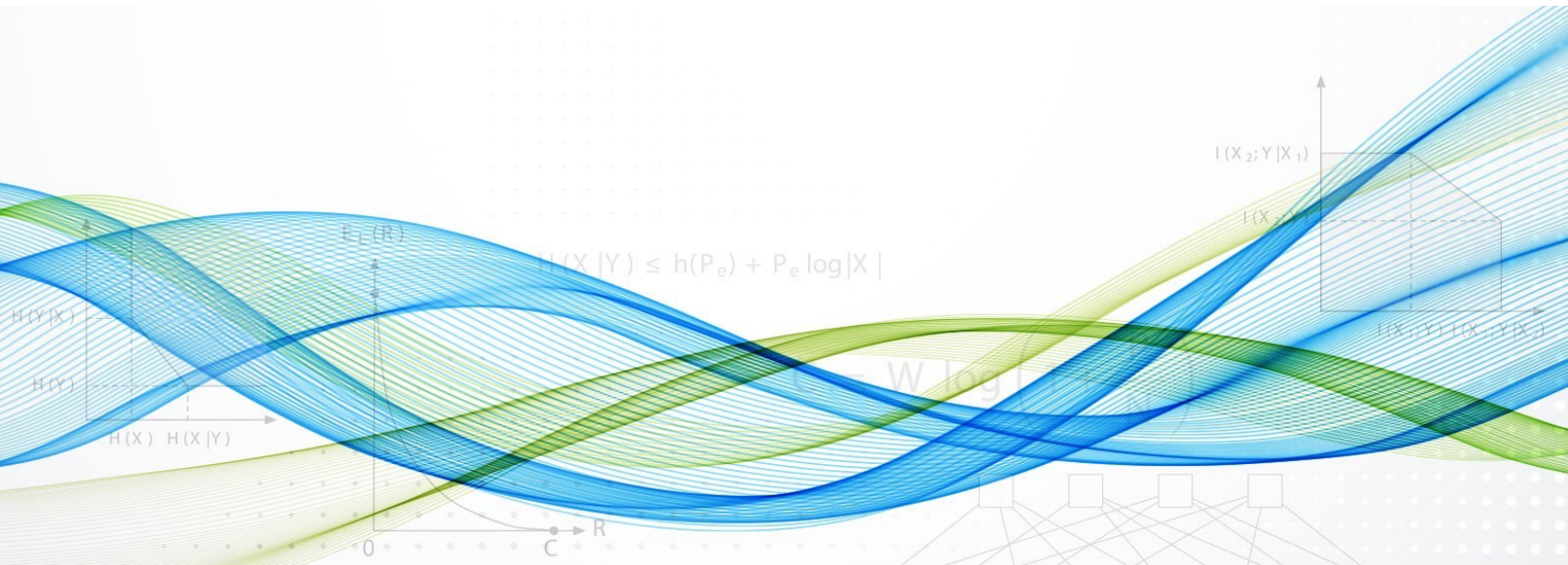
Georgia Tech School of Electrical and Computer Engineering
College of Engineering

IEEE INFORMATION THEORY SOCIETY

Program



Welcome

Welcome to the 2017 North-American School of Information Theory! We are thrilled to have you at Georgia Tech.

This year's school is the 10th edition of the North-American School of Information Theory, which started in 2008 at the Penn State University under the leadership of Prof. Aylin Yener and Prof. Gerhard Kramer and has been running ever since! Many of the organizers and speakers that you will meet during the event attended the 2008 North American School. Looking back at the event, it provided a fantastic venue to learn about exciting topics, present recent research results, and interact with other researchers who became colleagues and friends over the years. We hope that you will benefit from and enjoy the 2017 North-American School of Information Theory edition as much as we did the 2008 edition.

We are delighted to have Prof. Amin Shokrollahi from EPFL as the 2017 Padovani lecturer. His research accomplishments not only span a variety of topics, including coding theory (most notably Tornado codes and Raptor codes), computational number theory and algebra, and computational/algebraic complexity theory, but have also led to several patents and successfully standardization and pratical deployments.

Finally, the 2017 North-American School of Information Theory would not be happening without the strong and sustained support of the **IEEE Information Theory Society**, and the support of the **Center for Science of Information** at Purdue and the **School of Electrical and Computer Engineering** at Georgia Tech.

We are looking forward to a great week of interactions!

The 2017 NASIT Organizing Committee

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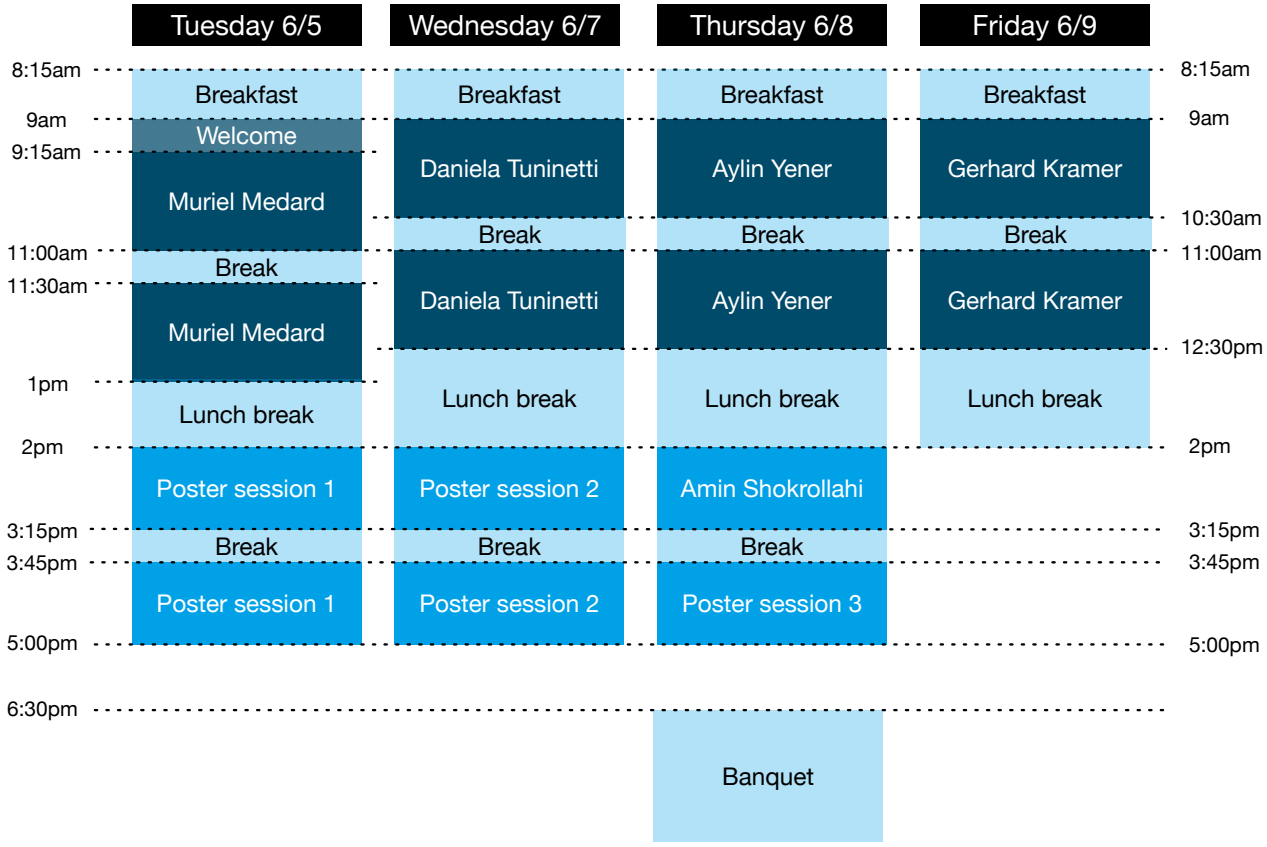

2 Lectures

Padovani Lecture - A Tale of Two Startups

Prof. Amin Shokrollahi, Ecole Polytechnique Fédérale de Lausanne (EPFL)

Thursday 2pm-3:15pm - Technology Square Research Building

Short biography Amin Shokrollahi has worked on a variety of topics, including coding theory, computational number theory and algebra, and computational/algebraic complexity theory. He is best known for his work on iterative decoding algorithms of graph based codes, an area in which he holds a number of granted and pending patents. He is the co-inventor of Tornado codes, and the inventor of Raptor codes. His codes have been standardized and successfully deployed in practical areas dealing with data transmission over lossy networks.

Prior to joining EPFL, Amin Shokrollahi has held positions as the chief scientist of Digital Fountain, member of the technical staff at Bell Laboratories, senior researcher at the International Computer Science Insitute in Berkeley, and assistant professor at the department of computer science of the University of Bonn. He is a Fellow of the IEEE, and he was awarded the Best Paper Award of the IEEE IT Society in 2002 for his work on iterative decoding of LDPC code, the IEEE Eric Sumner Award in 2007 for the development of Fountain Codes, and the joint Communication Society/Information Theory Society best paper award of 2007 for his paper on Raptor Codes.

Bringing Codes into Protocols: Some Principles and Applications

Prof. Muriel Médard, Massachusetts Institute of Technology

Tuesday 9:30am-1pm - Technology Square Research Building

In this lecture we shall overview three aspects regarding integrating codes into transport protocols.

The first part will cover routing with coding, in particular how coding allows us in the multicast case to use the type of convex optimization approaches generally associated with point-to-point routing. We shall overview how we can perform distributed optimization and eschew the use of Steiner trees. The second part will cover issues around in-order coding delay, and the design of codes in the context of protocols with feedback. As an application, the final part of the course will consider integrating coding into TCP, in order to improve reliability and goodput.

Short biography Muriel Médard is the Cecil H. Green Professor of Electrical Engineering and Computer Science at MIT. She was previously an Assistant Professor in the Electrical and Computer Engineering Department and a member of the Coordinated Science Laboratory at the University of Illinois Urbana-Champaign. From 1995 to 1998, she was a Staff Member at MIT Lincoln Laboratory in the Optical Communications and the Advanced Networking Groups. Professor Médard received B.S. degrees in EECS and in Mathematics in 1989, a B.S. degree in Humanities in 1990, an M.S. degree in EE 1991, and a Sc D. degree in EE in 1995, all from the Massachusetts Institute of Technology (MIT), Cambridge. She has served as an Associate Editor for the Optical Communications and Networking Series of the IEEE Journal on Selected Areas in Communications, the IEEE Transactions on Information Theory, the IEEE/OSA Journal of Lightwave Technology and the OSA Journal of Optical Networking. She has served as a Guest Editor for the IEEE Journal of Lightwave Technology, the Joint special issue of the IEEE Transactions on Information Theory and the IEEE/ACM Transactions on Networking on Networking and Information Theory and the IEEE Transactions on Information Forensic and Security: Special Issue on Statistical Methods for Network Security and Forensics. She serves on the board of Governors of the IEEE Information Theory Society as well as having served as President.

Professor Médard's research interests are in the areas of network coding and reliable communications, particularly for optical and wireless networks. She was awarded the 2009 Communication Society and Information Theory Society Joint Paper Award, the 2009 William R. Bennett Prize in the Field of Communications Networking and the IEEE Leon K. Kirchmayer Prize Paper Award 2002 [2]. She was co-awarded the Best Paper Award DRCN 2003. She received a NSF Career Award in 2001 and was co-winner 2004 Harold E. Edgerton Faculty Achievement Award, [3] established in 1982 to honor junior faculty members "for distinction in research, teaching and service to the MIT community." In 2007 she was named a Gilbreth Lecturer by the National Academy of Engineering.

Information-theoretic advances in coded caching

Prof. Daniela Tuninetti, University of Illinois at Chicago

Wednesday 9:00am-12:30pm - Technology Square Research Building

Coping with current and predicted future growth in wireless data traffic requires novel technologies to be put in place. Caching is expected to be a key element in increasing network performance. This lecture will survey recent information theoretic advances in coded caching.

We will start with the fundamental limits of shared-link broadcasts network with end-user caches, as introduced by Maddah-Ali and Niesen. In this system a server with N files, of B bits each, is connected to K users through a shared error-free broadcast link and where each user has a cache of size MB bits. A caching scheme has two phases. Placement phase: each user stores MB bits in its cache without knowledge of later demands; if each user directly copies some bits of the files, the placement is said to be uncoded; if users can coordinate their placement, the placement is said to be centralized. ii) Delivery phase: after each user has requested one file and according to cache contents, the server transmits RB bits in order to satisfy the user demands. The goal is to find the minimum delivery rate R such that any set of user demands (worst case demands) can be satisfied. Important ideas that will be covered are:

- local vs. global caching gains,
- centralized vs. decentralized coded caching,
- connections with index coding for uncoded cache placement,
- extensions beyond shared error-free broadcast systems with end-user caches,
- joint design of caching and physical layer.

Short biography Dr. Tuninetti is currently a Professor within the Department of Electrical and Computer Engineering at the University of Illinois at Chicago (UIC), which she joined in 2005. She got her Ph.D. in Electrical Engineering in 2002 from ENST/Telecom ParisTech (Paris, France, with work done at the Eurecom Institute in Sophia Antipolis, France), and she was a postdoctoral research associate at the School of Communication and Computer Science at the Swiss Federal Institute of Technology in Lausanne (EPFL, Lausanne, Switzerland) from 2002 to 2004.

Dr. Tuninetti was the editor-in-chief of the IEEE Information Theory Society Newsletter from 2006 to 2008, an editor for IEEE Communication Letters from 2006 to 2009, and for IEEE Transactions on Wireless Communications from 2011 to 2014; she is currently an associate editor for IEEE Transactions on Information Theory.

Dr. Tuninetti is a recipient of a best paper award at the European Wireless Conference in 2002, of an NSF CAREER award in 2007, and named UIC University Scholar in 2015. Dr. Tuninetti's research interests are in the ultimate performance limits of wireless interference networks (with special emphasis on cognition and user cooperation), coexistence between radar and communication systems, multi-relay networks, content-type coding, and caching systems.

Foundations of Energy Harvesting and Energy Cooperating Communications

Prof. Aylin Yener, Pennsylvania State University

Thursday 9:00am-12:30pm - Technology Square Research Building

Wireless communication networks composed of devices that can harvest energy from nature will lead to the green future of wireless, as energy harvesting offers the possibility of perpetual network operation without adverse effects on the environment. By developing effective and robust communication techniques to be used under energy harvesting conditions, some of the communication devices in a heterogeneous network can even be taken off the grid. Energy harvesting brings new considerations to system level design of wireless communication networks, leading to new insights. These include randomness and intermittency of available energy, as well as additional system issues to be concerned about such as energy storage capacity and processing complexity. Additionally, one can now envision such devices engaging in energy cooperation by powering one another to improve overall network performance. The goal of this talk is to furnish the audience with fundamental design principles of energy harvesting and energy cooperating wireless communication networks which is an emerging research area. We will consider the communication theory considerations followed by information theory of energy harvesting channels.

Short biography Aylin Yener is a Professor of Electrical Engineering at The Pennsylvania State University, University Park, PA, USA, since 2010, where she joined the faculty as an Assistant Professor in 2002. Since 2017, she is a Dean's Fellow in the College of Engineering at The Pennsylvania State University. She is currently also a Visiting Professor at the Department of Electrical Engineering, Stanford University, Stanford, CA, USA. From 2008 to 2009, she was a Visiting Associate Professor with the same department. Her research interests are in networked systems, with core expertise in information theory, communication theory, and network science.

She received the NSF CAREER award in 2003, the Best Paper Award in Communication Theory in the IEEE International Conference on Communications in 2010, the Penn State Engineering Alumni Society (PSEAS) Outstanding Research Award in 2010, the IEEE Marconi Prize Paper Award in 2014, the PSEAS Premier Research Award in 2014, and the Leonard A. Doggett Award for Outstanding Writing in Electrical Engineering at Penn State in 2014.

Dr. Yener is currently a member of the Board of Governors of the IEEE Information Theory Society, where she was previously the treasurer (2012-2014). She served as the student committee chair for the IEEE Information Theory Society 2007-2011, and was the co-organizer of the first North American School of Information Theory in 2008. She served/serves as a senior editor (2016-present), editor (2001-present) and a technical chair for various symposia (2008-present) for IEEE Communications Society. She is a fellow of the IEEE.

Optical Fiber Models and their Capacity

Prof. Gerhard Kramer, Technische Universität München

Friday 9:00am-12:30pm - Technology Square Research Building

Optical fiber models are based on a nonlinear differential equation that has many fascinating properties. Unfortunately, information theory seems difficult to apply to these models. This talk reviews the differential equation and describes progress on understanding fiber capacity. First, representative capacity lower bounds are presented for various networking scenarios. Second, the talk focusses on simplified fiber models to help the participants understand the effects of spectral broadening. Finally, a capacity upper bound is developed that applies two of Shannon's basic tools: maximum entropy under a correlation constraint and the entropy power inequality (EPI).

Short biography Gerhard Kramer is Alexander von Humboldt Professor and Chair of Communications Engineering at the Technical University of Munich (TUM). He received the B.Sc. and M.Sc. degrees in electrical engineering from the University of Manitoba, Canada, in 1991 and 1992, respectively, and the Dr. Sc. Techn. degree from the ETH Zurich, Switzerland, in 1998. From 1998 to 2000, he was with Endora Tech AG in Basel, Switzerland, and from 2000 to 2008 he was with the Math Center at Bell Labs in Murray Hill, NJ. He joined the University of Southern California (USC), Los Angeles, CA, as a Professor of Electrical Engineering in 2009. He joined TUM in 2010.

Gerhard Kramer's research interests are primarily in information theory and communications theory, with applications to wireless, copper, and optical fiber networks. He is an IEEE Fellow and served as the 2013 President of the IEEE Information Theory Society. He was elected to the Bavarian Academy of Sciences and Humanities in 2015.

3 Poster session 1: Security, Statistics, and Machine Learning

Tuesday 2pm-5pm - Technology Square Research Building

Covert Communication over Degraded Broadcast Channels
Keerthi Suria Kumar Arumugam, Georgia Institute of Technology

Sequential measurement-dependent noisy search
Sung-En Chiu, University of California, San Diego

Information Processing and Social Organization in Archaeology: Decoding Gregory A. Johnson's Models of Decision Making
Laura Ellyson, Washington State University

Learning via Active Hypothesis Testing over Networks
Anusha Lalitha, University of California San Diego

Hypothesis Testing under Maximal Leakage Privacy Constraints
Jiachun Liao, Arizona State University

Multi-receiver Secrecy Models with More Capable Eavesdroppers
Mohamed Nafea, The Pennsylvania State University

Jackknife Estimation for Markov Processes with No Mixing Constraints
Kevin Oshiro, University of Hawaii at Manoa

Deep Learning for Joint Source and Channel Coding
Milind Rao, Stanford University

Dynamic Watermarking: Active Defense of Networked Cyber-Physical Systems
Bharadwaj Satchidanandan, Texas A&M University

Covert Timing Channel on Renewal Packet Channels
Ramin Soltani, University of Massachusetts at Amherst

Distributed Statistical Machine Learning in Adversarial Settings: Byzantine Gradient Descent
Lili Su, University of Illinois at Urbana Champaign

Latent Tree Approximation in Linear Model
Navid Tafaghodi Khajavi, University of Hawaii at Manoa

Secrecy by Learning an Adversary's Actions
Mehrdad Tahmasbi, Georgia Institute of Technology

Jackknife estimation for Markov processes with no mixing constraints
Changlong Wu, University of Hawaii at Manoa

Capacity the EM Covert/SideChannel Created by the Execution of Instructions
Baki Berkay Yilmaz, Georgia Institute of Technology

Compound Multiple Access Wiretap Channel
Hassan ZivariFard, University of Texas at Dallas

4 Poster session 2: Coding and Signal Processing

Wednesday 2pm-5pm - Technology Square Research Building

Coded Computation for Distributed Channel Decoding
Malihe Aliasgari, New Jersey Institute of Technology

Asynchronous Coded Caching
Hooshang Ghasemi, Iowa State University

Encoding of Spatially Coupled LDGM Codes for Lossy Source Compression
Ahmad Golmohammadi, New Mexico State University

Lower Bounds for Quantized LDPC Min-Sum Decoders Based on Absorbing Sets
Homayoon Hatami, University of Notre Dame

Towards a Proof of the GM-MDS Conjecture
Anoosheh Heidarzadeh, Texas A&M University

Optimizing Coded Caching for Heterogeneous Systems
Abdelrahman Ibrahim, The Pennsylvania state university

Comparison of Iterative Reconstruction Algorithm for Compressive Sensing Problem
Mengke Lian, Duke University

Secretive Coded Caching
Vaishakh Ravindrakumar, UC San Diego

Deterministic Compressed Sensing: Recovery of Large Supports
Narayanan Rengaswamy, Duke University

Capacity of the Energy Harvesting Channel with Block i.i.d. Energy Arrivals
Dor Shaviv, Stanford University

Low Subpacketization Schemes for Coded Caching
Li Tang, Iowa State University

Cover's Open Problem: "The Capacity of the Relay Channel"
Xiugang Wu, Stanford University

Coded Caching for Combination Networks with Cache-Aided Relays
Ahmed A. Zewail, Penn State University

Data-driven approaches for seismic event detection and location on dense surface array
Lijun Zhu, Georgia Institute of Technology

5 Poster session 3: Communication Systems

Thursday 3:15pm-5pm - Technology Square Research Building

Network Coding Constructions for Wireless Distributed Storage Systems
Anil B Murthy, Texas A&M University

An Efficient Power Allocation Scheme for Multirelay Systems with Lossy Intra-Links
Diana Cristina Gonzalez Gonzalez, University of Campinas

Coordination With Clustered Common Randomness in a Three-Terminal Line Network
Ishaque Ashar Kadampot, Georgia Institute of Technology

Random multiple access codes for Gaussian MAC: Bounds via Dudley integral
Suhas Kowshik, Massachusetts Institute of Technology

Fundamental limits of random access communication with retransmissions
Derya Malak, The University of Texas at Austin

Information-Theoretic Analysis of Refractory Effects in the P300 Speller
Vaishakhi Mayya, Duke University

Strong Coordination Over Noisy Communication Channels: Separate Versus Joint Coding
Sarah Obead, New Jersey Institute of Technology

Noisy Beam Alignment Techniques for Reciprocal MIMO Channels
Dennis Ogbe, Purdue University

Estimating The VLQ-based Rate-Stability Tradeoff of Multi-sensor Linear Control Systems
Jia Zhang, Purdue University

6 Campus map


Technology Square Research Building
MIDTOWN
Georgia Tech Hotel
4 min.
10 min.
7 min.
15 min.
4 min.
Woodruff Dining Hall
Zbar
Residence Hall
INTERSTATE 75/85
NORTH AVENUE
FOWLER STREET
CHERRY STREET
ATLANTIC DRIVE
STATE STREET
CALHOUN STREET
FIRST DRIVE
TECH PARKWAY
MEANS STREET
NORTHSIDE DRIVE
SCALE
1500 FT
500 M
300 FT
50 M

7 Dining options around Georgia Tech

Your conference registration includes breakfasts, lunches, and banquet. Should you still feel hungry, we have compiled a list of snacking and dining options around Georgia Tech. There are of course many more dining options around Midtown, this is just a small sample!

Cafe Agora ($$)
92 Peachtree Pl NE, Atlanta, GA 30309

Raku ($)
810 Marietta St NW, Atlanta, GA 30318

Cafe Kia Ora ($)
759 West Peachtree St NW, Atlanta, GA 30308

Real Tacos ($)
100 6th St NE, 110, Atlanta, GA 30308

Rocky Mountain Pizza ($)
1005 Hemphill Ave NW, Atlanta, GA 30318

Sublime Doughnuts ($)
535 10th St NW, Atlanta, GA 30318

Bezoria ($)
903 Peachtree St NE, Atlanta, GA 30309

Amelie's French Bakery ($)
840 Marietta St NW, Atlanta, GA 30318

Sweet Hut ($)
933 Peachtree St NE #935, Atlanta, GA 30309

Atwoods ($$)
817 W Peachtree St NW Atlanta, GA 30308

Atlanta Breakfast Club ($$)
249 Ivan Allen Jr Blvd NW, Atlanta, GA 30313