Control for a Communications Network," filed 2003, patent pending
11. T. Ho, R. Koetter, M. Médard, D. Karger, N. Effros, "Randomized Distributed Network Coding Method and Apparatus," patent application
12. D.S. Lun, M. Médard, T. Ho, R. Koetter, N. Ratnakar, "Minimum Cost Routing with Network Coding," patent application
13. S. Deb, M. Médard, "A Network Coding Approach to Rapid Information Dissemination," patent application
14. S. Deb, M. Médard, R. Koetter, "A Random Linear Coding Approach to Distributed Data Storage," patent application
15. G. Ciancaglini et al., "Method and Apparatus for Provisioning Connection Oriented, Quality of Service Capabilities and Services," patent application
16. T. Ho, B. Leong, R. Koetter, D. Karger, M. Médard, M. Effros, "Byzantine Modification Detection in Multicast Networks Using Randomized Network Coding," patent application
17. R. Koetter, D. Lun, S. Licht, M. Médard, "Method for DNA Sequencing Inspired by Turbo Equalization," patent application

18. R. Koetter, D. Lun, S. Licht, M. Médard, “Method for High-Throughput DNA Sequencing Using Multiuser Detection,” patent application
19. M. Médard, S. Ray, L. Zheng, “Fiber Aided Wireless Network Architecture,” patent application
20. A. Eryilmaz, Médard, A. Ozdaglar, “A Method for Coding-Based, Delay-Efficient Data Transmission,” patent application

16. Professional Registration

    NA

17. Major New Products

    NA

Educational Contributions of Muriel Médard

1. Teaching materials

   a) In 6.441, I developed in Latex an all new set of lecture handouts, completely re-designed the syllabus, developed a substantial set of supplementary readings of relevant research papers, organized by relevance to different topics and by difficulty, introduced a research project on major papers in the literature.

   b) In 6.263, in collaboration with Dina Katabi, I significantly revised the course, wrote new lecture handouts, in particular in the areas of the use of transforms in analyzing queuing systems, of switching theory, of rerouting, of wireless networks and coding (including network coding); introduced a research design project and reading of major papers in the area.

2. Other educational contributions:

   a) Summer Professional Institute: co-instructor for 6.20S, Digital Communication Networks; significantly updated the curriculum.

   b) Developed a course on network coding in conjunction with Ralf Koetter of UIUC; the course was given at Centre for Wireless Communications at the University of Oulu, at the IEEE Global Telecommunications Conference (Globecom) in Dallas, at the International Symposium on Information Theory (ISIT) in Australia, at the International Workshop on Wireless and Ad Hoc Networks in New York, at the UCSD center for Information Theory and its Applications (ITA), and at IFIP Networking in Atlanta. It will be given at the Workshop on Network Coding in Hong Kong and at the International Symposium on Personal, Indoor and Mobile Radio Communications in France.

   c) I have supervised 27 projects of undergraduates, high school students and visiting graduate students, summarized as follows:

      Chan, Serena, “Localization of Attacks in Optical Networks,” Summer 97 and January, 6-A student at MIT Lincoln Laboratory (Serena is now in the doctoral program at MIT)

      Lin, Alvin, “Computer Simulation of Algorithms for Creating Minimal weight Redundant Trees in Edge-Redundant Graphs,” Summer 00, project through the Research Science Institute, run by the Center for Excellence in Education, to encourage promising U.S. high school students to pursue careers in science and engineering

      Chan, Derrick, “Coding for ALOHA Systems,” 6.199 Advanced Undergraduate Project, Fall 2000

      Divi, Vijay, “Heuristic Methods for Tree Selection,” UROP project, Spring 2001

      Abdallah, Rami, “Error Probability in Wireless Channels,” project through the Research Science Institute, Summer 2001

      Frey, Claudio, “Optimal Spreading Bandwidth in Ultrawideband Channels,” project through the Research Science Institute, Summer 2001

      Tang, Jie, “Cycles in Large Networks,” project through the Research Science Institute (**project was semi-finalist in the Siemens competition**), Summer 2003

      Ryu, Ho Seung (Paul), “Distribution of Node Degrees in Large Networks,” project through the Research Science Institute (**project was semi-finalist at the Siemens-Westinghouse Competition**), Summer 2003

Educational Contributions of Muriel Médard

Bdeir, Ayah, “SNR adaptation for PSAM systems,” undergraduate visiting from American University of Beirut, Summer 2003,

Fink, Evan, “Random Multicast Network Coding,” UROP project, Summer 2003

Lee, Anna, “Rate-Splitting Implementation of Slepian-Wolf Source Coding,” UROP project, Summer, Fall 2003 and Spring 2004

Choute, Clifford, “Network Coding in Gossip Networks,” UROP project, Spring 2004

Lee, Hyunjoo (Jenny), “Network Coding with a Cost Criterion,” AUP, Spring 2004

Muñoz-Torres, Enrique A., “Cycles and Reliability in Large Random Graphs,” AUP, Spring 2004

Ahmed, Ebad, “Distributed Optimization for Multicast Network Coding,” UROP Summer 2004, Fall 2004, Spring and Summer, Fall 2005

Acedanski, Szymon, “How Good is Random Linear Coding Based Distributed Networked Storage?” project through the Research Science Institute, Summer 2004

Tan, Jianlong, “Network Coding for Security,” UROP Fall 2004, Spring 2005

Vehkaperä, Mikko, “A Throughput-Delay Trade-Off in Packetized Systems with Erasures,” visiting student from Oulu University, Fall 2004, Spring 2005

Miliou, Natalia visiting student from ETH Zurich, Summer, Fall 2005

Loy, Jermaine, visiting student from Technical University Munich, Fall 2005

Kim, Minji, UROP student, “Conflict Graphs for Network Coding,” Spring 2006

Kim, Wonsik, UROP student, “Evolutionary Methods for Network Coding,” Summer 2006

Lima, Luisa, visiting student from University of Porto, Portugal, Fall 2006, Spring 2008,

Ming, Xiao, visiting student from Chalmers University, Sweden, Fall/Spring 2006/2007

Traskov, Danail, visiting student from University of Illinois Urbana-Champaign/ Technical University of Munich, Summer 2007

Singh, Jaspreet, visiting student from University of California Santa Barbara, Summer 2007

Fawaz, Nadia, visiting student from Supelec/Eurecom, Fall 2007

Joao Paulo da Silva Machado Garcia Vilela from University of Porto, Portugal, Spring 2008

Publications of Muriel Médard

1. Books
   N.A.

2. Papers in Refereed Journals:

   1. M. Médard, Marquis, D., Barry, R.A., and Finn, S.G., "Security Issues in All-Optical Networks," *IEEE Network Magazine*, Vol. 11, Issue 3, pp. 42-48, May 1997.
   2. M. Médard, Chinn, S.R., Saengudomlert, P., "Attack Detection in All-Optical Networks," in *Trends in Optics and Photonics (TOPS)*-Vol. 20 -Optical Networks and their Applications, Barry, R.A., editor, published by the Optical Society of America, pp. 227-232, 1998. **
   3. S.G. Finn, Médard, M., Barry, R.A., "A New Algorithm for Bi-directional Link Self-Healing for Arbitrary Redundant Networks," in *Trends in Optics and Photonics (TOPS)*-Vol. 20-Optical Networks and their Applications, Barry, R.A., editor, published by the Optical Society of America, pp. 222-226, 1998.
   4. M. Médard, Barry, R.A., Finn, S.G., Gallager, R.G., "Automatic Protection Switching for Multicasting in Optical Mesh Networks," in *Trends in Optics and Photonics (TOPS)*-Vol. 20-Optical Networks and their Applications, Barry, R.A., editor, published by the Optical Society of America, pp. 216-221, 1998.
   5. M. Médard, Finn, S.G., Barry, R.A., Gallager, R.G., "Redundant Trees for Preplanned Recovery in Arbitrary Vertex-Redundant or Edge-Redundant Graphs," *IEEE/ACM Transactions on Networks*, Vol. 7, Issue 5, pp. 641 -652, October 1999.
   6. M. Médard, "The Effect Upon Channel Capacity in Wireless Communications of Perfect and Imperfect Knowledge of the Channel," *IEEE Transactions on Information Theory*, Vol. 46, Issue 3, pp. 935-946, May 2000. (**Winner of the IEEE 2002 Leon Kirchmayer Prize Paper Award**)
   7. S. Lumetta, Médard, M., and Tseng, Y., "Capacity Versus Robustness: A Tradeoff for Link Restoration in Mesh Networks," *IEEE Journal of Lightwave Technology*, Vol. 18, Issue 12, pp. 1765 -1775, March 2001. **
   8. M. Médard, Chinn, S.R., and Saengudomlert, P., "Node Wrappers for QoS Monitoring in Transparent Optical Nodes," *Journal of High Speed Networks* (yearly publication), IOS Press, pp. 247-268, 2001. **
   9. M. Médard and Lumetta, S.S., "Architectural Issues for Robust Optical Access," *IEEE Communications Magazine*, Vol. 39, Issue 7, pp. 116-220, July 2001.
   10. M. Médard, Barry, R.A., Finn, S.G., He, W., Lumetta, S.S., "Generalized Loop-back Recovery in Optical Mesh Networks," I*EEE/ACM Transactions on Networking*, Vol. 10, Issue 1, pp. 153-164, February 2002. **
   11. M. Médard and Gallager, R.G., "Bandwidth Scaling for Fading Multipath Channels," *IEEE Transactions on Information Theory*, Vol. 48, Issue 4, pp. 840 -852, April 2002.
   12. P. Saengudomlert and Médard, M., "Guaranteeing BER in Transparent Optical Networks Using OOK Signaling," *IEEE Journal on Selected Areas in Communications*, Vol. 20, Issue 4, pp. 786-799, May 2002. **
   13. M. Médard, Lumetta, S.S., and Li, L., "A Network Management Architecture for Robust Packet Routing in Mesh Optical Access Networks," invited paper in *IEEE Journal on Selected Areas in Communications*, Vol. 20, Issue 4, pp. 822-833, May 2002.
   14. R. Koetter and Médard, M., "Beyond Routing: An Algebraic Approach to Network

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Coding," *IEEE/ACM Transactions on Networking*, Vol. 11, Issue 5, pp. 782-796, October 2003. (selected as one of the outstanding papers from INFOCOM for transfer to IEEE/ACM Transactions on Networking)

15. M. Jinno, Leonberger, F.J., Médard, M., Ransom, N., and Von Lehmen, A., "Guest Editorial: Optical Networks," *IEEE Journal of Lightwave Technology*, Vol. 21, Issue 11, pp. 2452-2454, November 2003.
16. M. Médard, "Channel Uncertainty in Communications," invited paper in *IEEE Information Theory Society Newsletter*, starting on page 1 (4 pages), June 2003.
17. M. Médard, Huang, J., Goldsmith, A., Meyn, S., and Coleman, T.P., "Capacity of Time-slotted ALOHA Packetized Multiple-Access Systems over the AWGN Channel," *IEEE Transactions on Wireless Communications*, Vol. 3, Issue 2, pp. 486-499, March 2004. **
18. D.S. Lun, Médard, M., and Abou-Fayçal, I.C., "On the Performance of Peaky Capacity-achieving Signaling on Multipath Fading Channels," *IEEE Transactions on Communications*, Vol. 52, Issue 6, pp. 931-938, June 2004. **
19. T.P. Coleman and Médard, M., "A Distributed Scheme for Achieving Energy-Delay Tradeoffs with Multiple Service Classes over a Dynamically Varying Network," *IEEE Journal on Selected Areas in Communications-Special Issue on Advanced Mobility Management and QoS Protocols for Wireless Internet*, Vol. 22, Issue 5, pp. 929-941, June 2004. **
20. M. Effros, Médard, M., Ho, T., Ray, S., Karger, D., Koetter, R., and Hassibi, B., "Linear Network Codes: A Unified Framework for Source, Channel, and Network Coding," *Advances in Network Information Theory, DIMACS Series in Discrete Mathematics and Theoretical Computer Science,* Vol. 66, pp. 197-216, Editors: Gupta et al., 2004. **
21. G.E. Weichenberg, Chan, V.W.S., and Médard, M., "High-Reliability Topological Architectures for Networks under Stress," *IEEE Journal on Selected Areas in Communications: Optical Communications and Networking Series*, Vol. 22, Issue 9, pp. 1830-1845, November 2004. **
22. T. Ho, Médard M., and Koetter, R., "An Information Theoretic View of Network Management," *IEEE Transactions on Information Theory*, Vol. 51, Issue 4, pp. 1295-1312, April 2005. **
23. I. Abou-Fayçal, Médard, M., and Madhow, U., "Binary Adaptive Coded Pilot Symbol Assisted Modulation over Rayleigh Fading Channels without Feedback," *IEEE Transactions on Communications*, Vol. 53, Issue 6, pp. 1036-1046, June 2005.
24. D. Karger and Médard, M., "Toward Using the Network as a Switch," *IEEE Journal on Selected Areas in Communications: Optical Communications and Networking Series*, Vol. 23, Issue 8, pp.1533-1541, August 2005.
25. C. Luo, Médard, M., and Zheng, L., "On Achieving Wideband Capacity Using Multitone FSK," *IEEE Journal on Selected Areas in Communications (JSAC)-Special Issue on Differential and Noncoherent Wireless Communications*, Vol. 23, Issue 9, pp. 1830-1838, September 2005. **
26. D.S. Lun, Ratnakar, N., Médard, M., Koetter, R., Karger, D.R., Ho, T., Ahmed, E., and Zhao, F., "Minimum-Cost Multicast over Coded Packet Networks," *IEEE Transactions on Information Theory*, Vol. 52, Issue 6, pp. 2608-2623, June 2006. **
27. S. Deb, Médard, M., and Choute, C., "Algebraic Gossip: A Network Coding Approach to Optimal Multiple Rumor Mongering," *IEEE Transactions on Information Theory*,

Vol. 52, Issue 6, pp. 2486-2507, June 2006. **

28. N. Cai, Chiang, N.M., Effros, M., Koetter, R., Médard, M., Prabhakar, B., Srikant, R., Towsley, D., and Yeung, R.W., "Introduction to the Special Issue on Networking and Information Theory," *IEEE Transactions on Information Theory*, Vol. 52, Issue 6, pp. 2285-2288, June 2006.
29. M. Médard and Srikant, R., "Capacity of Nearly-decomposable Markovian Fading Channels Under Asymmetric Receiver-sender Side Information," *IEEE Transactions on Information Theory*, Vol. 52, Issue 7, pp. 3052-3062, July 2006.
30. T.P. Coleman, Lee, A.H., Médard, M., and Effros, M., "Low-Complexity Approaches to Slepian-Wolf Near-Lossless Distributed Data Compression," *IEEE Transactions on Information Theory*, Vol. 52, Issue 8, pp. 3546-3561, August 2006. **
31. J. Huang, Meyn, S.P., and Médard. M., "Error Exponents for Channel Coding and Signal Constellation Design," *IEEE Journal on Selected Areas in Communications (JSAC)-Special Issue on Nonlinear Optimization of Communication Systems*, Vol. 24, Issue 8, pp.1647-1661, August 2006.
32. T. Ho, Médard, M., Koetter, R., Karger, D.R., Effros, M., Shi, J., and Leong, B., "A Random Linear Network Coding Approach to Multicast," *IEEE Transactions on Information Theory*, Vol. 52, Issue 10, pp. 4413-4430, October 2006. **
33. J.-S. Park, Lun, D.S., Yi, Y., Gerla, M., and Médard, M., "CodeCast: A Network Coding Based Ad Hoc Multicast Protocol," *IEEE Wireless Communications Magazine*, Vol. 13, Issue 5, pp. 76-81, October 2006. **
34. A.J. Goldsmith and Médard, M., "Capacity of Time-Varying Channels With Causal Channel Side Information," *IEEE Transactions on Information Theory*, Vol. 53, Issue 13, pp. 881-899, March 2007.
35. L. Zheng, Tse, D.N.C., and Médard, M., "Channel Coherence in the Low-SNR Regime," *IEEE Transactions on Information Theory*, Vol. 53, Issue 13, pp. 976-997, March 2007.
36. D. S. Lun, Jennings, L.D., Koetter, R. Licht, S., and Médard, M., "An Information-Based Computational Technique for Estimation of Chromatographic Peak Purity", *Journal of Chemical Information and Modeling*, Volume 47, Issue 5, pp. 1973 - 1978
37. S. Ray, Médard, M., and Zheng, L., "On Non-coherent MIMO Channels in the Wideband Regime: Capacity and Reliability,"*IEEE Transactions on Information Theory*, Volume 53, Issue 6, June 2007, pp. 1983 – 2009. **
38. M. Effros, Koetter, R., and Médard, M., "Breaking Network Logjams," *Scientific American*, Vol. 296, Number 6, pp. 78-85, June 2007.
39. G. Weichenberg, Chan, V., and Médard, M., "On the Capacity of Optical Networks: A Framework for Comparing Different Transport Architectures," *IEEE Journal on Selected Areas in Communications: Optical Communications and Networking Series*, Volume 25, Issue 6, August 2007, pp. 84 – 101. **
40. J.-K. Sundararajan, Deb, S., and Médard, M., "Extending the Birkhoff-von Neumann Switching Strategy for Multicast-On the use of Optical Splitting in Switches," *IEEE Journal on Selected Areas in Communications: Optical Communications and Networking Series*, Volume 25 , Issue 6, August 2007, pp. 36-50. **
41. D. S. Lun, Médard, M., Koetter, R., Effros, M., "On coding for reliable communication over packet networks", *Physical Communication*, Volume 1, Issue 1, March 2008, pp. 3-20

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42. S. Jaggi, Langberg M., Katti S. , Ho T. , Katabi D., Médard, M., and Effros, E., "Resilient Network Coding in the Presence of Byzantine Adversaries", accepted to the *Special Issue on Information-theoretic Security of the IEEE Transactions on Information Theory*
43. T. Ho, Leong, B., Koetter, R., Médard, M., and Effros, E., "Byzantine Modification Detection in Multicast Networks with Random Network Coding" accepted to the *Special Issue on Information-theoretic Security of the IEEE Transactions on Information Theory*
44. S. Katti, Hariharan, R., Hu, W. , Katabi, D., Médard, M., Crowcroft, J., "XORs in the Air: Practical Wireless Network Coding", accepted to the *IEEE/ACM Transactions on Networking*
45. S. Jing, Zheng, L., Médard, M., "On Training with Feedback in Wideband Channels", accepted to the *IEEE Journal on Selected Areas in Communications: Special Issue on Limited Feedback***

3. Proceedings of Refereed Conferences:
    1. T.P. McGarty and Médard, M., "Wireless Architectural Alternatives: Current Economic Valuations Versus Broadband Options, The Gilder Conjecture," *Telecommunications Policy Research Conference*, Section 1, pp. 174-200, October 1994.
    2. M. Médard and Gallager, R.G., "The Issue of Spreading in Multipath Time-Varying Channels," *IEEE Vehicular Technology Conference (VTC)*, Volume 1, pp. 1-5, July 1995.
    3. M. Médard and Gallager, R.G., "The Effect of a Randomly Time-varying Channel on Mutual Information," *IEEE International Symposium on Information Theory (ISIT)*, pg. 139, September 1995.
    4. M. Médard and Gallager, R.G., "The Effect of Channel Variations upon Capacity," *IEEE Vehicular Technology Conference (VTC)*, Volume 3, pp. 1781-1785, April 1996.
    5. M. Médard, "Security Issues for All-Optical Networks," invited panelist statement, at the *National Information Systems Security Conference*, Volume 2, pg. 882, October 1996.
    6. M. Médard, Finn, S.G., and Barry, R.A., "Automatic Protection Switching for Multicasting in Optical Mesh Networks," *Optical Fiber Communication Conference (OFC)*, pp. 314-315, February 1997.
    7. S.G. Finn, Médard, M., and Barry, R.A., "A Novel Approach to Automatic Protection Switching," *IEEE International Conference on Communications (ICC)*, pp. 272-276, Vol.1, June 1997.
    8. R.G. Gallager and Médard, M., "Bandwidth Scaling for Fading Channels," *IEEE International Symposium on Information Theory (ISIT)*, pg. 471, July 1997.
    9. M. Médard and Goldsmith, A.J., "Capacity of Time-Varying Channels with Channel Side Information," *IEEE International Symposium on Information Theory (ISIT)*, pg. 372, July 1997.
    10. A.H. Chan and Médard, M., "Reconfigurable Feedback Shift Registers," *IEEE International Symposium on Information Theory (ISIT)*, pg. 178, July 1997.
    11. M. Médard, "Capacity of Correlated Jamming Channels," *Allerton Conference on Communication, Control, and Computing*, pp. 1043-1052, November 1997.
    12. M. Médard, "Bound on Mutual Information for DS-CDMA spreading over Independent Channels," invited paper, *Asilomar Conference on Signals, Systems and Computers*,

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Volume1, pp. 187-191, October 1997.

13. D. Marquis, Médard, M., Barry, R.A., Finn, S.G., "Physical Security Considerations in All-Optical Networks," invited paper, *Proceedings of the International Society for Optical Engineering (SPIE)*, vol. 3228, pp. 260-271, November 1997.
14. M. Médard, Chan, A.H., Moores, J.D., Hall, K.A., Rauschenbach, K.R., and Parikh, S., "Ultrafast Cryptography Using Optical Logic in Reconfigurable Feedback Shift Registers," *Proceedings of the International Society for Optical Engineering (SPIE)*, vol. 3228, pp. 342-345, November 1997.
15. S.G. Finn, Médard, M., and Barry, R.A., "A New Algorithm for Bi-directional Self Healing for Arbitrary Redundant Networks," *Optical Fiber Communication Conference (OFC)*. pp. 298-299, February 1998
16. M. Médard, Chinn, S.R., and Saengudomlert, P., "Attack Detection in All-optical Networks," *Optical Fiber Communication Conference (OFC)*, pp. 272-273, February 1998. **
17. R. Bergman, Médard, M., and Chan, S., "Distributed Algorithms for Attack Localization in All-Optical Networks," I*nternet Society Network and Distributed System Security (NDSS) Symposium*, Session 3, paper 1 (15 pages), February 1998.
18. M. Médard, Marquis, D., and Chinn, S.R., "Attack Detection Methods for All-Optical Networks," *Internet Society Network and Distributed System Security (NDSS) Symposium*, Session 3, paper 2 (17 pages), February 1998.
19. Barry, R.A. and Médard, M., "BER Analysis of Low-rate Communications Through a Single Electro-Optic R2 Nonlinear Regenerator," *IEEE Conference on Lasers and Electro-Optics (CLEO)*, pp. 455-456, May 1998.
20. R.G. Gallager, Médard, M., Barry, R.A., and Finn, S.G., "Multicast Automatic Protection Switching in Arbitrary Redundant Graphs," *IEEE International Conference on Communications (ICC)*, Volume 1, pp. 640-644, June 1998.
21. J. Yueh, Chan, A.H., and Médard, M., "On the Complexity of Reconfigurable Feedback Shift Register Sequences," *IEEE International Symposium on Information Theory (ISIT)*, pg. 133, August 1998.
22. M. Médard, "A Coding Theorem for Multiple-Access Decorrelating Channels," *IEEE International Symposium on Information Theory (ISIT)*, pg. 215, August 1998.
23. M. Médard, "Secure Optical Communications," invited paper, FE3, *Lasers and Electro-Optics Society (LEOS) Annual Meeting*, pp. 323-324, Vol.2, December 1998.
24. M. Médard, Finn, S.G., and Barry, R.A., "WDM Loop-back in Mesh Networks," *Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)*, pp. 752-759. Vol.2, March 1999.
25. M. Médard and Goldsmith, A.J., "Capacity of Time-Varying Channels with Side Information at the Sender and the Receiver," *Miniconference on Information Theory, IEEE International Conference on Communications (ICC)*, pp. 16-20, June 1999.
26. M. Médard, "Processing of Wireless Signals to Preserve Wireline Network Resources," invited paper, *IEEE Wireless Communications and Networking Conference (WCNC)*, Volume 1, pp. 61-65, September 1999.
27. M. Médard and Goldsmith, A., "Capacity of Time-Slotted ALOHA Systems," invited paper, *IEEE Wireless Communications and Networking Conference (WCNC)*, Volume 1, pp. 490-494, September 1999.

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28. M. Médard, Huang, J., Meyn, S.P., and Goldsmith, A., "Capacity of Time-Slotted ALOHA Systems," *IEEE International Symposium on Information Theory (ISIT)*, pg. 407, June 2000. **
29. M. Médard and Srikant, R., "Capacity of Nearly-decomposable Markovian Fading Channels under Asymmetric Receiver-Sender Side Information," *IEEE International Symposium on Information Theory (ISIT)*, pg. 413, June 2000.
30. S.S. Lumetta and Médard, M., "Robust Routing for Local Area Optical Access Networks," *IEEE Lasers and Electro-Optics Society (LEOS) Summer Topical Meeting*, pp. IV39 -IV40, July 2000.
31. M. Médard, Lumetta. S.S., and Tseng, Y., "Capacity-Efficient Restoration for Optical Networks," *Optical Fiber Communication Conference (OFC)*, paper ThO2, pp. 207-209, March 2000. **
32. M. Médard and Tse, D.N.C., "Spreading in Block-Fading Channels," *Asilomar Conference on Signals, Systems, and Computers*, Volume 2, pp. 1598-1602, November 2000.
33. P. Saengudomlert and Médard, M., "Limits of BER Guarantees in Transparent Optical Networks Using OOK Signaling," invited paper, *38th Annual Allerton Conference on Communication, Control, and Computing*, Volume 1, pp. 583-592, October 2000. **
34. M. Médard, Abou-Fayçal, I., and Madhow, U., "Adaptive Coding with Pilot Signals," invited paper, *38th Annual Allerton Conference on Communication, Control, and Computing*, pp. 337-346, October 2000. **
35. M. Médard and Srikant, R., "The Effect on Capacity of Decoupling Slow Fades from Fast Fades in Channels with Asymmetric Channel Information," *IEEE International Symposium on Information Theory and its Applications (ISITA)*, pp. 697-700, November 2000.
36. S.S. Lumetta and Médard, M., "Classification of Two-link Failures in All-optical Networks," *Optical Fiber Communication Conference (OFC)*, Volume 1, pp. TuO3- 1-TuO3-3, March 2001.
37. Narula-Tam, Finn, S.G., and Médard, M., "Analysis of Reconfiguration of IP over WDM Access Networks," *Optical Fiber Communication Conference (OFC)*, sponsored by the Optical Society of America, Volume 1, pp. MN4-1 -MN4-3, March 2001.
38. S. Lumetta and Médard, M., "Towards a Deeper Understanding of Link Restoration Algorithms for Mesh Networks," *Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)*, Volume 1, pp. 367-375, April 2001.
39. R. Koetter and Médard, M., "An algebraic approach to network coding and robust networks," *IEEE International Symposium on Information Theory (ISIT)*, pg. 104, June 2001.
40. A.L. Libarikian and Médard, M., "A Robust Optical Folded Bus Architecture for Overlay Access Networks," invited paper, 3*9th Annual Allerton Conference on Communication, Control, and Computing*, pp. 633-645, October 2001. **
41. T.P. Coleman and Médard, M., "Trade-off Between Power Consumption and Delay in Wireless Packetized Systems," invited paper, *39th Annual Allerton Conference on Communication, Control, and Computing*, pp. 501-512, October 2001. **
42. R. Koetter and Médard, M., "Beyond Routing: An Algebraic Approach to Network Coding," *Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)*, Volume 1, pp. 122-130, July 2002. (**selected as one of the outstanding**

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**papers from INFOCOM for transfer to IEEE/ACM Transactions on Networking**)

43. H. Wang, Modiano, E., and Médard, M., "Using Local Information for WDM Network Protection," invited paper, *Symposium on Photonics, Networks and Computing, (JCIS)*, pp. 1398-1401, March 2002. **
44. H. Wang, Modiano, E., and Médard, M., "Partial Path Protection for WDM networks," *Sixth Institute for Operations Research and the Management Sciences (INFORMS) Telecommunications Conference*, paper ME01.2 (2 pages), March 2002. **
45. D.S. Lun, Médard, M., and Abou-Fayçal, I., "Error Exponents for Wideband Multipath Fading Channels-a Strong Coding Theorem," *Conference on Information Sciences and Systems (CISS)*, Princeton, pp. 866-870, April 2002. **
46. T. Ho, Médard, M., and Koetter, R., "A Coding View of Network Recovery and Management for Single Receiver Communications," *Conference on Information Sciences and Systems (CISS)*, Princeton, pp. 590-597, April 2002,**
47. M. Médard, "Optical Network Survivability Beyond the Core," invited paper, *Proceedings of the International Society for Optical Engineering (SPIE*), Volume 4872, pp. 239-253, July 2002.
48. H. Wang, Modiano, E., and Médard, M., "Partial Path Protection for WDM Networks: End-to-End Recovery Using Local Failure Information," *IEEE Symposium on Computers and Communications (ISCC)*, pp. 719-725, July 2002. **
49. T. Ho, Médard, M., and Koetter, R., "A Coding View of Network Capacity, Recovery and Management," *International Symposium on Information Theory*, pg. 137, July 2002. **
50. D.S. Lun, Médard, M., and Abou-Fayçal, I., "An Upper Bound on the Error probability of Capacity-Achieving Signaling On Broadband Rayleigh Fading Channels," *IEEE Vehicular Technology Conference*, Volume 1, pp. 577-581, September 2002. **
51. C. Luo and Médard, M., "FSK for Ultrawideband-How Close to Capacity Can We Get?" *International Symposium on Information Theory and its Applications*, pp. 839-842, October 2002. **
52. D.S. Lun, Médard, M., and Abou-Fayçal, I., "Error Exponents for Capacity-Achieving Signaling on Wideband Rayleigh Fading Channels," *International Symposium on Information Theory and its Applications*, pp. 255-258, October 2002. **
53. C. Luo and Médard, M., "Frequency Shift Keying for Ultrawideband-Achieving rates of the Order of Capacity," invited paper, *40th Annual Allerton Conference on Communication, Control, and Computing*, Volume 2, pp. 785-796, October 2002. **
54. I. Abou-Fayçal, Médard, M., and Madhow, U., "Adaptive Coding for PSAM Without Feedback," invited paper, *Asilomar Conference on Signals, Systems, and Computers*, Volume 2, pp. 1503-1507, November 2002.
55. C. Luo and Médard, M., "Performance of Single-tone and Two-tone Frequency-shift keying for Ultrawideband," *Asilomar Conference on Signals, Systems, and Computers*, Volume 1, pp. 701-705, November 2002. **
56. M. Effros, Médard, M., Ho T., Ray, S., Karger, D., and Koetter, R., "Linear Network Codes: A Unified Framework for Source Channel, and Network Coding," invited paper to the *DIMACS Workshop on Network Information Theory, DIMACS Series in Discrete Mathematics and Theoretical Computer Science*, Volume 66, American Mathematical Society, pp. 197-216, 2003. **
57. T. Ho, Médard, M., and Koetter, R., "An Information-Theoretic View of Network

Management," *Annual Joint Conference of the IEEE Computer and Communications Societies (INFOCOM)*, Volume 2, pp. 1456-1466, July 2003. **

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4. Other publications:

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7. S. Jaggi, Langberg, M., Katti, S., Ho, T., Katabi, D., and Médard, M., "Resilient Network Coding in the Presence of Byzantine Adversaries", MIT-CSAIL-TR-2006-053, August 1, 2006

6. Invited Lectures:

Spring 1997 "Optical Network Security," Steering Committee Lecture, MIT Lincoln Laboratory

Fall 1997 "Spreading and Recovery: topics in communications," **invited** seminar, University of California, Berkeley

Fall 1997 "Topics in Communications," **invited** seminar, University of Illinois Urbana-Champaign

Spring 1998 "Topics in Optical Network Security," **invited** seminar, University of Maryland and MIT

Spring 1998 "Security in Optical Networks," **invited** seminar, Rensselaer Polytechnic Institute

Fall 1998 "Restoration in Optical Networks," Coordinated Science Laboratory (CSL) Seminar, University of Illinois, Urbana-Champaign

Fall 1998 "Spreading in Time-varying Channels," **invited** seminar, University of Michigan

Spring 1999 "Capacity of Time-varying Channels with Side Information," **invited** seminar, University of Michigan and MIT

Summer 1999 "Capacity of Time-varying Channels with Side Information," **invited** seminar, Northwestern University

Fall 1999 "An Overview of Security for Optical Networks," Coordinated Science Laboratory (CSL) Seminar, University of Illinois Urbana-Champaign

Fall 1999 "Capacity of Fast Time-varying Channels with Side Information," Coordinated Science Laboratory (CSL) Seminar, University of Illinois Urbana-Champaign

Fall 2000 "Restoration in Optical Networks," **invited** seminar, Carnegie-Mellon University

Spring 2001 M. Médard, "Robustness and Recovery in Optical Networks," **invited** presentation, *IEEE Gigabit Networking Workshop,* also **invited** seminar, George Washington University

May 2001 "Some different aspects of adaptive coding for wireless communications," **invited** seminar, Stanford University and **invited** seminar, Lucent Bell Labs (June 2001)

June 2001, “Robust Optical Communications,” **invited** seminar, Lucent Bell Labs

May 2001 and August 2001 “Robustness and Security in Optical Networks,” presentation for AFOSR URI kickoff at Stanford University and AFOSR program review at Wright-Patterson Air Force Base

October 2001 “Some New Directions in Communications and Networking,” **invited** tutorial, Federal Communications Commission

December 2001, “Network Coding for Capacity and Robustness,” **invited** talk at the DIMACS (Center for Discrete Mathematics and Theoretical Computer Science at Rutgers University) Workshop on Codes and Complexity

December 2001, “Optical Network Security,” **invited** talk to the DARPA Information Assurance for Optical Networks (OpticIA) Workshop

March 2002, “When the Physical Layer Matters -a perspective on networking aspects of wireless communications,” **invited** talk, Information Science and Technology (ISAT) study group for DARPA on “Robust Networks for Critical Missions and Critical Infrastructure”

April 2002, “Some Aspects of Robustness in Wireless Networks,” **invited** seminar, University of Massachusetts, Amherst

June 2002, “Overview of New Results in Optical Access Networks Robustness,” **invited** Photonics Series seminar at the University of Illinois Urbana-Champaign

October 2002, M. Médard and Kim, M., “A Bound on Backup Path Lengths Using a Random Graph Approach,” **invited** paper, IEEE Annual Computer Communications Workshop, 2002

October 2002, “Network Coding and Network Management-Towards Fundamental Limits?” **invited** seminar, Cornell University, also **invited** seminar, Boston University

November 2002, “Security in Optical Networks,” **invited** briefing to the Assistant Secretary of Defense (C3I) (Highland Forum), at the Pentagon (Washington, D.C.)

Spring 2003, “Network Coding: Towards an Unified View of Routing, Network Management, Coding and Compression?” **invited** seminar, Applied Mathematics Department, Brown University, also **invited** seminar, ECE Department, Georgia Tech, also **invited** IBM Lecture, Notre Dame University

Fall 2004, “Network Coding: Towards an Unified View of Routing, Recovery, Coding and Compression?” **invited** seminar, Harvard University

Spring 2004, “Coding for Networks,” **invited** presentation, the Annual Lee Center Workshop (Caltech's Lee Center for Advanced Networking), in which 4 guest speakers present to Caltech faculty, students and alumni

May 2004, D.S. Lun, M. Médard, T. Ho, Koetter, R., “Network Coding with a Cost Criterion,” **invited** talk, Communication Theory Workshop

May 2004, “Network Coding: an Introduction,” a one-day course given to the Centre for Wireless Communications at the University of Oulu, Finland (co-taught with Ralf Koetter of UIUC)

August 2004, “Towards a Random, Distributed Operation of Networks,” **invited** presentation, Lucent Bell Labs, also Colloquium, Northeastern University, October 2004

October 2004, “Byzantine Modification Detection in Multicast Networks Using Randomized Network Coding,” **invited** seminar, Northeastern University

October 2004, “On the Implications of Optical Splitting for Multicasting,” **invited** presentation, 19th IEEE Annual Computer Communications Workshop

December 2004, "Network Coding," one-day tutorial at the IEEE Global Telecommunications Conference (Globecom) (co-taught with Ralf Koetter of UIUC and Phil Chou of Microsoft)

January 2005, "An Overview of the Use of Distributed Mechanisms in Network Coding," **invited** presentation, DIMACS (Center for Discrete Mathematics and Theoretical Computer Science at Rutgers University) Workshop on Network Coding

April 2005. "Network Coding for Cost, Reliability and Ease of Management," **invited** seminar, Yale University

June 2005, "Network Coding in Wireless Networks," **Plenary Speaker**, IEEE Workshop on Signal Processing Advances in Wireless Communications (SPAWC), New York

June 2005, "Network Coding -an Introduction," **invited** seminar, Seminaire Euronetlab, Universite Pierre et Marie Curie, Paris

June 2005 "Network Coding for Cost, Reliability and Ease of Management," **invited** seminar, Ecole Nationale Superieure de Telecommunications de Bretagne, also Joint IEEE Comsoc & IT-Lab Conference on Communications and Coding, **invited** seminar, ENST Paris, June 2005, also **invited** seminar, Ecole Polytechnique Federale de Lausanne, July 2005

September 2005, "On Distributed Optimization for Networks," **Keynote Speaker**, Mobile Information and Communications Systems Scientific Conference, Loewenberg, Switzerland

September 2005, "Network Coding," one-day tutorial at the IEEE International Symposium on Information Theory (co-taught with Ralf Koetter of UIUC and Phil Chou of Microsoft)

December 2005, "Wireless Network Coding," Signal Processing/ Communications **invited** seminar, University of California at Los Angeles

April 2006, "Wireless Network Coding," **invited** seminar, University of Texas at Austin,

May 2006, "Network Coding-Where to Now?" **Plenary Speaker**, IFIP Networking 2006, also **invited** seminar, May 2006, University of Porto, Portugal

June 2006, "Network Coding-An Overview," **invited** seminar, Ecole Nationale Supérieure de Télécommunications de Bretagne, Rennes

June 2006, "Distributed Network Coding for Sensor Networks**," tutorial**, International Workshop on Wireless and Ad Hoc Networks 2006

August 2006, "Network Coding: A Tutorial," **tutorial,** University of California at San Diego, ITA Center (co-taught with Ralf Koetter of UIUC)

August 2006, "Network Coding for Wireless Networks," **invited** seminar, University of Southern California

March 2007, "Network Coding-an Optimization View," **Plenary Speaker**, Conference on Information Sciences and Systems, Johns Hopkins University, also April 2007 **General Dynamics Distinguished Lecture Series,** University of Michigan and **invited** seminar Intel Workshop on Wireless Communications (last two cancelled because of sickness)

May 2007, "Some Interesting Directions in Network Coding," invited presentation, workshop on Algorithms, Inference and Statistical Physics, Santa Fe, NM, organized by the Los Alamos National Laboratory and the Center for Nonlinear Studies

May 2007, "Introduction to Network Coding," **tutorial**, IFIP Networking 2007, Atlanta, Georgia, also Workshop on Network Coding, Hong Kong, January 2008

May 2007, "On Security Aspects of Network Coding," **invited** talk, IEEE Communications Theory Workshop, Sedona, Arizona

** Outgrowth of supervised student research

September 2007, “Le codage sur réseaux - théorie, applications et nouvelles frontières”, **Plenary Speaker**, GRETSI 2007, Troyes, France

September 2007, “New Directions in Wireless Communications,” **Gilbreth Lecture** to the National Academy of Engineering

January 2008, “On Theory and Practice in Network Coding”, **Keynote Lecture**, Coordinated Science Laboratory at UIUC 3rd annual Student Conference in the areas of Control, Communications and Signal Processing.

February 2008, “Delay and throughput in network coding”, **invited** seminar, Iowa State University

June 2008, “Network Coding”, **invited** course, First School of Information Theory, organized by the IEEE Information Theory Society at Penn State

# Theses Supervised by Muriel Medard

Summary

| | Total | Completed | In Progress |
|---|---|---|---|
| Bachelor | 0 | 0 | 0 |
| Master of Engineering | 8 | 8 | 0 |
| Master of Science | 16 | 13 | 3 |
| Engineer | 0 | 0 | 0 |
| Doctoral | | | |
| As Supervisor | 13 | 6 | 7 |
| As Reader | 26 | 23 | 3 |

## Bachelor's Theses

None

## Master's of Engineering Theses

Zheng, Changqing, "Optimum Spreading Bandwidth for DS-CDMA on Time and Frequency Fading Channels," May 2002

Rettig, Pascal, "Transmit Simulation and Receive Optimization for 802.11b Networks" (6-A student at Qualcomm), May 2002

Le Cocq, Cécile, "Delay Improvements from Multiple Wavelengths in an Optical Folded Bus," September 2003

Choute, Clifford, "Performance of Random Network Coding for Data Dissemination," (co-supervised with Supratim Deb), June 2005

Lee, Anna, "Simplified Random Network Codes for Multicast Networks," June 2005

Tang, Jianlong, "Secure Network Coding with a Cost Criterion," June 2006

Ebad Ahmed, "Economic Aspects of Network Coding", (co-supervised with Asuman Ozdaglar and Atilla Eryilmaz), June 2007

Minji Kim, "Network Coding for Speed-up in Switches," August 2007

## Master's Theses

Saengudomlert, Poompat, "Analysis and Detection of Jamming Attacks in an All-optical Network," June 1998 (co-supervised with Robert G. Gallager)

Huang, Jianyi, "Capacity of Time-slotted ALOHA Systems," June 2000, University of Illinois Urbana-Champaign (co-supervised with Sean P. Meyn)

He, Wenbo, "Heuristic Algorithms for Failure Recovery in Mesh Networks," August 2000, University of Illinois Urbana-Champaign

Wang, Hung Jen, "Routing Policy on Robustness in Optical Networks," March 2002 (co-supervised with Eytan Modiano)

Libarikian, Ari, "Robustness of Bus Overlays in Optical Networks," April 2002, **winner of a MIT Masterworks (one of 9 in EECS)**

Coleman, Todd, "Trade-off Between Power Consumption and Delay in Wireless Packetized Systems," April 2002, **winner of the Morris J. Levin Award (First Prize) at the MIT Masterworks**

Lun, Desmond, "Error Exponent for Multipath Fading Channels: Strong Coding Theorem," September 2002 (co-supervised with Ibrahim Abou-Fayçal)

Weichenberg, Guy, "High-Reliability Architectures for Networks Under Stress," June 2003 (co-supervised with Vincent Chan)

Kim, Minkyu, "Robustness in Large-Scale Random Networks," June 2003

Ray, Siddharth, "Achievable Rates Over Bursty Multiple-Access Noise-Free Channels," September 2003 (co-supervised with Jinane Abounadi)

Youssef-Massaad, Pamela, "Impact of processing energy on the capacity of wireless channels," started Fall 2003 (co-supervised with Lizhong Zheng)

Sundararajan, Jay Kumar, "Extending the Birkhoff-von Neumann Switching Strategy to Multicast Switching" June 2005 (co-supervised with Supratim Deb), **winner of a Morris J. Levin Award at the MIT Masterworks**

Jing, Sheng, "On Sounding in Wideband Channels," June 2006, (co-supervised with Lizhong Zheng)

Doshi, Vishal, started Fall 2005 (co-supervised with Devavrat Shah)

ParandehGhebi, Ali, started Fall 2006 (co-supervised with Asuman Ozdaglar)

Shi, Shirley, started Spring 2006.

Engineers Theses

None

Doctoral Theses, Supervisor

Ho, Tracey, "Networking from a Network Coding Perspective," May 2004. Committee: David Karger, Ralf Koetter (UIUC), Michelle Effros (Caltech) (**received an Honorable Mention from the George M. Sprowls Award for the best doctoral theses in computer science**)

Peranginangin, Nathanael, "On Capacity of Relay Networks with Finite Memory Relays," September 2004. Committee: Robert G. Gallager, Ralf Koetter (UIUC), Vincent Chan.

Luo, Cheng, "Communication for Wideband Fading Channels: on Theory and Practice," (co-supervised with Lizhong Zheng), October 2005. Committee: Greg Wornell, Vincent Chan, Dennis Goeckel (University of Massachusetts Amherst).

Coleman, Todd, "Low-Complexity Approaches to Distributed Data Dissemination," November 2005. Committee: John Tsitsiklis, Ralf Koetter (UIUC), Michelle Effros (Caltech), Andrea Goldsmith (Stanford).

Lun, Desmond, "Efficient Operation of Coded Packet Networks," June 2006. Committee: John Tsitsiklis, Ralf Koetter (UIUC), Michelle Effros (Caltech).

Ray, Siddharth, "Energy-Efficient Multiple Antenna Communication", (co-supervised with Lizhong Zheng), August 2006. Committee: Pierre Moulin (UIUC), Pramod Viswanath (UIUC).

Weichenberg, Guy, started Summer 2003 (co-supervised with Vincent Chan)

Zhao, Fang, started Fall 2003 (co-supervised with Asuman Ozdaglar)

Kim, Minkyu, started Fall 2004

Sundararajan, Jay Kumar, started Fall 2005 (co-supervised with Devavrat Shah)

Sheng, Jing, started Fall 2006 (co-supervised with Lizhong Zheng)

Lucani, Daniel, started Fall 2006 (co-supervised with Milica Stojanovic)

Kim, Minji, starting Fall 2007

Doctoral Theses, Reader

Visotsky, Yevgeny, "Space-time Transmit Precoding and Interference Suppression for a Wireless Downlink," June 2000 (supervised by Upamanyu Madhow), University of Illinois Urbana-Champaign

Abou-Fayçal, Ibrahim, "An Information Theoretic Study of Reduced Complexity Receivers for Intersymbol Interference Channels," January 2001 (supervised by Amos Lapidoth)

Yeh, Edmund, "Successive Decoding in Multiple-user Communications," June 2001 (supervised by Robert G. Gallager)

Klein, Thierry, "Capacity of Gaussian Noise Channels with Side Information and Feedback," June 2001 (supervised by Robert G. Gallager)

Laneman, Nicholas, "Cooperative Diversity in Wireless Networks: Algorithms and Devices," July 2002 (supervised by Greg Wornell)

Roy, Sandip, "Moment Linear Stochastic Systems and Their Applications," June 2003 (supervised by George Verghese)

Yao, Huan, "Efficient Signal, Code, and Receiver Designs for MIMO Communication Systems," June 2003 (supervised by Greg Wornell)

Min, Rex, "Energy and Quality Scalable Wireless Communication," June 2003 (supervised by Anantha Chandrakasan)

Shulman, Nadav, "Communication over an Unknown Channel via Common Broadcasting," July 2003 (supervised by Meier Feder), Tel Aviv University

De Couto, Douglas, "High-Throughput Routing for Multi-Hop Wireless Networks," May 2004 (supervised by Robert Morris)

Huang, Jianyi, "Characterization and Computation of Optimal Distributions for Channel Coding," August 2004 (supervised by Sean Meyn), University of Illinois Urbana-Champaign

Wu, Xin Zhou, "Wireless Communications in the Energy-Limited Regime," October 2004 (supervised by R. Srikant), University of Illinois Urbana-Champaign

# Theses Supervised by Muriel Medard

Rasala-Lehman, April, “Network Coding,” January 2005 (supervised by Madhu Sudan)

Gentry, Sommer, “Dancing Cheek to Cheek: Haptic Communication between Partner Dancers and Swing as a Finite State Machine,” June 2005 (supervised by Eric Feron)

Chen, Li-Wei, “A Study on the Tradeoff between Efficient Resource Allocation and Node Complexity in WDM Optical Networks,” August 2005 (supervised by Eytan Modiano)

Jaggi, Siddharth, “Design and Analysis of Network Codes,” November 2005 (supervised by Michelle Effros), California Institute of Technology

Khalili, Ramin, “On the Properties of the Packet Layer Transmission,” December 2005 (supervised by Kaveh Salamatian), Universite Pierre et Marie Curie, France

Sicot, Guillaume, “Etude du codage dans l’ADN,” June 2006 (supervised by Ramesh Pyndiah), l’Ecole Nationale Supérieure de Télécommunications de Bretagne, France

Sethuraman, Vignesh, “On Non-Coherent Communication over Correlated Fading Channels with Practical Power Constraints,” July 2006 (supervised by Bruce Hajek), University of Illinois Urbana-Champaign

Ratnakar, Narajan, “On Joint Resource Allocation and Network Coding in Networks of Point to Point Links and on Multicasting in Aref Networks”, August 2006 (supervised by Ralf Koetter), University of Illinois Urbana-Champaign

Miliou, Natalia, “On Error Exponents for Fading Channels and Network Coding for Wireless Networks,” April 2007 (supervised by Amos Lapidoth), ETH Zurich, Switzerland

Piantanida, Pablo, “Multi-User Information Theory: State Information and Imperfect Channel Knowledge,” May 2007 (supervised by Pierre Duhamel), University of Paris-Sud XI (Supélec), France

Edalat, Farinaz, “Real-time Sub-carrier Adaptive Modulation and Coding in Wideband Orthogonal FrequencyDivision Multiplexing Wireless Systems" (supervised by Charles Sodini)

Wen, Yonggang, (supervised by Vincent W.S. Chan)

Sundaram, Shreyas (supervised by Chris Hadjicostis), University of Illinois Urbana-Champaign

Katti, Sachin (supervised by Dina Katabi)

Postdoctoral Fellows Supervised by Muriel Medard

## Postdoctoral Fellows Supervised

Current Postdocs

| Name | Dates of Appointment | PhD Granting Institution | Current Position |
|---|---|---|---|
| Chris Ng | October 2007 | Stanford | |

Previous Postdocs

| Name | Current Title | Current Employer |
|---|---|---|
| Atilla Eryilmaz | Asst. Professor | Ohio State University |
| Siddarth Jaggi | Asst. Professor | Chinese University of Hong Kong |
| Supratim Deb | Member of Tech. Staff | Lucent Bell Labs, India |
| Ibrahim Abou-Fayçal | Asst. Professor | American Univ. of Beirut |