Northeastern University
College of Engineering

ECE
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Scholarship
Report

Global Experiential Research University

Founded in 1898, Northeastern is a global, experiential, research university offering undergraduate and graduate programs leading to degrees through the doctorate in nine colleges and schools, and select advanced degrees at graduate campuses in Charlotte, North Carolina, and Seattle, Washington.

Northeastern University
College of Engineering

» WELCOME to the Northeastern University
    Department of Electrical and Computer Engineering «

inside

Dear Friends,

This first annual scholarship report reflects the exceptional academic and professional accomplishments of the electrical and computer engineering faculty and PhD candidates for the 2013-2014 year. With $59 million in annual research expenditures, and 134 faculty members (51 in electrical and computer engineering) the college is expanding in both size and research abilities. We look forward to a new infrastructure in 2016, adding a 220,000 square foot interdisciplinary science and engineering building which will provide state-of-the art labs.

As of 2013 I became the new Electrical and Computer Engineering department Chair. With strong partnerships between students, faculty, alumni, industry and government, I look forward to taking this department to even greater levels in research and education. We are dedicated to growing our faculty which corresponds with our increasing undergraduate and graduate student body.

Our scholars strive to use today's discovery and research to make tomorrow happen. You can see some highlights of our engineering faculty members at northeastern.edu/tomorrow. We hope you enjoy this book, and we look forward to sharing our future accomplishments in our annual scholarship reports.

Sincerely,

Sheila S. Hemami
Chair of Electrical and Computer Engineering
hemami@ece.neu.edu

Key Contacts

Chair
Sheila S. Hemami, hemami@ece.neu.edu

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Business Manager
Maria LoSurdo, m.losurdo@neu.edu

Stay Connected

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ece.neu.edu

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@NortheasternCOE

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neu.peopleadmin.com

Apply to our graduate program
northeastern.edu/graduate/apply

COLLEGE QUICK FACTS

134 Faculty Members

Top 50 US Engineering School

Degree Programs

Undergraduate	Graduate
Chemical Engineering	Bioengineering
	Biotechnology
Chemical Engineering and Physics	Chemical Engineering
Civil Engineering	Civil Engineering
	Computer Engineering
Computer Engineering	Computer Systems Engineering
	Electrical and Computer Engineering
Computer Engineering and Physics	Electrical Engineering
	Energy Systems
Electrical Engineering	Engineering Management
	Gordon Engineering Leadership
Electrical and Computer Engineering	Industrial Engineering
Electrical Engineering and Physics	Information Systems
	Interdisciplinary Engineering
Industrial Engineering	Mechanical Engineering
	Operations Research
Mechanical Engineering	Sustainable Building Systems
Mechanical Engineering and Physics	Telecommunication System Management

Federally Funded Multi-Institutional Research Centers

ALERT — Awareness and Localization of Explosives-Related Threats; a Department of Homeland Security Center of Excellence

GORDON-CenSSIS — Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems; a National Science Foundation Engineering Research Center

CHN — Center for High-rate Nanomanufacturing; a National Science Foundation Nanoscale Science and Engineering Center

CURENT — Center for Ultra-wide-area Resilient Electric Energy Transmission Networks; a National Science Foundation Engineering Research Center, jointly supported by NSF and the Department of Energy and led by the University of Tennessee

CHOT — Center for Health Organization Transformation; a National Science Foundation Industry-University Collaborative Research Center led by Texas A & M

HSyE — CMS Innovation Center for Healthcare Systems Engineering; a Department of Health and Human Services Regional Systems Engineering Extension Center

PROTECT — Puerto Rico Testsite for Exploring Contamination Threats; a National Institute of Environmental Health Sciences Superfund Research Program (SRP) Center

VOTERS — Versatile Onboard Traffic Embedded Roaming Sensors; a National Institute of Standards and Technology (NIST) Technology Innovation Program project
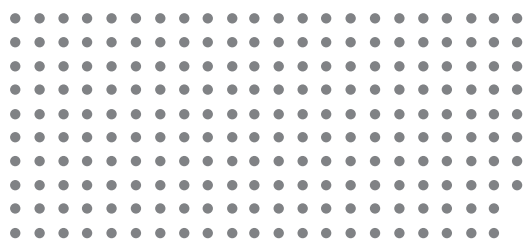
Electrical and Computer Engineering Quick Facts

51 ECE Faculty

$22M in Research Funding

218 PhD Students

6 Young Investigator Awards since 2012

Top 5 Funding Agencies		
NSF	ONR	DOE
Air Force		DHHS

320 MS Students

385 Undergrads

Faculty by Scholarship Focus

Communications and Signal Processing
Brooks, Dana; Dy, Jennifer; Erdogmus, Deniz; Hemami, Sheila; Ingle, Vinay; Lev-Ari, Hanoch; Makowski, Lee; Ratilal, Purnima; Salehi, Masoud; Sternad, Dagmar; Stojanovic, Milica; Yeh, Edmund

Computer Engineering and Networking
Basagni, Stefano; Camps, Octavia; Chowdhury, Kaushik; Fei, Yunsi; Fu, Yun Raymond; Kaeli, David; Kirda, Engin; Kokar, Mitch; Leeser, Miriam; Lombardi, Fabrizio; Meleis, Waleed; Mi, Ningfang; Robertson, Wil; Schirner, Gunar

Electromagnetics and Optics
Devaney, Anthony; DiMarzio, Charles; Harris, Vincent; Liu, Yongmin; Marengo, Edwin; Martinez, Jose; Mosallaei, Hossein; Niedre, Mark; Rappaport, Carey; Serafim, Philip; Silevitch, Michael; Vittoria, Carmine

Microsystems and Devices
Kim, Yong-Bin; McGruer, Nick; McKnight, Steve; Onabajo, Marvin; Rinaldi, Matteo; Sun, Nian

Power Electronics, Systems, Controls
Abur, Ali; Lehman, Bradley; Shafai, Bahram; Sznaier, Mario; Tadmor, Gilead

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Computing's Invisible Challenge

To us, it may not seem like a big deal: CNN's website is taking too long to load. The day's most popular YouTube video won't stop buffering. "Twitter is over capacity." While these little hiccups in usability may frustrate end users, they merely scratch the surface of the enormous technical challenge that's confronting the backend.

Northeastern University assistant professor of electrical and computer engineering Ningfang Mi recently learned she was one of 42 early-career researchers to win a Young Investigator Award from the Air Force Office of Scientific Research. They will receive the grants over a three-year period.

She plans to use award to figure out a better way to manage the vast amount of information sharing that takes place online—and push that massive technical challenge even further into the background for end users.

These days most of the data we request online is stored in the so-called "cloud"—a series of virtual computers distributed on physical servers around the world. For instance, Google has 12 data centers across four continents. The 20,000 emails sitting in my Gmail inbox aren't actually stored on my computer—they're stored in Google's cloud, which exists on all those remote servers. Every time I look at one of my emails, I am requesting access to it from one of those servers.

Now consider YouTube. Its billions of hours of video aren't all sitting on the same physical server; rather, they are stored remotely in the cloud. In this case, I am just one of millions of users requesting the same video in a given moment. And that, Mi explained, is where things get challenging.

Her research is focused on modeling performance in different scenarios and figuring out the best ways to manage resources based on the outcomes of those models. This will give her a sense of the workloads and number of traffic requests that remote servers are likely to have to handle.

"Based on this kind of information," she said, "how can I find the best configuration for the platform in order to provide the highest quality of service?"

There are two options: She can either move information around on a single server or move information between servers. The best choice will depend on the situation at hand.

"Before predictions were based more on average load or traffic, but now we know that in reality the workload changes," Mi said. "The term I use here is 'burstiness' or 'spikes.'"

Indeed, it all depends on the burstiness of human behavior. Some online phenomena are predictable, Mi said. For instance, you're likely to see a burst in email activity on the East Coast every weekday at around 9 a.m. EST. Similarly, the Internet is likely to be all-a-flurry across a range of websites on election night as people world over discuss the race on Twitter, stream acceptances speeches on NBC, and read about the results in The New York Times.

But what about when a celebrity unexpectedly passes away or makes a comment that goes viral? Or when a boy in a balloon suddenly becomes one of the biggest news stories on the Internet? No one can predict events like that, so no amount of resource management preparation could ready YouTube for the associated activity spikes.

Mi, for her part, is developing models that will help detect those bursts with more immediacy—and in some cases even predict them a couple hours in advance. So while we may not know when the next media hoax will drive traffic from millions of curious viewers, at least our computers will be able to handle it better.

The Wonder of Human Movement

To watch a ballerina move is to observe, perhaps, the pinnacle of coordination, to experience precise and exquisite elegance. But now imagine a rhythmic gymnast, who must not only move with the articulated grace of a dancer but must simultaneously manipulate a ball, hoop, or ribbon with extreme control.

"She extends her movements toward the object. She is one with the object," said Dagmar Sternad, professor of biology, electrical and computer engineering, and physics at Northeastern.

On Tuesday afternoon, Sternad received the 50th annual Robert D. Klein University Lecturer Award and delivered her university lecture, titled "The wonder of human movement: How the brain controls the body." She displayed images of gymnasts and dancers to highlight their incredible level of physical control.

On the flip side, she said, are individuals who suffer from disorders and ailments such as Parkinson's disease, cerebral palsy, or stroke. Damage to the neural system of the brain robs these patients of control over their limbs and movements. "We have no cure," Sternad said. "We have ways to ameliorate the symptoms, but no cure."

The Robert D. Klein University Lecturer Award, established in 1964 upon the recommendation of the Faculty Senate, Honors and Awards a member of the faculty who has contributed with distinction to his or her own field of study. In 1979, it was renamed in tribute to the late Klein, a revered professor of mathematics and a leader in the Faculty Senate.

Stephen W. Director, provost and senior vice president for academic affairs, presented the award to Sternard. Director characterized her as "a brilliant educator, a remarkable speaker, a leader, and an impassioned researcher."

Sternad, who directs the Action Lab at Northeastern, is an internationally known authority in the field of experimental and computational motor neuroscience. Her diverse academic career has spanned the disciplines of movement science, English linguistics and literature, experimental psychology, neuroscience, and kinesiology. Her studies of human motor control and learning have shed light on neurological defects in Parkinson patients, children with dystonia, and individuals who have suffered strokes.

In her lecture, Sternad elaborated on the complexity of the human brain, which consists of between 10 billion and 100 billion neurons, each making thousands of connections with all the others. "This is an unfathomable network with 100 trillion connections," she explained. How does this infinitely complex structure turn information into physical movements? And how can we use that process to help patients who cannot control their movements?

In a first step to answering these questions, developing appropriate interventions for patients, and understanding how ballerinas and gymnasts achieve such remarkable control over their movements, Sternad's team works backwards. Instead of starting with the neurons that cause the movement, they start with the behavior.

"We start by picking a task that is interesting," Sternad said. This may be carrying a cup of coffee or bouncing a ball. They then work to understand the physics of the task in order to render it in a virtual environment, where they can experimentally probe a human's performance. Based on what they learn, they can design interventions to help people modify their movements.

"It is unlikely that humans control their movements by learning the precise muscles that are controlling a given task," Sternad explained. Instead, we gather extrinsic information about it, such as performance feedback in a game. "We then find solutions in the task that make our variability less detrimental."

Her research has shown that though we may not understand the mathematical calculations that go into a task, we learn and respond to its physics the more we practice it. For instance, in the game table skittles, in which a player must skillfully launch a tethered ball in order to knock down a small pin, there are areas on the ball's elliptical trajectory where releasing it will be more likely to result in success. Though we may not know this, as we perform the game over and over we begin to release the ball just inside that sweet spot, she said.

Her work has shown that people with Parkinson's disease have control over their trajectory but not over the timing of their release of the ball. "We can [use] that insight to focus our interventions," she explained.

Still, even the most highly trained and skilled athletes can crack under pressure. In order to simulate the sense of competition threat that may be present during, say, the Olympics or the World Series, Sternad has partnered with Northeastern University psychology professor Stephen Harkins to develop experiments in which participants must play the game either with or without additional information about their likelihood of success. "We tell them there are gender differences," she said. Indeed, invoking threat causes that nuanced communication between brain and body to degrade. "So mind matters," Sternad said.
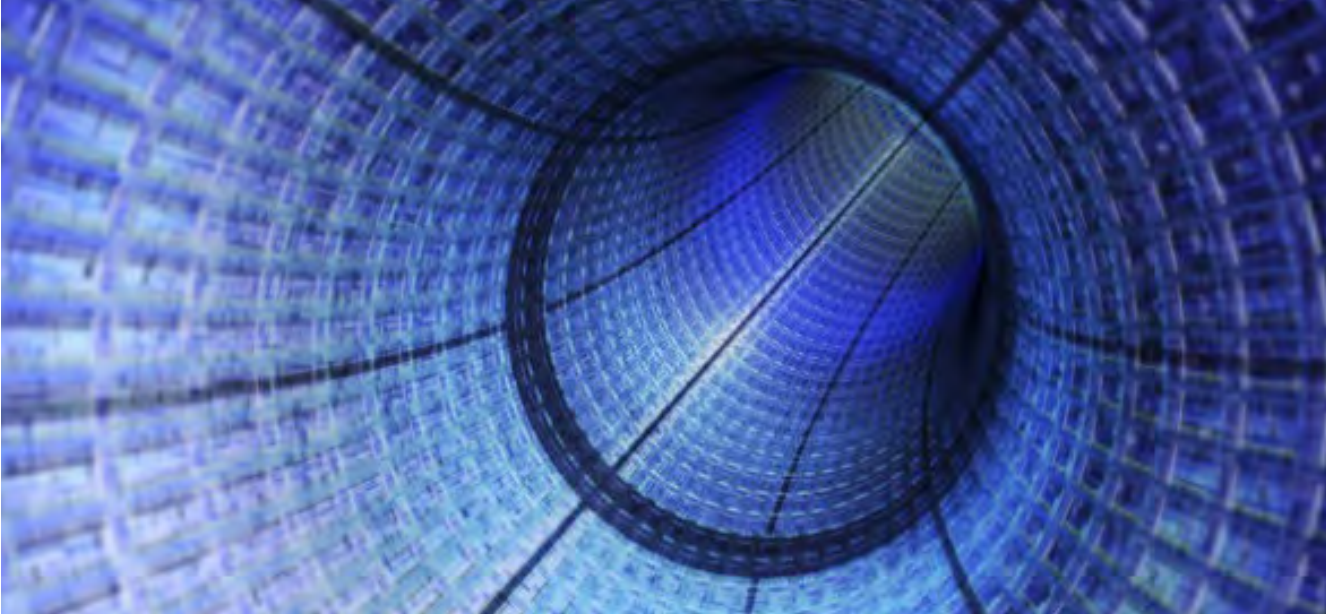
How to Fix the Internet's Plumbing Problem

Twenty-five years ago, an engineer at CERN, the European Organization for Nuclear Research in Geneva Switzerland, had an idea that would change the world. Tim Berners Lee sent a memo to his colleagues at the world's largest particle physics laboratory proposing a way for all of its computers—and eventually all the computers in the world—to talk to each other. This memo marks the birth of the World Wide Web.

Since then, the Internet has become increasingly essential to human activity—from reading the news and buying stocks to communicating and researching flu symptoms. But it still has some problems—namely, its plumbing, according to Edmund Yeh, an associate professor of electrical and computer engineering at Northeastern University.

Yeh is a principal investigator on a multi-university $7.9 million research project to unclog the Internet's plumbing and fix this problem. The Internet's basic architecture is highly inefficient, he said, because new connections to each piece of content must be created whenever a user wants access to the material.

"If you've got a lot of demand for a particular data type, it's like water building up," Yeh explained. That water, he said, can be managed in two ways—one is by getting it to its destination drain (i.e., the data server), the other is to drill a new drain somewhere along its journey (i.e., a caching point that temporarily stores the data).

Yeh's research team is building what it calls the Named Data Network—one of four projects funded by the federal government's Future Internet Program. NDN maintains a network of caching points, or "drains," that are strategically located around the core of the Internet as well as its periphery.

Content distribution networks such as Akamai are taking a similar approach, Yeh said, but their operations work only at the edge of the Internet and provide service only to large content providers such as CNN. "This," Yeh said, "is due to the inability of the current Internet architecture to handle caching."

With NDN, user requests would be directed to caching points located closer to them in the Internet, regardless of the type of content they're trying to access.

Still, a challenge remains: where to place the drains and how to best direct the "water" toward them. In collaboration with researchers at the California Institute of Technology, Yeh's lab at Northeastern recently released a paper on arXiv in which the team presents an algorithm called the VIP Algorithm. It simultaneously performs those two processes—both the drilling of drains and the directing of water. The processes work in a coordinated manner, Yeh said, with each relying on the other and both dynamically adapting to the prevailing demand for content.

Incidentally, the global network of high-energy physics researchers attempting to access particle physics data from the Large Hadron Collider at CERN—where the World Wide Web was born all those years ago—also has a similar plumbing problem. But physics researchers based at the California Institute of Technology believe Yeh's algorithms could help them unclog their network pipes. So the two groups have teamed up to test it out.

Indeed, Yeh's approach is a promising candidate for any scientific network in which a global community of users is requesting access to a vast body of data.

"We could make an impact first in these scientific big-data applications," he said. "That's a good testing ground for the broader Internet."

ALI ABUR

Professor, Electrical and Computer Engineering
PhD, Ohio State University, 1985. Joined Northeastern in 2005
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Scholarship Focus

- Power system state estimation
- Visualization of power system operation
- Fault identification in transmission and distribution networks

Honors and Awards and Awards

Fellow, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Papers in refereed journals

M. Korkali, A. Abur

Robust Fault-Location Using Least-Absolute-Value Estimator, Institute of Electrical and Electronics Engineers (IEEE) Transactions on Power Systems, Nov. 2013, vol. 28, no. 4, p 4384-4392

L. Zhang, A. Abur

Identifying Parameter Errors via Multiple Measurement Scans, IEEE Transactions on Power Systems, Nov. 2013, vol. 28, no. 4, p 3916-3923

M. Göl, A. Abur

Observability and Criticality Analyses for Power Systems Measured by Phasor Measurements, IEEE Transactions on Power Systems, Aug. 2013, vol. 28, no. 3, p 3319-3326

R. Emami, A. Abur

External System Line Outage Identification Using Phasor Measurement Units, IEEE Transactions on Power Systems, May 2013, vol. 28, p 1035-1040

M. Korkali, A. Abur

Optimal Deployment of Wide-Area Synchronized Measurements for Fault-Location Observability, IEEE Transactions on Power Systems, Feb. 2013, vol. 28, no. 1, p 482-489

L. Zhang, A. Abur

Strategic Placement of Phasor Measurements for Parameter Error Identification, IEEE Transactions on Power Systems, Feb. 2013, vol. 28, no. 1, p 393-400

Papers in refereed conferences

M. Göl, A. Abur

PMU Placement for Robust State Estimation, Proceedings of the North American Power Symposium, Sep. 22-24, 2013, Manhattan, KS

A. Rouhani, A. Abur

Distributed Implementation of an Augmented Dynamic State Estimator, Proceedings of the North American Power Symposium, Sep. 22-24, 2013, Manhattan, KS

M. Göl, A. Abur

Rapid Tracking of Bus Voltages Using Synchro-Phasor Assisted State Estimation, Proceedings of the ISGT 2013-Europe, Copenhagen, Denmark, Oct. 7-9, 2013

FACULTY

ALI ABUR continued

M. Göl, A. Abur

Identifying Vulnerabilities of State Estimators Against Cyber-Attacks, Proceedings of the PowerTech, Grenoble, France, p 16-20 June, 2013

A. Rouhani, A. Abur

Improving Performance of Dynamic State Estimators Under Unknown Load Changes, Proceedings of the IEEE PES General Meeting, Vancouver, Canada, July 21-25, 2013

Research Projects

New Methods of Fault Simulation and Location for Smart Grids Based on Synchronized Measurements

Principal Investigator, National Science Foundation

Exploiting Emerging Data for Enhanced Load Modeling

Co-Principal Investigator, National Science Foundation

Transmission Topology Control for Infrastructure Resilience to the Integration of Renewable Generation

Co-Principal Investigator, Advanced Research Projects Agency

Engineering Research Center for Ultra-wide Area Resilient Electric Energy Transmission Network

Co-Principal Investigator, National Science Foundation

Entergy's Response to Smart Grid Investment Grant Program

Principal Investigator, DOE/Entergy Corporation

Scalable and Flat Controls for Reliable Power Grid Operation with High Renewable Penetration

Co-Principal Investigator, Global Climate and Energy Project/Stanford University

Completed Dissertations Supervised

Mert Korkali

Robust and Systemwide Fault Location in Power Networks via Optimal Deployment of Synchronized Measurements

STEFANO BASAGNI

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Texas, Dallas, 2001. Joined Northeastern in 2002

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Scholarship Focus

- Mobile networks and wireless communications systems
- Wireless sensor networking (underwater and terrestrial)
- Design and implementation of network protocols

Selected Recent Publications

Books and book chapters

S. Basagni, M. Conti, S. Giordano, I. Stojmenovic
> Mobile Ad Hoc Networking: Cutting Edge Directions, IEEE Series on Digital & Mobile Communication, IEEE Press and John Wiley & Sons, Inc., Piscataway, NJ and Hoboken, second edition, March 5 2013

S. Basagni, M. Y. Naderi, C. Petrioli, D. Spenza
> Mobile Ad Hoc Networking: Cutting Edge Directions, ch. 20, pages 703–736, John Wiley & Sons, Inc., Hoboken, NJ, March 5 2013

Papers in refereed conferences

S. Basagni, L. Boloni, L. C. Petrioli, C. A. Phillips, D. Turgut
> Maximizing the Value of Sensed Information in Underwater Wireless Sensor Networks via an Autonomous Underwater Vehicle, in Proceedings of IEEE Infocom 2014, Toronto, Canada, April 27- May 2, 2014

L. Boloni, D. Turgut, S. Basagni, C. Petrioli
> Scheduling Data Transmissions of Underwater Sensor Nodes for Maximizing Value of Information, in Proceedings of IEEE Globecom 2013, Ad Hoc and Sensor Networking Symposium, Atlanta, GA, December 9–13 2013

L. Chen, S. Cool, H. Ba, W. Heinzelman, I. Demirkol, U. Muncuk, K. R. Chowdhury, S. Basagni
> Range Extension of Passive Wake-up Radio Systems Through Energy Harvesting, in Proceedings of IEEE ICC 2013, Ad Hoc and Sensor Networking Symposium, pages 142–147, Budapest, Hungary, June 9–13 2013, Best Paper Award

K. Kaushik, D. Mishra, S. De, S. Basagni, W. Heinzelman, K.R. Chowdhury, S. Jana
> Experimental Demonstration of Multi-Hop RF Energy Transfer, in Proceedings of IEEE PIMRC 2013, London, U.K., September 8–11 2013

Research Projects

Development of a Second-Generation Applications-Driven Wireless Sensor Networking Instrument
> Co-Principal Investigator, National Science Foundation

GENIUS: Green Sensor Networks for Air Quality Support
> Co-Principal Investigator, National Science Foundation

FACULTY

DANA BROOKS

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Northeastern University, 1991. Joined Northeastern in 1991

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Scholarship Focus

- Biomedical signal processing
- Medical imaging
- Inverse problems
- Dynamics and manifolds in biomedical imaging
- Electrocardiography
- Diffuse and fluorescence optical tomography
- Magnetic resonance imaging
- Fresh tissue microscopy image analysis
- Machine learning for biomedical imaging and image analysis
- Open source software for biomedical imaging
- Modeling and optimization of transcranial neuromodulation

Honors and Awards

Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

A.F. Frangi, D.R. Hose, P.J. Hunter, N. Ayache, D. Brooks
Guest Editorial Special Issue on Medical Imaging and Image Computing in Computational Physiology, IEEE Transactions on Medical Imaging, vol. 32, issue 1, Jan 2013, p 1-7

V. Pera, E. Zettergren, D.H. Brooks, M. Niedre
Maximum Likelihood Tomographic Reconstruction of Extremely Sparse Solutions in Diffuse Fluorescence Flow Cytometry, Optics Letters, vol. 38, issue 13, 2357-2359, July 2013

M. Milanic, V. Jazbinšek, R.S. MacLeod, D.H. Brooks, Rok Hren
Assessment of Regularization Techniques for Electrocardiographic Imaging, Journal of Electrocardiology, 1 January 2014, vol. 47, issue 1 p 20-28

V. Pera, D.H. Brooks, M. Niedre
On the Use of the Cramer-Rao Lower Bound for Diffuse Optical Imaging System Design, Journal of Biomedical Optics. Opt. 19 (2), 025002, February 06, 2014

B. Erem, J. Coll-Font, R. Martinez-Orellana, P. Stovicek, D.H. Brooks
Using Transmural Regularization and Dynamic Modeling for non-Invasive Cardiac Potential Imaging of Endocardial Pacing with Imprecise Thoracic Geometry, IEEE Transactions on Medical Imaging, 3:3, 2014, p 726-738

B. Erem, P. van Dam, D.H. Brooks
Identifying Model Inaccuracies and Solution Uncertainties in Non-Invasive Activation-Based Imaging of Cardiac Excitation Using Convex Relaxation, IEEE Transactions on Medical Imaging, 33:4, April 2014, p 902-912

J. Sourati, D. Erdogmus, J.G. Dy, D.H. Brooks

> Accelerated Learning-Based Interactive Image Segmentation using Pairwise Constraints, IEEE Transactions on Image Processing, 23:7, July 2014, p 3057-3070

L. Sallaway, S. Magee, J. Shi, F. Quivira, K. Tgavalekos, D.H. Brooks, S. Muftu, W. Meleis, R.H. Moore, D. Kopans, K-T. Wan

> Detecting Solid Masses in Phantom Breast Using Mechanical Indentation, Experimental Mechanics, 4:6 Jul. 2014

Research Projects

Center for Integrative Biomedical Computing

> Investigator, National Institutes of Health

High Resolution Multiplexed Fluorescence Tomography

> Co-Investigator, National Institutes of Health

Precise Characterization of Conformational Ensembles

> Co-Principal Investigator, National Science Foundation

Finding Underlying Manifolds of Large-Scale Complex Biological Signals

> Co-Principal Investigator, Northeastern University

Brain-Computer Interface for Signaling Changes in Psychological States

> Co-Principal Investigator, Northeastern University

Precise Characterization of Conformational Ensembles

> Co-Investigator, National Science Foundation

Completed Dissertations Supervised

Fatemeh Noushin Golabchi

> Graphical Model Based Segmentation of Massive Numbers of Irregular Small Objects in Images, with Application to Axon Characterization in Histological Sections

Burak Erem

> Differential Geometric Models and Optimization Methods for Dynamic Analysis of Electrocardiographic Signals and the Inverse Problem of Electrocardiography

FACULTY

OCTAVIA CAMPS

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Washington, 1992. Joined Northeastern in 2006

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Scholarship Focus

- Communications and signal processing
- Robust computer vision
- Image processing
- Machine learning

Selected Recent Publications

Books and book chapters

A. Vasile, O. Camps

Hierarchical Image Geo-Location on a World-Wide Scale, Advances in Visual
Computing, 2013, in Lecture Notes in Computer Science (8034), Springer-Verlag, 2013, p 266-277

Papers in refereed journals

S. Markovic, B. Li, V. Pera, M. Sznaier, O. Camps, M. Niedre

A Computer Vision Approach to Rare Cell in Vivo Fluorescence Flow Cytometry, Part A, 83, 12, p 1113-1123, Dec. 2013

Papers in refereed conferences

C. Dicle, O. Camps, M. Sznaier

The Way They Move: Tracking Multiple Targets with Similar Appearance, IEEE Int. Conf. on
Computer Vision (ICCV), Sydney, Australia, Dec. 2013

M. Ayazoglu, B. Yilmaz, M. Sznaier, O. Camps

Finding Causal Interactions in Video Sequences, IEEE Int. Conf. on Computer Vision (ICCV),
Sydney, Australia, Dec. 2013

F. Xiong, Y. Cheng, O. Camps, M. Sznaier, C. Lagoa

Hankel Based Maximum Margin Classifiers: A Connection Between Machine Learning and Wiener
Systems Identification, Proceedings 52 IEEE Conf. Dec. Control (CDC), Dec. 2013, p 6005-6010

Research Projects

Real Time Video Surveillance: Dynamic Research Model Based Anomaly Partnership Detection and
Resource Allocation

Principal Investigator, Northeastern University

ALERT DHS HS-STEM Career Development Program at Northeastern University

Co-Principal Investigator, Department of Homeland Security

Compressive Information Extraction: A Dynamical Systems Approach

Co-Principal Investigator, Air Force Office of Scientific Research

Robust Identification of a Class of Structured Systems with High Dimensional Outputs and Applications

Co-Principal Investigator, National Science Foundation

Dynamic Invariants for Video Scenes Understanding
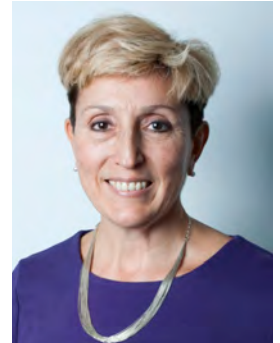
Principal Investigator, National Science Foundation

R3B-Millimeter-Wave Standoff Detection of Concealed Explosives

Investigator, Department of Homeland Security

Completed Dissertations Supervised

Binglong Li

Dynamics-Based Invariants for Video Analytics

KAUSHIK CHOWDHURY

Assistant Professor, Electrical and Computer Engineering

PhD, Georgia Institute of Technology, 2009. Joined Northeastern in 2009

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Scholarship Focus

- Wireless cognitive radio networks
- Ad hoc and sensor networks
- Experimentation and protocol design for communication systems
- Applications of wireless technology in multimedia delivery and health care

Honors and Awards and Awards

- Vice President IEEE Technical Committee on Simulation
- Fellow, National Science Foundation of China

Selected Recent Publications

Papers in refereed journals

K.R. Chowdhury, M.D. Felice, L. Bononi

XCHARM: A Routing Protocol for Multi-Channel Wireless Mesh Networks in Fading and Interference-Rich Environments, Elsevier Computer Communications journal, vol. 36, no. 14, p 1485-1497, Aug 2013

A. Al-Ali, K.R. Chowdhury

TFRC-CR: An Equation-Based Transport Protocol for Cognitive Radio Networks, Elsevier Ad Hoc Networks Journal, vol. 11, no. 6, p 1836–1847, August 2013

K.R. Chowdhury, M. D. Felice, I. F. Akyildiz

TCP CRAHN: A Transport Control Protocol for Cognitive Radio Ad Hoc Networks, IEEE Trans. on Mobile Computing, vol. 12, no. 4, April 2013

P. Nintanavongsa, R. Doost-Mohammady, M.D. Felice, K.R. Chowdhury

Device Characterization and Cross-layer Protocol Design for RF Energy Harvesting Sensors, Elsevier Pervasive and Mobile Computing Journal, vol. 9, no. 1, p 120-131, February 2013

G. Schirner, D. Erdogmus, K.R. Chowdhury, T. Padir

The Future of Human-in-the-Loop Cyber-Physical Systems, IEEE Computer, vol. 26, no. 1, 2013

Papers in refereed conferences

K. Kaushik, D. Mishra, S. De, S. Basagni, W. Heinzelman, K.R. Chowdhury, S. Jana

Experimental Demonstration of Multi-Hop RF Energy Transfer, IEEE PIMRC, London, UK, Sept. 2013

P. Nintanavongsa, M. Y. Naderi, K. R. Chowdhury

Medium Access Control Protocol Design for Sensors Powered by Wireless Energy Transfer, IEEE INFOCOM, Turin, Italy, April 2013

A. Al-Ali, K. R. Chowdhury, M. DiFelice, J. Paavola

Querying Spectrum Databases and Improved Sensing for Vehicular Cognitive Radio Networks, IEEE ICC, Sydney, Australia, June 2014

Research Projects

GENIUS: Green Sensor Networks for Air Quality Support

Principal Investigator, National Science Foundation

CPS: Medium: Collaborative Research: Holistic Design Methodology for Automated Implementation of Human-in-the-Loop Cyber-Physical Systems

Co-Principal Investigator, National Science Foundation

Link Layer Design and Implementation for Software Defined Radios

Principal Investigator, Mathworks

CDRIVE: Cognitive Radio Enabled Spectrum Aware Intelligent Vehicular Networks

Principal Investigator, National Science Foundation

A Flexible and Extensible Solution to Incorporating new RF Devices and Capabilities into EWI ISR Networks

Principal Investigator, Defense Advanced Research Projects Agency

ANTHONY DEVANEY

Distinguished Professor, Electrical and Computer Engineering

PhD, University of Rochester, 1971. Joined Northeastern in 1989

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Scholarship Focus

- Communications and signal processing
- Electromagnetic wave propagation
- Inverse scattering
- Tomography

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CHARLES DIMARZIO

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering, Mechanical and Industrial Engineering, PhD, Northeastern University, 1996. Joined Northeastern in 1987

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Scholarship Focus

- Coherent optical detection
- Imaging in turbid media
- Multi-modal microscopy
- Medical imaging with light and sound

Selected Recent Publications

Papers in refereed journals

Z.R. Hoffman, C. DiMarzio

Structured Illumination Microscopy Using Random Intensity Incoherent Reflectance, Journal of Biomedical Optics, 2013

Z. Lai, Josef Kerimo, Y. Mega, C.A. DiMarzio

Stepwise Multi-Photon Activation Fluorescence Reveals a New Method of Melanin Detection, Journal of Biomedical Optics, 2013

J.L. Hollmann, R.Horstmeyer, C. Yang, C.A. DiMarzio

Analysis and Modeling of an Ultrasound-Modulated Guide Star to Increase the Depth of Focusing in a Turbid Medium, Journal of Biomedical Optics, 18 (2):025004–025004, 2013

L. Zhenhua, J. Kerimo, Y. Mega, C.A DiMarzio

Stepwise Multiphoton Activation Fluorescence Reveals a New Method of Melanin Detection, Journal of Biomedical Optics,18 (6), 061225–061225, 2013

J.L .Hollmann, R. Horstmeyer, C. Yang, C.A DiMarzio

Diffusion Model for Ultrasound-Modulated Light, Journal of Biomedical Optics, 19 (3):035005–035005, 2014

Completed Dissertations Supervised

Yair Mega

Using Second Harmonic Generation Microscopy to Study the Three-Dimensional Structure of Collagen and its Degradation Mechanism

FACULTY

JENNIFER DY

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Purdue University, 2001. Joined Northeastern in 2002

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Scholarship Focus

- Machine learning
- Data mining
- Statistical pattern recognition
- Computer vision

Selected Recent Publications

Papers in refereed journals

D. Niu, J. Dy, M.I. Jordan
Iterative Discovery of Multiple Alternate Clustering Views, IEEE Transactions on Pattern Analysis and Machine Intelligence, 2013

Y. Yan, R. Rosales, G. Fung, R. Subramanian, J. Dy
Learning From Multiple Annotators with Varying Expertise, Machine Learning, 1-37, 2013

P. Castaldi, J. Dy, J. Ross, Y. Chang, G. Washko, (COPDGene Study team), E. Silverman, M. Cho
Cluster Analysis in the COPDGene Study Identifies Subtypes of Smokers with Distinct Patterns of Air way Disease and Emphysema, Thorax, 2014

F. Azmandian, A. Yilmazer, J. Dy, J.A. Aslam, D.R. Kaeli
Harnessing the Power of GPUs to Speed up Feature Selection for Outlier Detection, Journal of Computer Science and Technology, vol. 29 (3): 408-422, 2014

Papers in refereed conferences

J. Ross, J. Dy
Nonparametric Mixture of Gaussian Processes with Constraints, Proceedings of the International Conference on Machine Learning, JMLR W&CP 28 (3): 1346-1354, 2013

J. Sourati, K. Kose, M. Rajadhyaksha, J. Dy, D. Erdogmus, Dana H. Brooks
Automated Localization of Wrinkles and the Dermo-Epidermal Junction in Obliquely-Oriented Reflectance Confocal Microscopic Images of Human Skin, SPIE BiOS, 2013

M. Moghadamfalahi, A. Satpute, M. Akcakaya, D. Brooks, J. Dy, D.Erdogmus, L. Barrett
Are Affective Responses in fMRI Independent of Previous Affect-Inducing Stimuli?, Organization for Human Brain Mapng (OHBM), 2013

K. Kose, C. Alessi-Fox, J. Dy, D. Brooks, M. Rajadhyaksha
Computer-Based Algorithms for Classification of Skin Cancer Morphology in Reflectance Confocal Microscopy Images, 62nd Annual Montagna Symposium on the Biology of Skin, Light and Skin: How Light Sustains, Damages, Treats, Images and Modifies Skin Biology,Stevenson, WA, Oct., 2013

J. Ross, P. Castaldi, M. Cho, J. Dy
Dual Beta Process Priors for Latent Cluster Discovery in Chronic Obstructive Pulmonary Disease, ACM SIGKDD Knowledge Discovery and Data Mining, 2014

Research Projects

III:Small: Exploring Data in Multiple Clustering Views
Principal Investigator, National Science Foundation

Genetic Epidemiology of COPD
Principal Investigator, National Institutes of Health

Automated Classification of Retinopathy of Prematurity Using Machine Learning
Investigator, National Institutes of Health

DENIZ ERDOGMUS

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Florida, 2002. Joined Northeastern in 2008

617.373.3021 | erdogmus@ece.neu.edu | ece.neu.edu/~erdogmus

Scholarship Focus

- Statistical signal processing and machine learning
- Brain computer interfaces
- Information theory
- Differential geometry

Honors and Awards and Awards

- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

M. Akcakaya, B. Peters, M. Moghadamfalahi, A. Mooney, U. Orhan, B. Oken, D. Erdogmus, M. Fried-Oken
Noninvasive Brain Computer Interfaces for Augmentative and Alternative Communication, IEEE Reviews in Biomedical Engineering, Dec 2013

B. Oken, U. Orhan, B. Roark, D. Erdogmus, A. Fowler, A. Mooney, B. Peters, M. Miller, M. Fried-Oken
Brain-Computer Interface with Language Model-EEG Fusion for Locked-in Syndrome, Neuro-Rehabilitation and Neural Repair, Dec 2013

U. Orhan, D. Erdogmus, B. Roark, B. Oken, M. Fried-Oken
Offline Analysis of Context Contribution to ERP-based Typing BCI Performance, Journal of Neural Engineering, vol. 10, no. 6, Oct 2013

K.M. Keck, J. Kalpathy-Cramer, E. Ataer-Cansizoglu, S. You, D. Erdogmus, M.F. Chiang
Plus Disease Diagnosis in Retinopathy of Prematurity: Vascular Tortuosity as a Function of Distance from Optic Disc, Retina, vol. 33, no. 8, p 1700-1707, 2013

M. Higger, M. Akcakaya, D. Erdogmus
A Robust Fusion Algorithm for Sensor Failure, IEEE Signal Processing Letters, vol. 20, no. 8, 2013

A. Cansizoglu, E. Bas, J. Kalpathy-Cramer, G.C. Sharp, D. Erdogmus
Contour-Based Shape Representation Using Principal Curves, Pattern Recognition, vol. 46, no. 4, p 1140-1150, April 2013

O. Kyrgyzov, D. Erdogmus
Nonnegative Nonredundant Tensor Decomposition, Frontiers of Mathematics in China, vol. 8, no. 1, p 41-61, Feb 2013

M. Simundic, B. Drasler, V. Sustar, J. Zupanc, R. Stukelj, D. Makovec, D. Erdogmus, H. Hagerstrand, D. Drobne, V. Kralj-Iglic
Effect of Engineered TiO2 and ZnO Nano and Microparticles on Washed Erythrocytes, Platelet Rich Plasma and Giant Unilamelar Phospholipid Vesicles, BMC Veterinary Research, vol. 9, no. 7, 2013

G. Schirner, D. Erdogmus, K. Chowdhury, T. Padir
The Future of Human-in-the-Loop Cyber-Physical Systems, IEEE Computer, vol. 46, no. 1 Jan 2013

Papers in refereed conferences

M. Haghighi, M. Akcakaya, U. Orhan, D. Erdogmus, B. Oken, M. Fried-Oken
Initial Assessment of Artifact Filtering for RSVP Keyboard TM, SPMB 2013, p 1-5, Brooklyn, NY, 2013

A. Ahani, H. Wahbeh, H. Nezamfar, M. Miller, D. Erdogmus, B. Oken
Change in Physiological Signals During Mindfulness Meditation, Neural Engineering, Nov. 6-8 201

A. Fowler, B. Roark, U. Orhan, D. Erdogmus, M. Fried-Oken
Improved Inference and Autotyping in EEG-based BCI Typing Systems, ASSETS 2013, Bellevue,

WA, Oct 2013

N. Ghadar, X. Zhang, K. Li, D. Erdogmus, G. Thibault, A. Bayesteh, I. Shafran, K. Coleman, K.A. Grant
Visual Hull Reconstruction for Automated Primate Behavior Observation, Proc MLSP 2013, p 1-6, Sep 2013

M. Higger, M. Akcakaya, U. Orhan, D. Erdogmus
Failure Robust Sensor Fusion for RSVP Keyboard, Proc. HCI, Foundations of Augmented Cognition, LNCS, vol. 8027, p 443-449, Jul 2013

M. Fried-Oken, U. Orhan, B. Roark, D. Erdogmus, A. Fowler, M. Miller, A. Mooney, B. Oken, B. Peters
The RSVP KeyboardTM: A Brain-Computer Interface for Communication by People with Locked-In Syndrome, Proc. RESNA, Jun 2013

S. You, M. Massey, N. Shapiro, D. Erdogmus
A Novel Line Detection Method in Space-time Images for Microvascular Flow Analysis in Sublingual Microcirculatory Videos, Proc. ISBI 2013, p 828-831, San Francisco, CA, Apr 2013

J. Sourati, M. Rajadhyaksha, J.G. Dy, D. Erdogmus, D.H. Brooks
Automated Localization of Wrinkles and the Dermo-Epidermal Junction in Obliquely-Oriented Reflectance Confocal Microscopic Images of Human Skin, SPIE Optical Imaging 2013, Jan 2013

Research Projects

Flexible, Adaptive, and Synergistic Training
Co-Investigator, Intelligence Advanced Research Projects Agency

Automated Classification of Retinopathy of Prematurity using Machine Learning
Investigator, National Institutes of Health

Automated Segmentation of Vessel Network Structures in Large Image Stack Sets
Principal Investigator, Massachusetts Green High-Performance Computing Center

Adaptive Brain Computer Interfaces Sub Award to CSL at NU
Principal Investigator, National Science Foundation

Precise Characterization of Conformational Ensembles
Co-Principal Investigator, National Science Foundation

CAREER: Signal Models, Channel Capacity, and Information Rate for Noninvasive Brain Interfaces
Principal Investigator, National Science Foundation

SHB-Small: Robustly Detecting Clinical Laboratory Errors
Co-Principal Investigator, National Science Foundation

Signal Processing Support for Oken-National Institutes of Health-K24 Mid-Career Development Grant
Principal Investigator, National Institutes of Health

Collaborative Research: Holistic Design Methodology for Automated Implementation of Human-in-the-Loop Cyber-Physical Systems
Co-Principal Investigator, National Science Foundation

CDI-Type I: Computational Models for the Automatic Recognition of Non-Human Primate Social Behaviors
Principal Investigator, National Science Foundation

Translational Refinement of an Adaptive Communication System for Locked-in Patients
Co-Investigator, National Institutes of Health

Completed Dissertations Supervised

Umut Orhan
RSVP Keyboard: An EGG Based BCI Typing System with Context Information Fusion

Associate Professor, Electrical and Computer Engineering
PhD, Princeton University, 2004. Joined Northeastern in 2011
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Scholarship Focus
- Computer architecture
- Embedded systems
- Hardware-oriented security
- Design automation
- Mobile computing
- Underwater sensor networks

Honors and Awards
National Science Foundation CAREER Award

Selected Recent Publications
Papers in refereed journals

J. Martinez-Santos, Y. Fei
> Leveraging Speculative Architectures for Run-Time Program Validation, ACM Trans. on Embedded Computing Systems, vol. 13, no. 1, Aug. 2013

Papers in refereed conferences

T. Hu, Y. Fei
> An Adaptive Routing Protocol Based on Connectivity Prediction for Underwater Disruption Tolerant Networks, in IEEE Global Communications Conference (GlobeCom), 2013

T. Hu, Y. Fei
> DSH-MAC: Medium Access Control Based on Decoupled and Suppressed Handshaking for Long-Delay Underwater Acoustic Sensor Networks, in IEEE Conf. Local Computer Networks (LCN), 2013

J. Martinez Santos, Y. Fei
> Micro-Architectural Support for Metadata Coherence in Multi-core Dynamic Information Flow Tracking, in Workshop on Hardware and Architectural Support for Security & Privacy (HASP), in conjunction with Int. Symp. Computer Architecture, 2013

B. Jiang, Y. Fei
> Decentralized Scheduling of PEV on-Street Parking and Charging for Smart Grid Reactive Power Compensation, IEEE PES Innovative Smart Grid Technologies Conference, 2013

Research Projects
MRI: Development of a Testbed for Side-Channel Analysis and Security Evaluation-TeSCASE
> Principal Investigator, National Science Foundation

TWC: Medium: Collaborative: A Unified Statistics-Based Framework for Side-Channel Attack Analysis and Security Evaluation of Cryptosystems
> Principal Investigator, National Science Foundation

CAREER: Architectural Enhancement and Design Methodologies for Secure Processing in Embedded Systems
> Principal Investigator, National Science Foundation

ARTS: Adaptive, RobusT, and Sustainable Networking for Undersea Distributed Sensor Systems
> Principal Investigator, Office of Naval Research

Completed Dissertations Supervised
Juan Carlos Martinez Santos
> Architectural Support for Software Security

YUN RAYMOND FU

Assistant Professor, Electrical and Computer Engineering; jointly appointed, Computer and Information Science, PhD, University of Illinois, 2008. Joined Northeastern in 2012

617.373.7328 | yunfu@ece.neu.edu | ece.neu.edu/~yunfu

Scholarship Focus

- Machine learning and computational intelligence
- Big data and social media analytics
- Computer vision and pattern recognition
- Cyber-physical systems

Honors and Awards

- Army Research Office Young Investigator Award
- Office of Naval Research Young Investigator Award
- International Neural Network Society's Young Investigator Award

Selected Recent Publications

Books and book chapters

Y. Fu

Human-Centered Social Media Analytics, Springer, VIII, 208 p 97, 2013

Y. Fu, Y. Ma

Graph Embedding for Pattern Classification, Springer, VIII, 260 p 91, 2013

Papers in refereed journals

X. Zhao, X. Li, Z. Wu, Y. Fu, Y. Liu

Multiple Subcategories Parts-Based Representation for One Sample Face Identification, IEEE Transactions on Information Forensics and Security (T-IFS), Volume: 8, Issue: 10, p 1654-1664, 2013

Y. Kong, Y. Jia, Y. Fu

Interactive Phrases: Semantic Descriptions for Human Interaction Recognition, IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI), 2014

K. Li, Y. Fu

Prediction of Human Activity by Discovering Temporal Sequence Patterns, IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI), 2014

M. Shao, D. Kit, Y. Fu

Generalized Transfer Subspace Learning Through Low-Rank Constraint, International Journal of Computer Vision (IJCV), vol. 109, issue 1-2, p 74-93, August, 2013

Y. Yao, Y. Fu

Contour Model Based Hand-Gesture Recognition Using Kinect Sensor, IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT), 2013

L. Li, S. Li, Y. Fu

Learning Low-Rank and Discriminative Dictionary for Image Classification, Image and Vision Computing (IVC), 2014
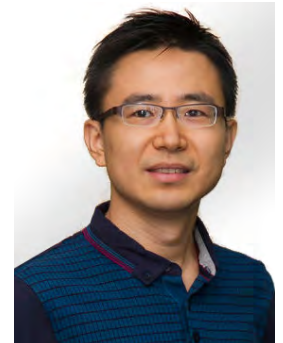
W.W. Xu, L. Li, M.A. Stefanone, Y. Fu

Does Social Media Users' Commenting Behavior Differ by Their Local Community Tie? A Computer Assisted Linguistic Analysis Approach, First Monday, vol. 19, no. 1-6, January 2014

Y. Su, S. Li, S. Wang, Y. Fu

Submanifold Decomposition, IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT), 2014

Research Projects

Manifold Learning for 3D Shape Description and Classification

Principal Investigator, Army Research Office

Self-Learning Engine for Anomaly Detection in Crowd Behavior

Principal Investigator, Northeastern University

Unconstrained Face Recognition through Low-Rank Learning

Principal Investigator, Samsung

Finding Underlying Manifolds of Large-Scale Complex Biosignal Dynamics

Principal Investigator, Northeastern University

Medium: Quantitative Visual Sensing of Dynamic Behaviors for Home-based Progressive Rehabilitation

Principal Investigator, National Science Foundation

Stabilized Manifold Learning Based on Low-Rank Matrix Recovery for Visual Representation

Principal Investigator, Office of Naval Research

Socio-Cultural Media Sharing as Conversations: Sensing and Modeling Behavior in Response to Environmental Changes

Principal Investigator, Air Force Office of Scientific Research

Geolocation on Motion Imagery with Alternative Socio-Behavioral Context

Principal Investigator, Central Intelligence Agency

Social Computing: Occupation Recognition by Heterogeneous Context Fusion

Principal Investigator, Google

Deep Structures Boosted Self-Organized Behavior Pattern Learning for Anomaly Detection

Principal Investigator, Office of Naval Research

Intention Sensing Through Video-Based Imminent Activity Prediction

Principal Investigator, Army Research Office

Three-Dimensional Data Acquisition Platform for Human Activity Understanding

Principal Investigator, Department of Defense

FACULTY

VINCENT HARRIS

University Distinguished Professor, William Lincoln Smith Professor, Electrical and Computer Engineering; affiliated faculty, Chemical Engineering, PhD, Northeastern University, 1990. Joined Northeastern in 2003

617.373.7603 | harris@ece.neu.edu | www.cm3ic.neu.edu/people/harris/Harris

Scholarship Focus

- Design and processing of advance magnetic materials with emphasis on materials for high frequency applications
- Understanding the structure, processing and magnetism relationship of materials
- Synchrotron radiation characterization of materials with emphasis on extended x-ray absorption fine structure

Honors and Awards

- Fellow, Institute of Electrical and Electronics Engineers
- Fellow, American Physical Society
- Fellow, Institute of Physics
- Fellow, Institute of Engineering and Technology
- Institute of Metal Research's Lee Hsun Lecture Award
- Fulbright Sensor Scientist Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and Book Chapters

Y. Chen, V. Harris

Impact of Structural and Magnetic Anisotropies on Microwave Ferrites, Chapter 9 in Recent Advances in Magnetic Insulators - From Spintronics to Microwave Applications, Solid State Physics, vol. 64, Elsevier Inc., p 331-347, 2013

Papers in refereed journals

L. Jiang, J. Yang, H. Hao, G. Zhang, S. Wu, Y. Chen, O. Obi, T. Fitchorov, V. Harris

Giant Enhancement in the Magnetostrictive Effect of FeGa Alloys Doped with Low Levels of Terbium, Ap. Phys. Lett. 102, 222409, 2013

Z. Wang, Y. Li, R.Viswan, B. Hu, V. Harris, J. Li, D. Viehland

Engineered Magnetic Shape Anisotropy in $BiFeO_3$–$CoFe_2O_4$ Self-Assembled Thin Films, ACS Nano, 7, 3447-3456, 2013

Z. Su, Y. Chen, B. Hu, A. Sokolov, S. Bennett, L. Burns, X. Xing, V. Harris

Crystallographically Textured Self-Biased W-Type Hexaferrites for X Band Microwave Applications, Journal of Applied Physics, 113 (17), 17B305-17B305-3, 2013

V.G. Harris, Y. Chen, Z. Chen, A.L. Geiler

Crystallographic Texture and Magnetic Anisotropy and Their Role in Microwave Ferrite Devices, Journal of Metals, 65 (7), p 883-889, 2013

O. Obi, L. Burns, Y. Chen, S. Bennett, M. Sawicki, D. Kaplan, A. Arango, L. Lewis, V. Harris
Effect of Ambient Aging on Heat-Treated Mechanically Alloyed Mn-Al-C Powders, IEEE Transactions on Magnetics, 49, 3372-3374, 2013

B. Hu, Y. Chen, Z. Su, S. Bennett, L. Burns, G. Uddin, K. Ziemer, V. Harris
Magnetocrystalline Anisotropy and FMR Linewidth of Zr and Zn-Doped Ba-Hexaferrite Films Grown on MgO (111), IEEE Transactions on Magnetics, 49, 4234-4237, 2013

Research Projects

Design and Development of Multifunctional Electromechanical Ceramics
Co-Principal Investigator, Army Research Office

Carbide Based Permanent Magnet Materials as Replacements for Rare Earth Based Permanent Magnets
Co-Principal Investigator, Advanced Research Projects Agency

Rare Earth Free Permanent Magnet Materials for Alternative Energy Technologies
Co-Principal Investigator, Advanced Research Projects Agency

Broadband Metamaterial Integrated Circulator/Antenna
Co-Principal Investigator, Office of Naval Research

Realizing Room Temperature Magnetoelectric Materials
Co-Principal Investigator, National Science Foundation

Completed Dissertations Supervised

Scott M. Gillette
Highly Sensitive Tube-Topology Magnetoelectric Magnetic Sensors

Trifon Fitchorov
Electric Field-Driven Tuning of Multiferroic Transducers and Antennas Through Changes in Field Strength and Material Morphology

Steven Bennett
The Realization of a New Band Gap Engineered Photoferroelectric Photovoltaic Device with High Photocurrent

FACULTY

SHEILA S. HEMAMI

Professor and Chair, Electrical and Computer Engineering

PhD, Stanford University, 1994. Joined Northeastern in 2013

617.373.7878 | hemami@ece.neu.edu

Scholarship Focus

- Multimedia signal processing

- Image and video compression and transmission

- Visual psychophysics

Honors and Awards

Fellow, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Papers in refereed journals

F.M. Ciaramello, S.S. Hemami

A Computational Intelligibility Model for Assessment and Compression of American Sign Language Video, IEEE Transactions on Image Processing, November 2011

D.M. Rouse, S.S. Hemami, R. Pépion, P.-L. Callet

Estimating the Usefulness of Distorted Natural Images Using an Image Contour Degradation Measure, Journal of the Optical Society of America: A, vol. 28, issue 2, p 157-188, 2011

H.R. Wu, A.R. Reibman, W. Lin , F. Pereira, S.S. Hemami

Perceptual Visual Signal Compression and Transmission, Proceedings of the IEEE, vol. 101, issue 9 October 2013

Papers in refereed conferences

A. Wang, S.S. Hemami, A. Molnar

Angle-Sensitive Pixels: A New Paradigm for Low-Power, Low-Cost 2D and 3D Sensing, Stereoscopic Displays and Applications XXIII, San Francisco, CA, January 2012

G.O. Pinto, S.S. Hemami

Image Quality Assessment in the Low Quality Regime, Human Vision and Electronic Imaging, San Francisco, CA, January 2012

S.S. Hemami, F.M. Ciaramello, S.S. Chen, N.G. Drenkow, D.Y. Lee, S. Lee, E.G. Levine, A.J. McCann

Comparing User Experiences in 2D and 3D Videoconferencing, IEEE International Conference on Image Processing, Orlando, FL, October 2012

L. McLaughlin, S.S. Hemami

Reduced-Reference Video Quality Assessment with Scalable Overhead, IEEE International Conference on Image Processing, September 2013

VINAY INGLE

Associate Professor, Electrical and Computer Engineering

PhD, Rensselaer Polytechnic Institute, 1981. Joined Northeastern in 1981

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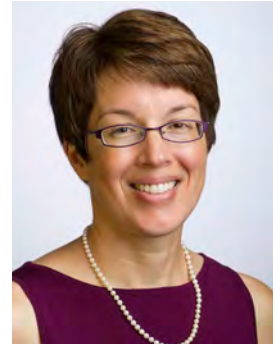
Scholarship Focus

- Signal and image processing
- Statistical analysis
- Hyperspectral signal processing

Selected Recent Publications

Papers in refereed journals

R. Herrero, V. Ingle
> Space-Filling Curves Applied To Compression Of Ultra-Spectral Images,
> Journal of Signal, Image and Video Processing, Springer, October 24, 2013

S. Niu, S. Golowich, V. Ingle, D. Manolakis
> Implications and Mitigation of Model Mismatch and Covariance Contamination for Hyperspectral
> Chemical Agent Detection, Journal of Optical Engineering – SPIE, 52 (2), 026202, Feb 04, 2013

S. Niu, S. Golowich, V. Ingle, D. Manolakis
> New Approach to Remote Gasphase Chemical Quantification: Selected-Band Algorithm, Journal of
> Optical Engineering – SPIE, 53 (2), 021111, Dec 23, 2013

Papers in refereed conferences

R. Herrero, V. Ingle
> Analytical and Comparative Analysis of Lossy Ultraspectral Image Compression, SPIE DSS
> Conference, May 18, 2013

S. Niu, S. Golowich, V. Ingle, D.G. Manolakis
> Hyperspectral Chemical Plume Quantification via Background Radiance Estimation, Proc. SPIE
> 8743, Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery
> XIX, 874316, Baltimore, Maryland, USA, May 18, 2013

C. Brett, R. DiPietro, D. Manolakis, V. Ingle
> Efficient Implementation of Hyperspectral Chemical Detection, SPIE Security and Defense
> Conference, Dresden Germany, 2013

Research Projects

Hyperspectral Detection Algorithms with False Alarm Mitigation
> Principal Investigator, Massachusetts Institute of Technology

Implementation of MF Detectors Using GPGPUs
> Principal Investigator, Massachusetts Institute of Technology

Integrating an Active Learning Platform into the ECE Curriculum
> Senior Investigator, Analog Devices

Completed Dissertations Supervised

Sidi Niu
> Quantification of Chemical Gaseous Plumes on Hyperspectral Imagery (see p 84)

FACULTY

DAVID KAELI

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Rutgers University, 1992. Joined Northeastern in 1993

617.373.5413 | kaeli@ece.neu.edu | ece.neu.edu/faculty/kaeli.html

Scholarship Focus

- Parallel computer architectures
- Cybersecurity
- Hardware and software reliability
- Big data analytics

Honors and Awards

- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering
- Fellow, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Books and book chapters

B. Gaster, L. Howes, D. Kaeli, P. Mistry, D. Schaa
Heterogeneous Computing with Open CL - Revised Open CL 1.2, Edition Morgan Kaufmann, p 1-291, 2013

J. Cavazos, X. Gong, D. Kaeli
Proceedings of the 6th Workshop on General Purpose Processing Using Graphics Processing Units, ACM Online Conference Proceedings Series, March 2013

Papers in refereed conferences

Z. Chen, D. Kaeli, N. Rubin
Characterizing Scalar Opportunities in GPGPU Applications, IEEE International Symposium on Performance Analysis of Systems and Software, April 2013

Y. Ukidave, A. Ziabari, P. Mistry, D. Kaeli
Quantifying the Energy Efficiency of FFT on Heterogeneous Platforms, IEEE International Symposium on Performance Analysis of Systems and Software, April 2013

P. Mistry, Y. Ukidave, D. Schaa, D. Kaeli
A Framework for Profiling and Performance Monitoring of Heterogeneous Applications, 6th Workshop on Programmability Issues for Heterogeneous Multicores (MULTIPROG'13), 2013

P. Mistry, Y. Ukidave, D. Schaa, D. Kaeli
Valar: A Benchmark Suite to Study the Dynamic Behavior of Heterogeneous Systems, GPGPU-6, March, 2013

R. Whelan, T. Leek, D. Kaeli
Architecture-Independent Information Flow Tracking, 22nd International ACM Conference on Compiler Construction, 2013, p 144-163

R. Wang, N. Kandasamy, C. Nwankpa, D.Kaeli
Datacenters as Controllable Load Resources in the Electricity Mark, Proceedings of the 33rd IEEE International Conference on Distributed Computing Systems, July 2013, p 176-185

A. Yimazer, D. Kaeli
HQL: A Scalable Synchronization Mechanism for GPUs, Proceedings of the 27th IEEE International Symposium on Parallel and Distributed Processing, May 2013, p 475-486

L. Anzalota, J. Meeker, D. Kaeli, A. Alshawabkeh, P. Brown, C. Velez Vega, D. Cantonwine, L. Rivera-Gonzalez, B. Jimenez Velez, J. Cordero
Puerto Rico Testsite for Exploring Contamination Threats (PROTECT): An Innovative Approach to

Assessing and Addressing Pre-Term Birth in Puerto Rico, 6th International Conference on Health Promoting Universities, San Juan, PR, March 2013

R. Dominguez, D. Kaeli

Unstructured Control Flow in GPGPU, Programming and Applications for Multi-Core Processors and GPUs: IPDPSW '13 Proceedings of the 2013 IEEE 27th International Symposium on Parallel and Distributed Processing Workshops, May 2013, p 1194-1202

Y. Ukidave, D. Kaeli

Analyzing Optimization Techniques for Power Efficiency on Heterogeneous Platforms, Accelerators and Hybrid Exascale Systems: IPDPSW '13 Proceedings of the 2013 IEEE 27th International Symposium on Parallel and Distributed Processing Workshop, May 2013, p 1040-1049

D. Kaeli, T. Leek, R. Whelan

Leveraging Binary Translation to Support Full-System Tainting, Proceedings of the 6th Workshop on Architectural and Micro-Architectural Support in Binary Translation, June 2013

Research Projects

AMD GPU Research Gift
Principal Investigator, AMD Corporation

Puerto Rico Testsite for Exploring Environmental Contamination Threats (PROTECT)
Co-Principal Investigator, National Institutes of Health

Multi-Disciplinary Preparation of Next Generation Information Assurance Practitioners- Phase II
Co-Principal Investigator, National Science Foundation

CRS: Small: Power Efficient Emerging Heterogeneous Platforms
Co-Principal Investigator, National Science Foundation

MRI: Development of a Testbed for Side-Channel Analysis and Security Evaluation
Co-Principal Investigator, National Science Foundation

SHF: Small: The Cross Layer Reliability Stack
Principal Investigator, National Science Foundation

A System Model for Effective Anomaly Analysis and Detection
Principal Investigator, Northeastern University

Project A: Reducing Uncertainties in SBRT for Pancreatic Cancer
Principal Investigator, Massachusetts General Hospital

Lightweight Hypervisor-Based Instrumentation and Machine Learning to Provide Timely Malware Detection
Principal Investigator, Air Force Small Business Innovation Research

A Disk-Subsystem Interposer Using a Lightweight Virtual Machine Monitor
Principal Investigator, Massachusetts Institute of Technology Lincoln Laboratory

A Biomedical Imaging Acceleration Testbed
Principal Investigator, National Science Foundation

Analogic CenSSIS Corporate Membership to Fund GPU Research
Principal Investigator, Analogic

Analogic Grant to Fund GPU Ultrasound Research
Principal Investigator, Analogic

Samsung-GPU-Modeling
Principal Investigator, Analog Devices

FACULTY

YONG-BIN KIM
Associate Professor, Electrical and Computer Engineering

PhD, Colorado State University, 1996. Joined Northeastern in 2000

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Scholarship Focus
- High speed digital/analog integrated circuit design
- Clocking scheme for high performance VLSI systems including on-chip skew analysis and clock distribution
- High speed integrated circuit signal integrity and physical CAD tool development
- High speed system integration for signal processing and communication applications
- Innovative circuits and system applications

Selected Recent Publications

Books and book chapters

Y.B. Kim, K. Kim

Modern VLSI Layout Design, MyCAD Press, Feb. 2013

Papers in refereed journals

J. Yang, Y.B. Kim

Self Adaptive Body Biasing Scheme for Leakage Power Reduction Under 32nm CMOS Regime, International Journal of Advanced Computer Science, vol. 3, no. 9, p 453-459, September, 2013

H. Chauhan, Y. Choi, M. Onabajo, I. Jung, Y.-B. Kim

Accurate and Efficient On-Chip Spectral Analysis for Built-in Testing and Calibration Approaches, IEEE Transactions on VLSI Systems, vol. 22, no. 3, p 497-506, March 2014

Inseok Jung, Yong-Bin Kim, and Kyung Ki Kim

Cost Effective Test Methodology Using PMU For Automated Test Equipment Systems, International Journal of VLSI design & Communication Systems (VLSICS), vol. 5, no.1, p 15-27, Feb. 2014

Papers in refereed conferences

W. Li, Y.-B. Kim

A High Performance Modulo 2n+1 Squarer Design Based on Carbon Nanotube Technology, IEEE International Midwest Symposium on Circuits and Systems(MWCAS), Aug.4-7, 2013, Columbus, OH, p 429-432

I. Jung, M. Onabajo, Y.-B. Kim

A 10-bit 64MS/s SARADC Using Variable Clock Period Method, IEEE International Midwest Symposium on Circuits and Systems (MWCAS), Aug. 4-7, 2013, Columbus OH, p 1144-1147

H. Lee, Y.-B. Kim

Low Power Null Convention Logic Circuit Design Based on DCVSL, 2013 IEEE International Midwest Symposium on Circuits and Systems(MWCAS), Aug.4-7, 2013, Columbus OH, p 29-32

Y. Choi, H. Jeon, Y.-B. Kim

A Switched-Capacitor DC-DC Converter Using Delta-Sigma Digital Pulse Frequency Modulation Control Method, 2013 IEEE International Midwest Symposium on Circuits and Systems (MWCAS), Aug.4-7, Columbus, OH, p 356-359, 2013

FACULTY

J. Lu, J. Yang, Y.-B. Kim, K. Kim

Implementation of CMOS Neuron for Robot Motion Control Unit, 2013 IEEE International SoC Conference (ISOCC), Nov. 17-19, 2013, Busan South Korea, p 9-12

J. Wu, H. Qin, Y. Shi, M. Choi, H. J. Lee, K. Kim, Y.-B. Kim

Stochastic Encoding for Enhanced Resistance Against Power Analysis Attacks in Crypto- Hardware, 2014 IEEE International Industrial Information Systems Conference (IIISC 2014), Jan 21-24, Chiang Mai, Thailand, p 7-9I

Jung, Y.-B. Kim

Test Methodology using Parametric Measurement Unit for Automated Test Equipment Systems with 600 MHz High Speed DCL, 2014 IEEE International Industrial Information Systems Conference (IIISC 2014), Jan 21-24, Chiang Mai, Thailand, p 17-19

H.Chauhan, Y. Choi, C. Hsiang, Y.-B. Kim, M. Onabajo

On- Chip Amplifier Linearity Calibration with the Fast Fourier Transform, 2013 IEEE North Atlantic Test Workshop (NATW), May 8-10, 2013, Wakefield, MA

Research Projects

VLSI Chip Fabrication for Low Power Integrated Circuits Design

Principal Investigator, Techwin Corporation and Dongbu Electronics

Low Power DC-DC Converter Design for Power Management

Principal Investigator, Techwin Corporation

Multi-Ferroic Materials for RF Applications

Principal Investigator, Defense Advanced Research Projects Agency

Collaborative Research: Cyberplasm - An Autonomous Micro-Robot Constructed Using Synthetic

Co-Principal Investigator, National Science Foundation

Software Grant for VLSI Design and Verification Software Grant

Principal Investigator, MyCAD

CAD Tool Grant

Principal Investigator, Cadence

FACULTY

ENGIN KIRDA

Professor, Electrical and Computer Engineering; jointly appointed, Computer and Information Science

PhD, Technical University of Vienna, 1973. Joined Northeastern in 2011

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Scholarship Focus

- Security issues with the potential to affect a large number of people
- Web security, malware and vulnerability analysis, intrusion detection, and other computer security issues

Selected Recent Publications

Papers in refereed journals

M. Egele, A. Moser, C. Kruegel, E. Kirda

PoX: Protecting Users from Malicious Facebook Applications, Computer Communications Journal, Elsevier, 2012

T. Scholte, D. Balzarotti, E. Kirda

Have Things Changed Now? An Empirical Study on Input Validation Vulnerabilities in Web Applications, Computers and Security 31 (3): 334-356, 2012

M. Egele, T. Scholte, E. Kirda, C. Kruegel

A Survey on Automated Dynamic Malware Analysis Techniques and Tools, ACM Computing Surveys Journal, vol. 44, issue 2, February 2012

Papers in refereed conferences

T. Lauinger, K. Onarlioglu, A. Chaabane, E. Kirda, W. Robertson

Mohamed Ali Kaafar, Holiday Pictures or Blockbuster Movies? Insights into Copyright Infringement in User Uploads to One-Click File Hosters, The 16th International Symposium on Research on Attacks, Intrusions and Defenses (RAID 2013), St. Lucia, October 2013

K. Onarlioglu, M. Battal, W. Robertson, E. Kirda

Securing Legacy Firefox Extensions with SENTINEL, 10th Conference on Detection of Intrusions and Malware and Vulnerability Assessment (DIMVA), Berlin, Germany, July 2013

K. Onarlioglu, C. Mulliner, W. Robertson, E. Kirda

PRIVEXEC: Private Execution as an Operating System Service, IEEE Security and Privacy, San Francisco, May 2013

A. Cassola, W. Robertson, E.Kirda, G. Noubir

A Practical, Targeted, and Stealthy Attack Against WPA Enterprise Authentication, 20th Annual Network and Distributed System Security Symposium, (NDSS 2013), San Diego, CA, February 2013

T. Lauinger, M. Szydlowski, K.Onarlioglu, G. Wondracek, E. Kirda, C. Kruegel

Clickonomics: Determining the Effect of Anti-Piracy Measures for One-Click Hosting, 20th Annual Network and Distributed System Security Symposium, 12 (NDSS 2013), San Diego, CA, February 2013

FACULTY

MIECZYSLAW KOKAR

Professor, Electrical and Computer Engineering
PhD, Wroclaw University of Technology, 1973. Joined Northeastern in 1984
617.373.4849 | mkokar@ece.neu.edu | ece.neu.edu/faculty/kokar

Scholarship Focus

- Information fusion – situation awareness
- Cognitive radio – awareness of itself and environment
- Software engineering – self-adaptive software
- Ontology based computing and modeling

Selected Recent Publications

Papers in refereed journals

L. Lechowicz, M. Kokar

Waveform Reconstruction from Ontological Description, Journal of Analog Integrated Circuits and Signal Processing, Published electronically, 2013

Papers in refereed conferences

B. Ulicny, J. Moskal, M. Kokar

Situational Awareness from Social Media, Proceedings of the Eighth Conference on Semantic Technologies for Intelligence, Defense, and Security, Fairfax, VA, 2013

D. Suresh, M. Kokar, J. Moskal

Prototyping SCA Transceiver APIs Using a Generic Reasoner API, SDR Winn-Comm: Wireless Innovation Forum Conference on Wireless Communications Technologies and Software Defined Radio, Washington D.C., 2013

L. Lechowicz, M. Kokar

Waveform Reconstruction from Ontological Description, SDR Winn-Comm: Wireless Innovation Forum Conference on Wireless Communications Technologies and Software Defined Radio, Washington D.C., 2013

L. Grande, M. Sherman, H. Zhu, M. Kokar, J. Stine

IEEE DySPAN 1900.5 Efforts To Support Spectrum Access Standardization, 2013 IEEE Military Communications Conference (MILC OM 2013), San Diego, 2013

Research Projects

Information Salience

Principal Investigator, Office of Naval Research

FACULTY

31

MIRIAM LEESER

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Cambridge University, 1988. Joined Northeastern in 1996

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Scholarship Focus

- Computer engineering
- Reconfigurable and GPU computing
- Embedded computing
- Computer arithmetic

Selected Recent Publications

Books and book chapters

V. Ross, M. Leeser

GPGPU Computing for Cloud Auditing, High Performance Cloud Auditing and Applications, Springer, November 2013

Papers in refereed conferences

P. Grossmann, M. Leeser, M. Onabajo

Minimum Energy Operation for Clustered Island-Style FPGAs, in Proceedings of the ACM/SIGDA International Symposium on Field Programmable Gate Arrays p 157-166, ACM, February, 2013

N. Moore, M. Leeser, L. S. King

Kernel Specialization for Improved Adaptability and Performance on Graphics Processing Units (GPUs), in Parallel & Distributed Processing (IPDPS), 2013 IEEE 27th International Symposium on p 1037-1048, May 2013

D. Kusinsky, M. Leeser

FPGA-based Hyperspectral Covariance Coprocessor for Size, Weight, and Power Constrained Platforms, in High Performance Extreme Computing Conference (HPEC), 2013 IEEE, p 1-6, September, 2013

X. Fang, M. Leeser

Vendor Agnostic, High Performance, Double Precision Floating Point Division for FPGAs, in High Performance Extreme Computing Conference (HPEC), IEEE, p 1-5, 2013

Research Projects

MRI: Development of a Testbed for Side Channel Analysis and Security Evaluation (TeSCASE)
Co-Principal Investigator, National Science Foundation

Ensuring Reliability and Portability of Scientific Software for Heterogeneous Architectures
Co-Principal Investigator, National Science Foundation

Modeling Manycore Architectures in Matlab
Principal Investigator, Mathworks

Mathworks System Modelling and Radio Technology Lab (SMART)
Principal Investigator, Mathworks

Completed Dissertations Supervised

Peter Grossmann

Design and Analysis of Minimum Energy FPGAs

BRAD LEHMAN
Professor, Electrical and Computer Engineering
PhD, Georgia Institute of Technology, 1992. Joined Northeastern in 1995
617.373.3052 | lehman@ece.neu.edu | ece.neu.edu/groups/power/lehman

Scholarship Focus

- Power electronics
- DC-DC converters
- Non-linear dynamics/control

Selected Recent Publications

Papers in refereed journals

S. Chen, P. Li, D. Brady, B. Lehman

Determining the Optimum Grid-Connected Photovoltaic Inverter Size, Solar Energy, vol. 87, January 2013, p 96–116

Y. Zhao, J. de Palma, J. Mosesian, R. Lyons, B. Lehman

Line-line Fault Analysis and Protection Challenges in Solar Photovoltaic Arrays, IEEE Transactions on Industrial Electronics, IEEE Transactions on Industrial Electronics, vol. 60, no. 9, p 3784-3795, September, 2013

Papers in refereed conferences

W. Huang, B. Lehman

Mitigation and Utilization of the Inductor Coupling Effect in Interleaved Multiphase DC/DC Converters, in Energy Conversion Congress and Exposition, 2013 IEEE, p 1822-1829, 2013

S. Sheng, L. Peng, B. Lehman

Parallel Operation of Digital Controlled Modified Sine Wave Inverters, in Energy Conversion Congress and Exposition, 2013 IEEE, p 3440-3447

C. Hsu, P. Li, S. Sheng, B. Lehman

A Maximum Power Point Tracking Method for PV Systems Supplying a Periodic Nonlinear Load, in Energy Conversion Congress and Exposition, 2013 IEEE, p 2771-2777

Y. Zhao, B. Lehman, R. Ball, J.F. de Palma

Graph-Based Semi-Supervised Learning for Fault Detection and Classification in Solar Photovoltaic Arrays, in Energy Conversion Congress and Exposition, 2013 IEEE, p 1628-1634

Q. Sun, S. Patil, N. Sun, B. Lehman

Inductive Magnetic Harvester with Resonant Capacitive Rectifier Based on Synchronized Switch Harvesting Technique, in Energy Conversion Congress and Exposition, 2013 IEEE, p 4940-4947

Q. Sun, S. Patil, N. Sun, B. Lehman

Modeling and Optimization of an Inductive Magnetic Harvester Considering Nonlinear Effects, in Control and Modeling for Power Electronics (COMPEL), 2013 IEEE 14th Workshop on, p 1-6

S.W. Qian, B. Lehman

A Simple Formula for Estimating the Optimum Tilt Angles of Photovoltaic Panels, in Control and Modeling for Power Electronics, 2013 IEEE 14th Workshop on, p 1-8

FACULTY

BRAD LEHMAN continued

J.H. Huang, Y. Zhao, B. Lehman, D. Nguyen
  Fast Switching Reconfigurable Photovoltaic Modules Integrated within DC-DC Converters, in
  Control and Modeling for Power Electronics, 2013 IEEE 14th Workshop on, p 1-7

S. Sheng, C. Hsu, P. Li, B. Lehman
  Energy Management for Solar Battery Charging Station, in Control and Modeling for Power
  Electronics (COMPEL), 2013 IEEE 14th Workshop on, p 1-8

Y. Zhao, B. Lehman, R. Ball, J. Mosesian, J.F. de Palma
  Outlier Detection Rules for Fault Detection in Solar Photovoltaic Arrays, in Proc. 28th IEEE APEC,
  Long Beach, CA, March 2013, p 2913-2920

S. Chen, P. Li, B. Lehman, R. Ball, J.F. de Palma,
  A New Topology of Bridge-Type Non-Superconducting Fault Current Limiter, proc. 28th IEEE
  Applied Power Electronics Conference, Long Beach, CA, March 2013, p 1465-1472

Research Projects

Fault Detection and Protection for Solar PV Systems
  Principal Investigator, Mersen

GOALI: Adaptive Self Healing Solar Arrays
  Principal Investigator, National Science Foundation

Partnerships for Innovation: Accelerating Innovation Research
  Principal Investigator, National Science Foundation

BOS and Grid Tie Option
  Principal Investigator, Power Film

Watt-Sun: Solar Forecasting
  Principal Investigator, IBM

Completed Dissertations Supervised

Song Chen
  A Non-Superconducting Fault Current Limiter (NSFCL) (see p 74)

HANOCH LEV-ARI

Professor, Electrical and Computer Engineering
PhD, Stanford University, 1984. Joined Northeastern in 1990
617.373.3032 | levari@ece.neu.edu | ece.neu.edu/~levari

Scholarship Focus

- Statistical and adaptive signal processing
- Networked dynamic state estimation
- Signal processing techniques for power delivery systems

Honors and Awards

Fellow, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Papers in refereed conferences

P. Argyropoulos, H. Lev-Ari

Customized Wavelets for Improved Fault Location Quality in Power Systems, IEEE Power and Energy Conference at Illinois (PECI), Champaign, IL, Feb 2013

P. Argyropoulos, H. Lev-Ari, A.M. Stankovic

IIR Phasor-Banks: Causal, Delay-Free, Numerically Robust, Customizable Uniform-DFT-Like Perfect Reconstruction Filter Banks, IEEE International Conference on Acoustics, Speech and Signal Processing, Vancouver, BC, May 2013, p 5613-5617

L. Peng. H. Lev-Ari

Estimating the Auto-Correlation Function of an Arbitrarily Time-Variant System Response, IEEE International Conference on Acoustics, Speech and Signal Processing, Vancouver, BC, May 2013, p 6249-6253

Research Projects

Cyber-Physical Models for Estimation, Control and Fault Management in Naval Energy Systems

Principal Investigator, Office of Naval Research

Scalable and Flat Controls for Reliable Power Grid Operation with High Renewable Penetration
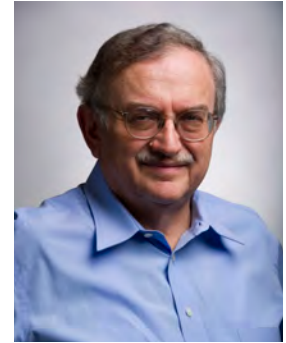
Principal Investigator, GCEP Stanford

ERC for Ultra-wide Area Resilient Electric Energy Transmission Network

Co-Principal Investigator, National Science Foundation

New Methods of Fault Simulation and Location for Smart Grids Based on Synchronized Measurements

Co-Principal Investigator, National Science Foundation

FACULTY

YONGMIN LIU

Assistant Professor, Mechanical and Industrial Engineering; jointly appointed, Electrical and Computer Engineering, PhD, University of California, Berkeley, 2009. Joined Northeastern in 2012

617.373.4457 | y.liu@neu.edu | northeastern.edu/liulab

Scholarship Focus

- Nano optics
- Nano plasmonics
- Transformation optics/acoustics
- Nano structured materials and devices
- Nano optomechanics
- Energy harvesting technology

Selected Recent Publications

Papers in refereed journals

C.L. Zhao, Y. M. Liu, Y. H. Zhao, N. Fang, T. J. Huang
A Reconfigurable Plasmofluidic Lens, Nature Communications, 2013

Y.M. Liu, X. Zhang
Metasurfaces for Manipulating Surface Plasmons, Applied Physics Letters, 2013

H. Cang, Y. M. Liu, Y. Wang, X. Yin, X. Zhang
Giant Suppression of Photo-Bleaching for Single Molecule Detection via the Purcell Effect, Nano Letters, 2013

Research Projects

Plasmonic Metamaterials: A Sustainable, Bottom-up Approach
Co-Principal Investigator, Northeastern University

Graphene Photonics for Terahertz Radiation
Principal Investigator, Northeastern University

FACULTY

FABRIZIO LOMBARDI

ITC Professor, Electrical and Computer Engineering
PhD, University of London, 1982. Joined Northeastern in 1998
617.373.4854 | lombardi@ece.neu.edu

Scholarship Focus

- Testing and design of digital systems
- Quantum and nano computing
- Advanced memory and storage design
- Emerging technologies for computing
- Defect tolerance

Honors and Awards

- Fellow, Institute of Electrical and Electronics Engineers
- Søren Buus Outstanding Research Award, College of Engineering

Selected Publications

Books and book chapters

A. Ottavi, A. Salsano, S. Pontarelli, F. Lombardi

Modeling Magnetic Quantum-Dot Cellular Automata by HDL, Nanoelectronic Device Applications Handbook, Edited by J. Morris and K. Iniewski, p 225-238, CRC Press, 2013

P. Junsangsri, F. Lombardi

Hybrid Design of a Memory Cell Using a Memristor and Ambipolar Transistors, Nanoelectronic Device Applications Handbook, Edited by J. Morris and K. Iniewski, p 327-340, CRC Press, 2013

Papers in refereed journals

K. Namba, W. Wei, F. Lombardi

Extending Non-Volatile Operation to DRAM Cells, IEEE Access, vol. 1, p 758-769, 2013

J. Han, J. Liang, F. Lombardi

Analysis of Error Masking and Restoring Properties of Sequential Circuits, IEEE Transactions on Computers, vol. 62, no. 9, p 1694-1704, 2013

J. Han, J. Liang, F. Lombardi

New Metrics for the Reliability of Approximate and Probabilistic Adders, IEEE Transactions on Computers, vol. 62, no. 9, p 1760-1771, 2013

H. Feng, A.F. Almurib, T. Nandha Kumar, F. Lombardi

Testing a Nano Crossbar for Multiple Fault Detection, IEEE Transactions on Nanotechnology, vol. 12, no. 4, p 477-485, 2013

G. Cho, F. Lombardi

On the Delay of a CNTFET with Undeposited CNTs by Gate Width Adjustment, Journal of Electronic Testing Theory and Applications, vol. 29, no. 3, p 261-273, Springer 2013

A.F. Almurib, T Nandha Kumar, F. Lombardi

Single-Configuration Fault Detection in Application-Dependent Testing of FPGA Interconnects, Proc. IET Computers & Digital Techniques, vol. 7, no. 3, p 132-141, 2013

FACULTY

FACULTY

W. Wei, J. Han, F. Lombardi

Design and Evaluation of a Hybrid Memory Cell by Single-Electron Transfer, IEEE Transactions on Nanotechnology, vol. 12, no. 1, p 57-70, 2013

P. Junsangsri, F. Lombardi

Design of a Hybrid Memory Cell Using Memristance and Ambipolarity, IEEE Transactions on Nanotechnology, vol. 12, no. 1, p 71-80, 2013

T. Nandha Kumar, F. Lombardi

A Novel Heuristic Method for Application Dependent Testing of a SRAM-based FPGA Interconnect, IEEE Transactions on Computers, vol. 62, no. 1, p 163-172, 2013

Papers in refereed conferences

S. Pontarelli and M. Ottavi, F. Lombardi

F-DICE: A Multiple Node Upset Tolerant Flip-Flop for Highly Radioactive Environments, Proc. IEEE Int Symposium on DFT in VLSI and Nanotechnology Systems, p 107-111, New York, 2013

K. Namba, F. Lombardi

A Novel Scheme for Concurrent Error Detection of OLS Parallel Decoders, Proc. IEEE Int Symposium on DFT in VLSI and Nanotechnology Systems, p 52-57, New York, October 2013

J. Han, H. Wu, F. Lombardi

A PCM-Based TCAM Cell Using NDR, Proc. ACM Symposium on Nano Architectures, p 89- 94, New York, July 2013

G. Cho, F. Lombardi

Novel and Improved Design of a Ternary CNTFET-Based Cell, Proc. ACM Great Lakes Symposium on VLSI, p 131-136, Paris, May 2013

J. Han, F. Lombardi

Approximate XOR/XNOR-based Adders for Inexact Computing, Proc. IEEE Int. Symp on Nanotechnology, p 690-693, Beijing, August 2013

K. Chen, J. Han, F. Lombardi

Design and Evaluation of Two MTJ-Based Content Addressable Non-Volatile Memory Cells, Proc. IEEE Int. Symp on Nanotechnology, p 707-712, Beijing, August 2013

A.F. Almurib, T. Nandha Kumar, F. Lombardi

On the Operational Features and Performance of a Memristor-Based Cell for a LUT of an FPGA, Proc. IEEE Int. Symp on Nanotechnology, p 71-76, Beijing, August 2013

P. Junsangsri, J. Han, F. Lombardi

On the Drift Behaviors of a Phase Change Memory (PCM) Cell, Proc. IEEE Int. Symp on Nanotechnology, p 1145-1150, Beijing, August 2013

Professor and Interim Chair, Bioengineering; affiliated faculty, Chemistry and Chemical Biology, Electrical and Computer Engineering, PhD, Massachusetts Institute of Technology, 1976. Joined Northeastern in 2010

617.373.3006 | makowski@ece.neu.edu

Scholarship Focus

Novel methods for data and signal processing of biophysical data; x-ray scattering for studies of proteins and tissues.

Selected Recent Publications

Papers in refereed journals

D. Minh, L. Makowski

Wide-Angle X-Ray Solution Scattering for Protein-Ligand Binding: Multivariate Curve Resolution with Bayesian Confidence Intervals, Biophys. J. 104, p 873-884, Feb 10, 2013

R.E. Iacob, D. Houde, G.M. Bou-Assaf, L. Makowski, J.R. Engen, S.A. Berkowitz

Understanding Monoclonal Antibody Aggregation by Comparing the Higher-Order Structure of Solution-Free Monomers to Aggregate Dimers, J. Pharmaceutical Sciences 102, 4315-4329, 2013

J. Liu, H. Inouye, N. Venugopalan, R.F. Fischetti, S.C. Gleber, S. Vogt, J.C. Cusumano, J.I. Kim, C. Chape, L. Makowski

Tissue Specific Variation in the Nanoscale Architecture of Arabidopsis, Journal of Structural Biology 184, 103, 2013

J. Badger, J. Lal, R. Harder, H. Inouye, S.C. Gleber, S. Vogt, I. Robinson, L. Makowski

Three-Dimensional Imaging of Crystalline Inclusions Embedded in Intact Maize Stalks, Scientific Reports 3, 2843, 2013

Research Projects

MADMAX: Precise Measurement of Conformational Changes in Proteins

Principal Investigator, National Institutes of Health

Center for Direct Catalytic Conversion of Biomass to BioFuels (C3Bio)

Co-Investigator, Basic Energy Sciences

Conformational Flexibility in Activation of Scr-Kinase

Subcontract Lead, National Institutes of Health

Precise Characterization of Conformational Ensembles

Principal Investigator, National Science Foundation

FACULTY

EDWIN MARENGO

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Northeastern University, 1997. Joined Northeastern in 2004

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Scholarship Focus

- Physics-based signal processing and imaging
- Electromagnetic information theory

Honors and Awards

National Science Foundation CAREER Award

Selected Recent Publications

Papers in refereed journals

E. A. Marengo

A New Theory of the Generalized Optical Theorem in Anisotropic Media, IEEE Transactions on Antennas and Propagation, vol. 61, p. 2164-2179, 2013

E.A. Marengo, F.K. Gruber

Optical-Theorem-Based Coherent Scatterer Detection in Complex Environments, International Journal of Antennas and Propagation, Article ID 231729, 12 pages, 2013

E.A. Marengo

Multipole Theory and Algorithms for Target Support Estimation, International Journal of Antennas and Propagation, 2013, Article ID 515240

E.A. Marengo, P. Berestesky

Cramer-Rao Bound Study of Multiple Scattering Effects in Target Separation Estimation, International Journal of Antennas and Propagation, Article ID 572923, 2013

E.A. Marengo

Inverse Diffraction Theory and Computation of Minimum Source Regions of far Fields, Mathematical Problems in Engineering,18 pages, January, 2014

Papers in refereed conferences

E.A. Marengo

Target Detection Based on the Optical Theorem, Proceedings of the 2013 IEEE International Symposium on Antennas and Propagation and URSI National Radio Science Meeting, Buena Vista, Florida, July 7-13, 2013

E.A. Marengo

The Inverse Support Problem with far Field Data, Proceedings of the 2013 IEEE International Symposium on Antennas and Propagation and URSI National Radio Science Meeting, Buena Vista, Florida, July 7-13, 2013

Research Projects

Wave-Based Algorithms and Bounds for Target Support Estimation

Principal Investigator, Air Force Office of Scientific Research

JOSE MARTINEZ LORENZO

Assistant Professor, Mechanical and Industrial Engineering; jointly appointed, Electrical and Computer Engineering, PhD, University of Vigo, 2005. Joined Northeastern in 2013

617.373.6835 | j.martinez-lorenzo@neu.edu | coe.neu.edu/~jmartinez

Scholarship Focus

- Compressive sensing and modeling using mechanical and electromagnetic waves

- Computational methods for differential and integral equations

- Physics-based signal processing, imaging and optimization

- Explosives detection: portal-based, standoff-based, and underground-based

- Multimodal breast cancer detection: x-ray and thermoacoustic-tomography

- Non-Destructive Testing (NDT) using mechanical and electromagnetic waves

- Micro-sized microwave atmospheric sounding satellites

Selected Recent Publications

Papers in refereed journals

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport, A.G. Pino
A New Physical Optics Based Approach to Sub-Reflector Shaping for Reflector Antenna Distortion Compensation, IEEE Transactions on Antennas and Propagation, vol. 61, no. 1, p 467-472, Jan. 2013

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
On the use of Improved Imaging Techniques for the Development of a Multistatic Three-Dimensional Millimeter-Wave Portal Based Imaging for Personnel Screenings, Progress in Electromagnetics Research, PIER, vol. 138, p 83-98, 2013

Y. Alvarez, B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
An Improved SAR Based Technique for Accurate Profile Reconstruction, IEEE Transactions on Antennas and Propagation, vol. 61, no. 3, p 1490-1495, March 2013

J.A. Martínez Lorenzo, Y. Rodríguez-Vaqueiro, C. Rappaport, O. Rubinos Lopez, A. Garcia Pino
A Compressed Sensing Approach for Detection of Explosive Threats at Standoff Distances, Using a Passive Array of Scatterers, Homeland Security Affairs, Supplement 6, Article 1, p 1-6 , April, 2013

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
SAR Processing for Profile Reconstruction and Characterization of Dielectric Objects on the Human Body Surface, Progress in Electromagnetics Research, PIER, vol. 138, p 269-282, 2013

Y. Álvarez, J. Laviada, L. Tirado, C. García, J.A. Martínez-Lorenzo, F. Las- Heras, C. Rappaport
Inverse Fast Multipole Method for Monostatic Imaging Applications, Geoscience and Remote Sensing Letters, vol. 10, no. 5, p 1239-1243, Sept. 2013

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport
A New Fast Algorithm for Radar-Based Shape Reconstruction of Smoothly Varying Objects, IEEE Antennas and Wireless Propagation Letters, vol. 12, no., p 484-487, 2013

FACULTY

JOSE MARTINEZ LORENZO continued

Y. Álvarez, Y. Rodriguez-Vaqueiro, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, F. Las-Heras, C. Rappaport
Phase Error Compensation in Imaging Systems Using Compressed Sensing Techniques, IEEE
Antennas and Wireless Propagation Letters, vol. 12, no. 12, Dec. 2013, p 1574 - 1577

Research Projects

Small Business ERC Collaborative Opportunity: Advanced Deep View Signal and Image Processing
Algorithms with Hardware Acceleration
Principal Investigator, National Science Foundation

Millimeter-Wave Standoff Detection of Concealed Explosives
Investigator, Department of Homeland Security (part of ALERT center of excellence)

Advanced Algorithm Development for Multiband GPR Radar Detection of Buried Mines
Co-Principal Investigator, US Army Night Vision and Electronic Sensors Directorate

Walking Robot Based Ground Penetrating Radar Sensor for Mine and IED Detection
Co-Principal Investigator, National Science Foundation

Advanced Mechanical-Electromagnetic Applications for next Generation Environmental Monitoring
Principal Investigator, National Oceanic and Atmospheric Administration

Microwave Nearfield Radar Imaging (NRI) Using Digital Breast Tomosynthesis (DBT) for Non-Invasive
Breast Cancer Detection
Principal Investigator, National Science Foundation

Processing of Physiologic Optical Images and Signals for Development of an Intra-Operative Burn
Surgery Diagnostic Device
Principal Investigator, SpectralMD

Multi-Modality Electromagnetic Detection and Localization of Implanted Explosives Using Ultra low Field
MRI and Nuclear Quadrupole Resonance
Co-Principal Investigator, Defense Advanced Research Projects Agency (DARPA)

FACULTY

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering, Mechanical and Industrial Engineering, PhD, Michigan State University, 1983. Joined Northeastern in 1987

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Scholarship Focus

- MEMS
- NEMS
- Micro-fabrication
- Micro-systems
- Organic semiconductor devices

Honors and Awards

Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

H. Pan, Y.-C. Wu, G.G. Adams, G.P. Miller, N. McGruer

Interfacial Shear Stress Between Single-Walled Carbon Nanotubes and Gold Surfaces With and Without an Alkanethiol Monolayer, Journal of Colloid and Interface Science, vol. 407, p 133-139

C. Pramanik, Y. Li, A. Singh, W. Lin, J.Hodgson, J. Briggs, S. Ellis, P. Müller, N. McGruer, G. Miller

Water Soluble Pentacene, J. Mater. Chem. C, 2013, 1, 2193-2201

Y.-C. Wu, N. McGruer, G.G. Adams

Adhesive Slip Process Between a Carbon Nanotube and a Substrate, Journal of Physics D: Applied Physics, vol. 46, 2013, 175305

R.P. Hennessy, A. Basu, G.G. Adams, N. McGruer

Hot-Switched Lifetime and Damage Characteristics of MEMS Switch Contacts, Journal of Micromechanics and Microengineering, vol. 23, 2013

Papers in refereed conferences

A. Basu, R. Hennessy, G. Adams, N. McGruer

Reliability in Hot Switched Ruthenium on Ruthenium MEMS Contacts, Proceedings of the 59th Holm Conference on Electrical Contacts (HOLM),2013, 22-25 Sept. 2013, Pages 1-8

A. Basu, R. Hennessy, G. Adams, N. McGruer

Leading and Trailing Edge Hot Switching Damage in a Metal Contact RF MEMS Switch, Proceedings of Transducers & Eurosensors XXVII: The 17th International Conference on Solid-State Sensors, Actuators and Micro-systems (Transducers & Eurosensors XXVII), p 16-20, 2013

Research Projects

NSEC: The Center for High-Rate Nanomanufacturing (CHN)

Investigator, National Science Foundation

Center for RF MEMS Reliability and Design Fundamentals

Principal Investigator, Defense Advanced Research Projects Agency

Completed Dissertations Supervised

Anirban Basu

An Experimental Investigation of Hot Switching Contact Damage in RF MEMS Switches

Huiyan Pan

Determination of Shear Stress Between Single-Walled Carbon Nanotubes and Substrates Using NEMS Devices

Anup Kumar Singh

Organic Photovoltaics Using Novel Pentacene Derivatives

STEPHEN MCKNIGHT
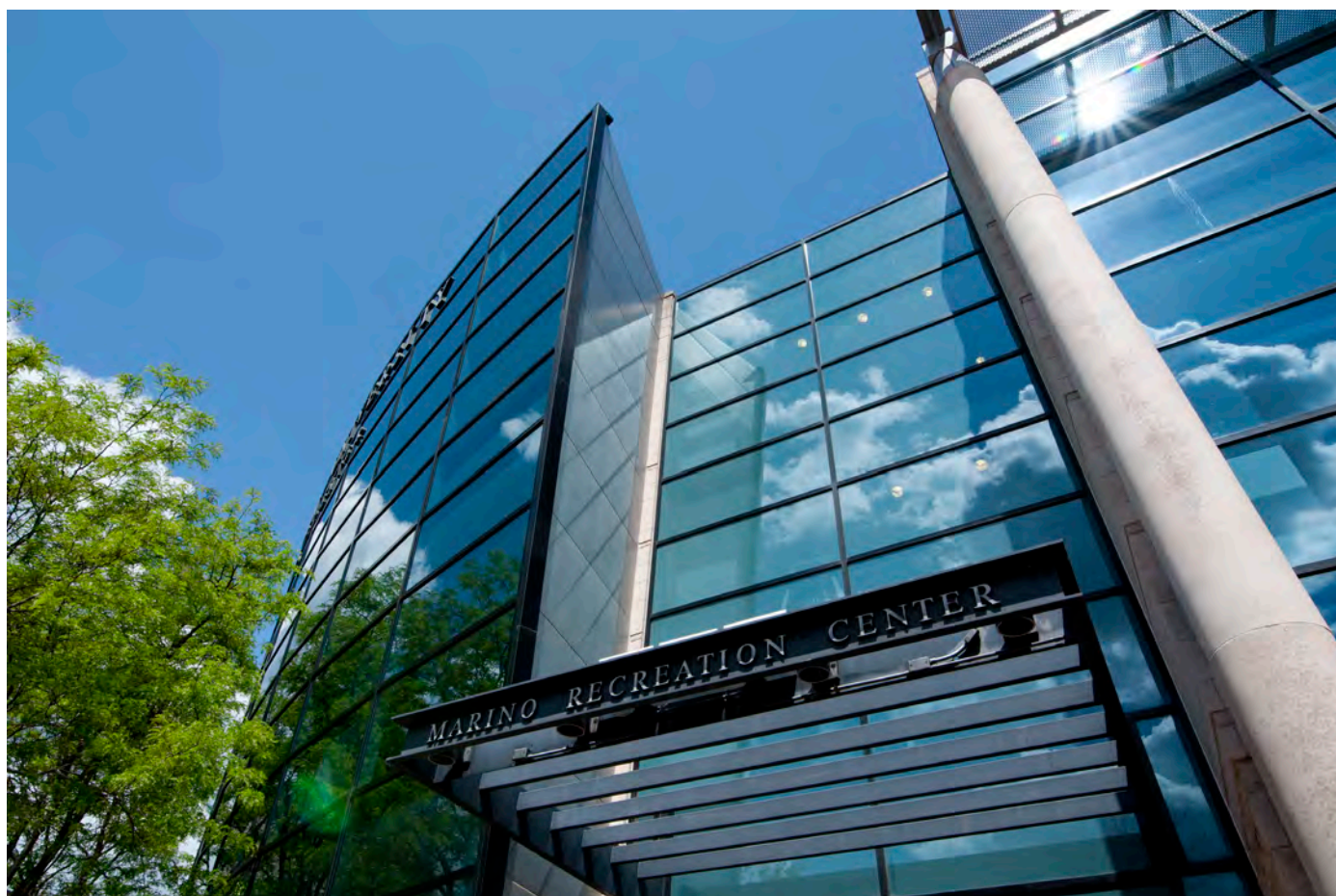
Professor, Electrical and Computer Engineering

PhD, University of Maryland, 1976. Joined Northeastern in 1980

617.373.2060 | mcknight@ece.neu.edu

Scholarship Focus

- Sub-millimeter devices and materials
- Optical and infrared materials and systems
- Sensing and imaging

WALEED MELEIS

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Michigan, 1996. Joined Northeastern in 1996

617.373.3023 | meleis@ece.neu.edu | ece.neu.edu/faculty/meleis.html

Scholarship Focus

- Combinatorial optimization
- Algorithm design and analysis
- Scheduling
- Machine learning
- Parallel computing
- Online platforms for behavioral experimentation

Selected Recent Publications

Papers in refereed journals

L. Sallaway, S. Magee, J. Shi, F. Quivira, K. Tgavalekos, D. Brooks, S. Muftu, W. Meleis, R. Moore, D. Kopans, K-T. Wan

Detecting Solid Masses in Phantom Breast Using Mechanical Indentation, Experimental Mechanics, March 27, 2013

Research Projects

Online Laboratory to Study Large Group Network Performance

Co-Principal Investigator, Army Research Office

Completed Dissertations Supervised

Curtis Watson

Signal Detection and Digital Modulation Classification-Based Spectrum Sensing for Cognitive Radio

FACULTY

NINGFANG MI

Assistant Professor, Electrical and Computer Engineering

PhD, College of William and Mary, 2009. Joined Northeastern in 2009

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FACULTY

Scholarship Focus

- Performance evaluation
- Resource management
- Capacity planning
- Cloud computing
- Storage systems
- System modeling
- Simulation
- Data analysis

Honors and Awards

- IBM Faculty Award
- Air Force Office of Scientific Research Young Investigator Award

Selected Recent Publications

Papers in refereed conferences

Y. Yao, J. Wang, B. Sheng, N. Mi

Using a Tunable Knob for Reducing Makespan of Map Reduce Jobs in a Hadoop Cluster, The
IEEE International Conference on Cloud Computing (Cloud'13), Santa Clara Marriott, CA,
June, 2013

Deng Liu, Jianzhe Tai, Jack Lo, Ningfang Mi and Xiaoyun Zhu,

vFRM: Flash Resource Manager in VMware ESX Server, the IFIP/IEEE Network Operations and

Management Symposium (NOMS'14), Krakow, Poland, May 2014

Yi Yao, Jiayin Wang, Bo Sheng, Jason Lin, and Ningfang Mi,

HASTE: Hadoop YARN Scheduling Based on Task-Dependency and Resource-Demand, the IEEE
International Conference on Cloud Computing (Cloud'14), Alaska, USA, June 2014

Research Projects

CSR: EAGER: An Integrated Framework for Performance and Reliability in Large-Scaled Computing Systems
Principal Investigator, National Science Foundation

HOSSEIN MOSALLAEI

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of California, Los Angeles, 2001. Joined Northeastern in 2005

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Scholarship Focus

- Metamaterials and devices
- GHz-THz front-ends
- Photonic and quantum systems
- Computational electromagnetics and physics

Selected Recent Publications

Books and book chapters

C. Pelletti, R. K. Arya, A. Rashidi, H. Mosallaei, R. Mittra

Numerical Techniques for Efficient Analysis of FSSs, EBGs, and Metamaterials, Computational Electromagnetics–Recent Advances and Engineering Applications, Springer, 2013

Papers in refereed journals

J. Cheng, W. L. Wang, H. Mosallaei, E. Kaxiras

Surface Plasmon Engineering in Graphene Functionalized with Organic Molecules: A Multi Scale Theoretical Investigation, Nano Lett, 2013

D. Ansari O.B., M. Rostami, E. Chernobrovkina, S. K. Saikin, S. Valleau, H. Mosallaei, A. Aspuru Guzik

Parametric Hierarchical Matrix Approach for the Wide Band Optical Response of Large Scale Molecular Aggregates, Journal of Applied Physics, vol. 114, 164315, 2013

M. Farmahini-Farahani, J. Cheng, H. Mosallaei

Metasurfaces Nanoantennas for Light Processing, JOSA B, vol. 30, no. 9, p 2365 2370, 2013

B. Memarzadeh, H. Mosallaei

Multi Material Loops as the Building Block for a Functional Metasurface, JOSA B, vol. 30, no. 7, p 1827-1834, 2013

M. Farmahini-Farahani, H. Mosallaei

A Plasmonic MIM Frequency Diplexer, IEEE Trans. Nanotechnology, vol. 12, no. 3, p 361-367, May 2013

S. Saadat, H. Mosallaei, E. Afshari

A Radiation Efficient 60 GHz on Chip Dipole Antenna Realized by a Reactive Impedance Metasurface, IET Microwaves, Antennas & Propagation, vol. 7, issue 2 of MAP, p 98-104, 2013

S. Saadat, M. Adnan, H. Mosallaei, E. Afshari

Composite Metamaterial and Metasurface Integrated with non Foster Active Circuit Elements: A Bandwidth Enhancement Investigation, IEEE Trans. Antennas Propagat, vol. 61, no. 3, p 1210, 2013

M. Farmahini Farahani, H. Mosallaei

A Birefringent Reflectarray Meta-Surface for Beam Engineering in Infrared, Optics Letters, vol. 38, no. 4, Feb. 2013

M. Rostami, D. Ansari O.B., H. Mosallaei

Dispersion Diagram Analysis of Arrays of Multishell Multimaterial Nanospheres, PIERB, 48, p 77-98, 2013

A. Rashidi, H. Mosallaei, R. Mittra

Numerically Efficient Analysis of Array of Plasmonic Nanorods Illuminated by an Oblique Incident Plane Wave Using the Characteristic Basis Function Method, J. Comput. Theor. Nanosci. 10, p 427-445 2013

Papers in refereed conferences

H. Mosallaei

Photonic Materials by Design Computation, Materials Research Society, Fall Meeting, Boston, MA, Dec. 1-6, 2013

D. Ansari O.B., H. Mosallaei

Computation of Large Arrays of Plasmonic Metamaterials: A Model Profile Approach, IEEE AP-S International Symposium and USNC/URSI National Radio Science Meeting, Orlando, FL, 2013

M. Farmahini Farahani, H. Mosallaei

A Birefringent Reflect Array Metasurface for Beam Engineering in Infrared, Materials Research Society, Spring Meeting, San Francisco, CA, Apr. 1-5, 2013

J. Cheng, W. L. Wang, H. Mosallaei, E. Kaxiras

Graphene Metamaterial with Organic Molecular Patterning, Materials Research Society, Fall Meeting, Boston, MA, Dec. 1-6, 2013

Research Projects

3D Optical Metamaterials with Tunability and Low Loss

Co-Principal Investigator, Office of Naval Research

Dielectric and Plasmonic Particles Enabling Nanoscale Energy Engineering

Principal Investigator, Air Force Office of Scientific Research

Transformative Parameters Extreme Antennas: Active, Nonlinear, and Patterned Metamaterials Investigation

Principal Investigator, Office of Naval Research

Completed Dissertations Supervised

Babak Memarzadeh Isfahani

Plasmonic Metasurfaces with Tailored Linear and Nonlinear Building Blocks (see p 83)

MARK NIEDRE

Associate Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Toronto, 2004. Joined Northeastern in 2008

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Scholarship Focus

- Biomedical optics and non-invasive imaging
- Rare cell detection and tracking in the body
- Ultrafast time-domain diffuse optical imaging
- Image reconstruction and biomedical signal processing

Honors and Awards

Massachusetts Life Sciences Center New Investigator Award

Selected Recent Publications

Papers in refereed journals

S. Markovic, B. Li, V. Pera, O. Camps, M. Sznaier, M. Niedre

A Computer Vision Approach to Rare-Cell in Vivo Fluorescence Flow Cytometry, Cytometry A, 83 (12):1113-1123, 2013

V. Pera, E. Zettergren, D.H. Brooks, M. Niedre

Maximum Likelihood Tomographic Reconstruction of Extremely Sparse Solutions in Diffuse Fluorescence Flow Cytometry, Optics Letters, 38 (13): 2357-2359, 2013

N. Pestana, L. Mortensen, J. Runnels, D. Vickers, S.K. Murthy, C.P. Lin, M. Niedre

Improved Diffuse Fluorescence Flow Cytometer Prototype for High Sensitivity Detection of Rare Circulating Cells in Vivo, Journal of Biomedical Optics, 18 (7): 77002, 2013

Y. Mu, N. Valim, M. Niedre

Evaluation of a Fast Single-Photon Avalanche Photodiode for Measurement of Early Transmitted Photons Through Diffusive Media, Optics Letters, 38 (12): 2098-2100, 2013

N. Pestana, D. Walsh, A. Hatch, P. Hahn, G.J. Jaffe, S.K. Murthy, M. Niedre

A Dedicated Low-Cost Fluorescence Microfluidic Device Reader for Point-of-Care Ocular Diagnostics, Journal of Medical Devices, 7 (2): 024501, 2013

N. Valim, J. Brock, M. Leeser, M. Niedre

The Effect of Temporal Impulse Response on Experimental Reduction of Photon Scatter in Time-Resolved Diffuse Optical Tomography, Physics in Medicine and Biology, 58 (2): 335-349, 2013

Research Projects

Ultra-Fast Time-Domain Multiplexed Fluorescence Tomography

Principal Investigator, National Institutes of Health

Completed Dissertations Supervised

Niksa Valim

Instrumentation and Methods for Time-Resolved Diffuse Fluorescence Imaging (see p 87)

FACULTY

MARVIN ONABAJO

Assistant Professor, Electrical and Computer Engineering

PhD, Texas A&M University, 2011. Joined Northeastern in 2011

617.373.3452 | monabajo@ece.neu.edu | ece.neu.edu/~monabajo

Scholarship Focus

- Design of analog, radio frequency and mixed-signal integrated circuits

- Built-in test and calibration techniques for systems-on-a-chip

- On-chip temperatures sensors for thermal monitoring and built-in testing

Selected Recent Publications

Papers in refereed journals

C.H. Chang, M. Onabajo
    IIP3 Enhancement of Subthreshold Active Mixers, IEEE Trans. on Circuits and
    Systems II: Express Briefs, vol. 60, no. 11, p 731-735, Nov. 2013

C.H. Chang, M. Onabajo
    Input Impedance Matching Optimization for Adaptive Low-Power Low-Noise Amplifiers, Analog
    Integrated Circuits and Signal Processing, vol. 77, no. 3, p 583-592, Dec. 2013

C.-J. Park, M. Onabajo, J. Silva-Martinez
    External Capacitor-Less low Drop-out Regulator with 25dB Superior Power Supply Rejection in the 0.4-
    4MHz Range, IEEE J. Solid-State Circuits, vol. 27, no. 2, p 486-501, Feb. 2014

Y. Ni, M. Onabajo
    A Low-Power Temperature-Compensated CMOS Relaxation Oscillator, Analog Integrated Circuits and
    Signal Processing, vol. 79, no. 2, p 309-317, May 2014

Papers in refereed conferences

I.S. Jung, M. Onabajo, Y.B. Kim
    A 10-bit 64MS/s SAR ADC Using Variable Clock Period Method, in Proc. IEEE Intl. Midwest Symp.
    on Circuits and Systems (MWSCAS), Aug. 2013

C.H. Chang, M. Onabajo
    Linearization of Subthreshold Low-Noise Amplifiers, in Proc. IEEE Intl. Conf. on Circuits and
    Systems (ISCAS), p 377-380, May 2013

C.J. Park, H. M. Geddada, A. I. Karsilayan, J. Silva-Martinez, M. Onabajo
    A Current-Mode Flash ADC for Low-Power Continuous-Time Sigma Delta Modulators, in Proc. IEEE
    Intl. Conf. on Circuits and Systems (ISCAS), p 141-144, May 2013

P. Grossmann, M. Leeser, M. Onabajo
    Minimum Energy Operation For Clustered Island-Style FPGAs, in Proc. 21st ACM/SIGDA
    International Symposium on Field-Programmable Gate Arrays (FPGA 2013), p 157-165, 2013

Research Projects

Integrated Self-Calibrated Analog Front-End for Biopotential and Bioimpedance Measurements
    Principal Investigator, National Science Foundation

RF Power Amplifier Linearization with Digital Predistortion
    Principal Investigator, Analog Devices, Inc. (Lyric Labs)

Compact & Power Efficient Integrated Voltage Tunable RF Inductors & Transformers with Wide Tunable
Inductance Range
    Principal Investigator, Northeastern Subcontract from Winchester Technologies, LLC (SBIR, National
    Science Foundation)

CAREY RAPPAPORT

COE Distinguished Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Massachusetts Institute of Technology, 1987. Joined Northeastern in 1987

617.373.2043 | rappaport@ece.neu.edu | ece.neu.edu/faculty/rappaport

Scholarship Focus
- Antenna design
- Wave propagation in complex media
- Biomedical microwaves device design and analysis
- Subsurface sensing system design and integration
- Concealed object detection for security applications

Honors and Awards
- Fellow, Institute of Electrical and Electronics Engineers
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
> On the use of Improved Imaging Techniques for the Development of a Multistatic Three-Dimensional Millimeter-Wave Portal Based Imaging for Personnel Screenings, Progress in Electromagnetics Research, vol. 138, p 83-98, 2013

B. Gonzalez-Valdes, Y. Alvarez, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
> SAR Processing for Profile Reconstruction and Characterization of Dielectric Objects on the Human Body Surface, Progress In Electromagnetics Research, vol. 138, p 269-282, 2013

Y. Alvarez, B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, F. Las-Heras, C. Rappaport
> An Improved SAR Based Technique for Accurate Profile Reconstruction, IEEE Transactions on Antennas and Propagation (TAP), vol. 61, No. 3, p 1490 – 1495, March 2013

J.A. Martínez Lorenzo, Y. Rodríguez-Vaqueiro, C. Rappaport, O. Rubinos Lopez, O., G. Pino
> A Compressed Sensing Apoach for Detection of Explosive Threats at Standoff Distances, Using a Passive Array of Scatterers, Homeland Security Affairs, Supement 6, Article 1, p 1 - 6, 2013

Y. Álvarez, J. Laviada, L. Tirado, C. García, J.A. Martínez-Lorenzo, F. Las- Heras, C. Rappaport
> Inverse Fast Multipole Method for Monostatic Imaging Applications, Geoscience and Remote Sensing Letters, vol. 10, no. 5, p 1239-1243, Sept. 2013

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport
> A New Fast Algorithm for Radar-Based Shape Reconstruction of Smoothly Varying Objects, IEEE Antennas and Wireless Propagation Letters, vol.12, no., p 484-487, 2013

Y. Rodríguez-Vaqueiro, Y. Álvarez, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, F. Las-Heras, C. Rappaport
> On the Use of Compressed Sensing Techniques for Improving Multistatic Three-dimensional Millimeter-Wave Portal-Based Personnel Screening, IEEE (TAP), vol. 62, no. 1, p 494 - 499

B. Gonzalez Valdes, G. Allan, Y. Rodriguez-Vaqueiro, Y. Álvarez, S. Mantzavinos, M. Nickerson, J.A. Martinez Lorenzo, F. Las-Heras, C. Rappaport
> Sparse Array Optimization using Simulated Annealing and Compressive Sensing for Near-Field Millimeter Wave Imaging, IEEE Transactions on Antennas and Propagation, vol. PP, no. 99, 2013

Y. Álvarez, Y. Rodriguez-Vaqueiro, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, F. Las-Heras, C. Rappaport
> Phase Error Compensation in Imaging Systems Using Compressed Sensing Techniques, IEEE Antennas and Wireless Propagation Letters, vol. 12, no. 12, Dec. 2013, p 1574 - 1577

Papers in refereed conferences

S. Mantzavinos, B. Gonzalez Valdes, D. Busuioc, M. Nickerson, R. Miller, J.A. Martinez-Lorenzo, C. Rappaport
> Low-Cost, Fused Millimeter-Wave and 3D Point Cloud Imaging for Concealed Threat Detection, Gordon Research Conference: Detecting Illicit Substances, Drugs and Explosives, May 2013

C. Rappaport, A. Morgenthaler
> A Simple and Accurate Means of Predicting the Locus of Constant Travel Time of an Underground

Scatterer for Air-Launched Bistatic GPR, International Geoscience and Remote Sensing Symposium (IGARS), July 2013, p 3537 - 3541

M. Hines, C. Rappaport
Localization of Anti-Personnel Landmines using Computationally Modeled Data for Bistatic Ground-Coupled Ground Penetrating Radar, (IGARSS), July 2013, p 4070 - 4073

M. Tajdini, C. Rappaport
Analytic Analysis of Ground Penetrating Radar Wave Scattering of Reinforced Concrete Bridge Decks, (IGARSS), July 2013, p 4066 - 4069

A. Morgenthaler, C. Rappaport
Fast GPR Underground Shape Anomaly Detection Using the Semi-Analytic Mode Matching Algorithm, (IGARSS)

M. Tajdini, C. Rappaport
An Efficient Forward Model of Ground Penetrating Radar for Sensing Deteriorated Bridge Decks, IEEE International Antennas and Propagation Symposium, July 2013, p 1022 - 1023

J.A. Martinez-Lorenzo, R. Obermeier, F. Quivira, C. Rappaport, R. Moore, D. Kopans
Fusing Digital-Breast-Tomosynthesis and Nearfield-Radar-Imaging Information for a Breast Cancer Detection Algorithm, IEEE International Antennas and Propagation Symposium, 2013 p. 2038-2039

J.A. Martinez-Lorenzo, A. Basukoski, F. Quivira, C. Rappaport, R. Moore, D. Kopans
Composite Models for Microwave Dielectric Constant Characterization of Breast Tissues, IEEE International Antennas and Propagation Symposium, July 2013, p 2036 - 2037

S. Mantzavinos, B. Gonzalez-Valdes, D. Busuioc, R. Miller, J.A. Martinez-Lorenzo, C. Rappaport
Low-Cost, Fused Millimeter-Wave and 3D Point Cloud Imaging for Concealed Threat Detection, IEEE International Antennas and Propagation Symposium, July 2013, p 1014 - 1015

A. García Pino, B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport
Scanned Blade Beam Reflector Antenna for Nearfield Imaging, IEEE IAPS, July 2013, p 950 - 951

Y. Rodriguez-Vaqueiro, B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport, Y. Álvarez, F. Las-Heras
Compressed Sensing Techniques for Multistatic Three-dimensional Millimeter-Wave Personnel Screening, IEEE International Antennas and Propagation Symposium, July 2013, p 534-535

Y. Álvarez, F. Las-Heras, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, C. Rappaport
Low Permittivity Dielectric Object on Conductor Characterization, IEEE IAPS, July 2013, p 822 - 823

Y. Álvarez, F. Las-Heras, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, C. Rappaport
Accurate Profile Reconstruction Using An Improved SAR Based Technique, IEEE International Antennas and Propagation Symposium (IAPS), July 2013, p 818 - 819

B. Gonzalez-Valdes, J.A. Martinez-Lorenzo, C. Rappaport
Dual Band SAR Processing for Low Dielectric Contrast Buried IED Detection, IEEE IAPS, p 1080

C. Rappaport, B. Gonzalez-Valdes, G. Allan, J.A. Martínez-Lorenzo
Optimizing Element Positioning in Sparse Arrays for Nearfield Mm-Wave Imaging, IEEE Phased Array Conference, October 13-16, 2013, p 333-335

Y. Álvarez, F. Las-Heras, B. Gonzalez-Valdes, J.A. Martínez-Lorenzo, C. Rappaport
Material Characterization Using A Millimeter Wave Portal-Based Imaging System for Security Screening, IEEE Homeland Security Technology Conference, October 2013, p 511 - 516

Research Projects

Awareness and Localization of Explosive-Related Threats (ALERT)
Co-Principal Investigator, Department of Homeland Security

Walking Robot Based Ground Penetrating Radar Sensor for Mine and IED Detection,
Principal Investigator, National Science Foundation

Microwave Nearfield Radar Imaging (NRI) Using Digital Breast Tomosynthesis (DBT) for Non-Invasive Breast Cancer Detection,
Co-Principal Investigator, National Science Foundation

PURNIMA RATILAL

Associate Professor, Electrical and Computer Engineering, affiliated faculty, Bioengineering

PhD, Massachusetts Institute of Technology, 2002. Joined Northeastern in 2004

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Scholarship Focus

- Remote sensing
- Wave propagation and scattering in random media and multi-path environments
- Temporal and spatial signal processing
- Statistical inference theory
- Acoustical oceanography
- Fisheries and marine mammal acoustics
- Nonlinear scattering theory

Honors and Awards

- Presidential Early Career Award for Scientists and Engineers
- Office of Naval Research Young Investigator Award

Selected Recent Publications

Papers in refereed journals

Z. Gong, D. Tran, P. Ratilal

Comparing Passive Source Localization and Tracking Approaches With a Towed Horizontal Receiver Array in an Ocean Waveguide, J. Acoust. Soc. Am., vol 134, 3705-3720, 2013

Z. Gong, T. Chen, P. Ratilal, N. Makris

Temporal Coherence of the Acoustic Field Forward Propagated Through a Continental Shelf with Random Internal Waves, J. Acoust Soc. Am., vol. 134, 3476-3485, 2013

A. Jain, A. Ignisc

Feasibility of Ocean Acoustic Waveguide Remote Sensing (OAWRS) of Atlantic Cod with Seafloor Scattering Limitations, Remote Sens. vol. 6 (1), 180-208, 2013

D. Tran, W. Huang, A. Bohn, D. Wang, Z. Gong, N. Makris, P. Ratilal

Range Localization, Classification and Shallow-Water Dive Profiling of Sperm Whales With a Low-Frequency Coherent Horizontal Receiver Array, J. Acoust. Soc. Am., Vol. 135, 3352-3363, January 2014

Research Projects

Development of a Lightweight Towed Array Receiver (LTAR) for Wide-Area Ocean Monitoring and Imaging

Principal Investigator, National Science Foundation

Supemental Funding Request: Sea Test and Design of Vibration Isolation Module of National Science Foundation-MRI funded Lightweight Towed Receiver Array (LTAR)

Principal Investigator, National Science Foundation

Enhancing Long Range Sonar Performance in Range-Dependent Fluctuating Ocean Waveguides by Mitigating Biological Clutter and Environmental Reverberation

Principal Investigator, Department of Defense

Instantaneous Passive And Active Detection, Localization, Monitoring And Classification Of Marine Mammals Over Long Ranges With High-Resolution Towed Array Measurements

Principal Investigator, National Science Foundation

Unified Four-Dimensional Multi-Resolution Oceanographic, Acoustic and Atmospheric Modeling and Dynamics

Collaborator, Office of Naval Research

FACULTY

MATTEO RINALDI

Assistant Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Pennsylvania, 2010. Joined Northeastern in 2012

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Scholarship Focus

- Micro/nano electromechanical systems (MEMS/NEMS)
- Chemical, physical and biological sensors
- Radio frequency wireless communication devices
- Piezoelectric materials
- Nano-materials and nano-structures

Honors and Awards

- National Science Foundation CAREER Award
- Defense Advanced Research Projects Agency Young Faculty Award

Selected Recent Publications

Papers in refereed journals

T. Nan, Y. Hui, M. Rinaldi, N.Sun
Self-Biased 215MHz Magnetoelectric NEMS Resonator for Ultra-Sensitive DC Magnetic Field Detection, Scientific Reports, article 1985, 2013

Y. Hui, M. Rinaldi
Fast and High Resolution Thermal Detector Based on an Aluminum Nitride Piezoelectric Micro-Electromechanical Resonator with an Integrated Suspended Heat Absorbing Element, Applied Physics Letters, 102, 093501, 2013

Y. Hui, T. Nan, N. Sun, M. Rinaldi
High Resolution Magnetometer Based on a High Frequency Magnetoelectric MEMS-CMOS Oscillator, IEEE/ASME, Journal of Microelectromechanical Systems (JMEMS), 2014

Papers in refereed conferences

Z. Qian, Y. Hui, F. Liu, S. Kar, M. Rinaldi
245 MHz Graphene-Aluminum Nitride Nano Plate Resonator, Proceedings of the 17th International Conference on Solid-State Sensors, Actuators and Microsystems, Transducers 2013, p 2005-2008

Y. Hui, T. X. Nan, N. X. Sun, M. Rinaldi
MEMS Resonant Magnetic Field Sensor Based on an AlN/FeGaB Bilayer Nano-Plate Resonator, Proceedings of the 26th IEEE International Conference on Micro Electro-Mechanical Systems (MEMS 2013), Taipei, p 721-724

G. Hummel, Y. Hui, Z. Qian, M. Rinaldi
Switchable Aluminum Nitride MEMS Resonator Using Phase Change Materials, Proceedings of the 2014 Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head, 2014, p 431-434

Y. Hui, Z. Qian, G. Hummel, M. Rinaldi
Pico-Watts Range Uncooled Infrared Detector Based on a Freestanding Piezoelectric Resonant Microplate with Nanoscale Metal Anchors, Proceedings of the 2014 Solid-State Sensors, Actuators and Microsystems Workshop,Hilton Head, 2014, p 387-390

Research Projects

Un-Cooled Nanomechanical Infrared/THz Detectors Based on Piezoelectric Resonant Nano Plates
Principal Investigator, Defense Advanced Research Projects Agency (Young Faculty Award)

Nano Electro Mechanical Resonant Sensing Platform for Chip Scale, High Resolution and Ultra-Fast Terahertz Spectroscopy and Imaging
Principal Investigator, National Science Foundation (CAREER Award)

Intrinsically Switchable and Programmable MEMS Filter Array
Principal Investigator, Defense Advanced Research Projects Agency

WILLIAM ROBERTSON

Assistant Professor, Computer & Information Science; jointly appointed, Electrical and Computer Engineering, PhD, University of California, 2009. Joined Northeastern in 2011

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Scholarship Focus

- Security and privacy of operating systems, mobile and embedded devices, and web applications
- Malware and vulnerability analysis
- Anomaly and intrusion detection

Selected Recent Publications

Papers in refereed conferences

A. Cassola, W. Robertson, E. Kirda, G. Noubir
A Practical, Targeted, and Stealthy Attack Against WPA Enterprise Authentication, in Proceedings of the Network and Distributed System Security Symposium (NDSS), San Diego, CA USA, February 2013

K. Onarlioglu, C. Mulliner, W. Robertson, E. Kirda
PrivExec: Private Execution as an Operating System Service, in Proceedings of the IEEE Symposium on Security and Privacy, San Francisco, CA USA, May 2013

K. Onarlioglu, M. Battal, W. Robertson, E. Kirda
Securing Legacy Firefox Extensions with Sentinel, in Proceedings of the International Conference on Detection of Intrusions and Malware and Vulnerability Assessment (DIMVA), Berlin, July 2013

T. Lauinger, K. Onarlioglu, A. Chaabane, E. Kirda, W. Robertson, M. Kaafar
Holiday Pictures or Blockbuster Movies? Insights into Copyright Infringement in User Uploads to One-Click File Hosters, in Proceedings of the International Symposium on Research in Attacks, Intrusions, and Defenses (RAID), St. Lucia, LC, October 2013

T.-F. Yen, A. Oprea, K. Onarlioglu, T. Leetham, W. Robertson, A. Juels, E. Kirda
Beehive: Large-Scale Log Analysis for Detecting Suspicious Activity in Enterprise Networks, in Proceedings of the Annual Computer Security Applications Conference (ACSAC), New Orleans, LA USA, December 2013

C. Mulliner, J. Oberheide, W. Robertson, E. Kirda
PatchDroid: Scalable Bird-Party Patches for Android Devices, in Proceedings of the Annual Computer Security Applications Conference (ACSAC), New Orleans, LA, USA, December 2013

C. Mulliner, W. Robertson, E. Kirda
Hidden GEMs: Automated Discovery of Access Control Vulnerabilities in Graphical User Interfaces, in Proceedings of the IEEE Symposium on Security and Privacy (Oakland), San Jose, CA USA, May 2014

A. Kharraz, E. Kirda, W. Robertson, D. Balzarotti, A. Francillon
Optical Delusions: A Study of Malicious QR Codes in the Wild, in Proceedings of the IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), Atlanta, GA USA, June 2014

C. Mulliner, W. Robertson, E. Kirda
VirtualSwindle: An Automated Attack Against In-App Billing on Android, in Proceedings of the ACM Symposium on Information, Computer and Communications Security (ASIACCS), Kyoto, JP, June 2014

FACULTY

MASOUD SALEHI

Associate Professor, Electrical and Computer Engineering

PhD, Stanford University, 1979. Joined Northeastern in 1989

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Scholarship Focus

- Information theory
- Coding
- Digital communications

Selected Recent Publications

Books and book chapters

J.G. Proakis, M. Salehi

Fundamentals of Communication Systems, Second Edition, Published by Pearson, 2013

Papers in refereed conferences

K. Firouzbakht, G. Noubir, M. Salehi

On the Performance of Multi-Layer Superposition Coding Scheme Under Constrained Jamming, Proceedings of the 47th annual conference on Information Sciences and Systems, March 20-22, 2013, Baltimore, MD

O. Vahabzadeh, M. Salehi

A Novel Two-User Cooperation Scheme for Cooperative Communications Based on Protograph-Based Low-Density Parity-Check (LDPC) Codes, Proceedings of the 47th annual conference on Information Sciences and Systems, March 20-22, 2013, Baltimore, MD

K.L. Huang, V. Gaudet, M. Salehi

A Scaling Method for Stochastic LDPC Decoders with Binary Symmetric Channel, Proceedings of the 47th annual conference on Information Sciences and Systems, 2013, Baltimore, MD

Kuo-Lun Huang, Vincent Gaudet, Masoud Salehi

Output Decisions for Stochastic LDPC Decoders, Proceedings of the 48th Annual Conference on Information Sciences and Systems, Princeton, New Jersey, March 21-23 2014

Completed Dissertations Supervised

Yuegian Li

Code Design for SISO and MIMO Block-Fading Channels

Osso Vahabzadeh

Efficient Low-Density Parity-Check Codes for Cooperative Communication

GUNAR SCHIRNER

Assistant Professor, Electrical and Computer Engineering

PhD, University of California, Irvine, 2008. Joined Northeastern in 2009

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Scholarship Focus

- Design of embedded computer systems
- System-level design automation, hardware / software co-design
- Architectures and technology solutions for embedded vision
- Design of cyber-physical systems

Selected Recent Publications

Books and Book Chapters

G. Schirner, M. Götz, A. Rettberg, M. Zanella, F. J. Rammig
Embedded Systems: Design, Analysis and Verification, vol/lev. 403, Springer, 2013

R. Birken, J. Zhang, G. Schirner
System Level Design of a Roaming Multi-Modal Multi-Sensor System, in Sensor Technologies for Civil Infrastructures: Performance Assessment and Health Monitoring, Ming L. Wang; Jerome P. Lynch, and Hoon Sohn (Editors), April 2014

Papers in refereed journals

G. Schirner, D. Erdogmus, K. Chowdhury, T. Padir
The Future of Human-in-the-Loop Cyber-Physical Systems, IEEE Computer, vol/lev. 46, pp. 36-45, 2013

H. Tabkhi, R. Bushey and G. Schirner
Function-Level Processor (FLP): A High Performance, Minimal Bandwidth, Low Power Architecture for Market-Oriented MPSoCs, IEEE Embedded Systems Letters, 05/2014

Papers in refereed conferences

H. Tabkhi, R. Bushey, G. Schirner
Algorithm and Architecture Co-Design of Mixture of Gaussian (MoG) Background Subtraction for Embedded Vision, Proceedings of the Asilomar Conference on Signals, Systems, and Computers (AsilomarSSC), Nov. 2013

R. Bushey, H. Tabkhi, G. Schirner
Flexible Function-Level Acceleration of Embedded Vision Applications using the Pipelined Vision Processor, Proceedings of the Asilomar Conference on Signals, Systems, and Computers Nov. 2013

J. Zhang, G. Schirner
Joint Algorithm Developing and System-Level Design: Case Study on Video Encoding, Proceedings of the International Embedded Systems Symposium (IESS), June 2013

Y. Ukidave, A. Ziabari, P. Mistry, G. Schirner, D. Kaeli
Quantifying the Energy Efficiency of FFT on Heterogeneous Platforms, IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS), Apr. 2013

H. Tabkhi, R. Bushey, G. Schirner
Function-Level Processor (FLP): Raising Efficiency by Operating at Function Granularity for Market-Oriented MPSoCs, IEEE International Conference on Application-specific Systems, Architectures and Processors (ASAP), Zurich, Switzerland, 2014

FACULTY

C. Zhang, H. Tabkhi, G. Schirner

  A GPU-based Algorithm-specific Optimization for High-performance Background Subtraction, International Conference on Parallel Processing, Minneapolis, MN, 2014

J. Zhang and G. Schirner

  Automatic Specification Granularity Tuning for Design Space Exploration, Proceedings of the ACM/IEEE Conference on Design, Automation & Test in Europe (DATE), Dresden, Germany, 03/2014

J. Zhang, H. Qiu, S. Shamsabadi Shamsabadi, R. Birken and G. Schirner

  SIROM - A Scalable Intelligent ROaming Multi-Modal Multi-Sensor Framework, Computer Software and Applications Conference (COMPSAC), 07/2014

Research Projects

CPS: Medium: Collaborative Research: Holistic Design Methodology for Automated Implementation of Human-in-the-Loop Cyber-Physical Systems

  Principal Investigator, National Science Foundation

SHF: Small: Power Efficient Emerging Heterogeneous Platforms

  Principal Investigator, National Science Foundation

Versatile Onboard Traffic Embedded Roaming Sensors (VOTERS)

  Technical Lead for System Integration, National Institute of Standards and Technology

Designing Green Software for High-Performance Computing Clusters

  Sole Principal Investigator, Massachusetts Green High Performance Computing Center

System-Level Estimation for MPSoC Design

  Sole Principal Investigator, Analog Devices Inc

Simplifying BSP Integration Through Simulink Abstract Devices

  Sole Principal Investigator, Mathworks

Bringing Model-based HW/SW Co-Design into the ECE Experience

  Sole Principal Investigator, Mathworks

Integrating an Active Learning Platform into the ECE Curriculum

  Co-Principal Investigator, Analog Devices Inc

Integrating the Personal Active Learning Platform: Advancing the Department of Electrical and Computer Engineering through Curriculum Innovation

  Principal Investigator, David House Foundation

PHILIP SERAFIM

Professor, Electrical and Computer Engineering

ScD, Massachusetts Institute of Technology, 1963. Joined Northeastern in 1985

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Scholarship Focus

- Electromagnetics

- Nonlinear optics

- Microwaves

- Remote sensing

- Electrodynamics of random media

- Plasma turbulence

- Ionospheric scintillations

- Gaseous lasers

FACULTY

BAHRAM SHAFAI

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, George Washington University, 1985. Joined Northeastern in 1985

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Scholarship Focus

- Control systems and signal processing
- Robust and optimal control
- Stability and control of time delay systems, positive systems, multi-agent systems

Honors and Awards

- Associate Editor of IEEE Transactions on Systems
- Senior Member, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Papers in refereed journals

R. Ghadami, B. Shafai

Decomposition-Based Distributed Control for Continuous-Time Multi-Agent Systems, IEEE Transaction on Automatic Control, vol. 58, no. 1, p 258-264, Jan. 2013

Papers in refereed conferences

B. Shafai, R. Ghadami

A Two-Step Procedure for Optimal Constrained Stabilization of Linear Continuous-Time Systems, Proceedings of 21st Mediterranean Conference on Control and Automation (MED 2013), Chania, Crete, Greece, p 910-915, 2013

P.M. Nia, R. Sipahi, B. Shafai

On Controller Design for Delay-Independent Stability of Linear Time-Invariant Systems with Multiple Delays, Proceedings of 2013 European Control Conference (ECC), Zurich, Switzerland, p 4406-4411, 2013

A.B. Farjadian, M.J. Yazdanpanah, B. Shafai

Application of Reinforcement Learning in Sliding Mode Control for Chattering Reduction, Proceedings of the World Congress in Engineering 2013, London, England, p 743-747, 2013

M. Alavi, M. Saif, B. Shafai

State Estimation in Discrete-Time Nonlinear Stochastic Systems Subject to Random Data Loss, Proceeding of 2013 Asian Control Conference, Istanbul, Turkey, p 1-5, 2013

K. Bekiroglu, M. Sznaier, C. Lagoa, B. Shafai

Vision Based Control of an Autonomous Blimp with Actuator Saturation Using Pulse-Width Modulation, Proceedings of 2013 IEEE Multi-Conference on Systems and Control (MSC), Hyderabad, India, p. 433-438, 2013

B. Shafai, R. Ghadami, A. Oghbaee

Constrained Stabilization with Maximum Stability Radius for Linear Continuous-Time Systems, Proceeding of 52nd IEEE Conference on Decision and Control, Florence, Italy, p 3415-3420, 2013

Completed Dissertations Supervised

Pascal Maurice Brunet

Nonlinear System Modeling and Identification of Loudspeakers (see p 74)

MICHAEL SILEVITCH

Robert D. Black Professor, COE Distinguished Professor, Electrical and Computer Engineering; affiliated faculty, Civil and Environmental Engineering, PhD, Northeastern University, 1971. Joined Northeastern in 1972

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Scholarship Focus

- Subsurface sensing and imaging
- Medical and security screening systems
- Multi-partner large center development

Honors and Awards

Life Fellow, Institute of Electrical and Electronics Engineers

Research Projects

Awareness and Localization of Explosives Related Threats (ALERT), a Department of Homeland Security Center of Excellence. ALERT seeks to conduct transformational research, technology and educational development for effective characterization, detection, mitigation and response to the explosives-related threats facing the country and the world

Director and Principal Investigator, Department of Homeland Security

Puerto Rico Testsite to Explore Contaminant Threats (PROTECT), a National Institute of Environmental Health Sciences Superfund Research Center. PROTECT investigates the relationship between environmental contamination and preterm birth

Research Translation Core co-Leader, National Institutes of Health

The Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems, A Graduated NSF Engineering Research Center. Gordon-CenSSIS was created to develop new technologies to detect hidden objects, and to use those technologies to meet real-world subsurface challenges in areas as diverse as noninvasive breast cancer detection and underground pollution assessment

Director and Principal Investigator, National Science Foundation

Research and Development of Reconstruction Advances in CT Based Object Detection Systems

Principal Investigator, Department of Homeland Security

DAGMAR STERNAD

Professor, Biology; jointly appointed: Electrical and Computer Engineering, Physics; affiliated faculty, Bioengineering, PhD, University of Connecticut, 1995. Joined Northeastern in 2008

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Scholarship Focus

- Control and coordination of goal-directed human behavior
- Single and multi joint human movements including upper limb manipulation tasks and locomotion examined in virtual environments

Selected Recent Publications

Papers in refereed journals

S.-W. Park, T. Dijkstra, D. Sternad
Learning to Never Forget: Time Scales and Specificity of Long-Term Memory of a Motor Skill, Frontiers in Computational Neuroscience, 7:111, 2013

D. Sternad, H. Marino, M. Duarte, L. Dipietro, S. Charles, N. Hogan
Transitions Between Discrete and Rhythmic Primitives in a Unimanual Task, Frontiers in Computational Neuroscience, 7:90, 2013

N. Hogan, D. Sternad
Dynamic Primitives in the Control of Locomotion, Frontiers in Computational Neuroscience, 7:71, 2013

M.O. Abe, D. Sternad
Directionality in Distribution and Temporal Structure of Variability in Skill Acquisition, Frontiers in Human Neuroscience, 7:225, 2013

W.T.V. Chu, D. Sternad, T.D. Sanger
Healthy and Dystonic Children Compensate for Changes in Motor Variability, Journal of Neurophysiology, 109, 8, 2169-2178, 2013

Papers in refereed conferences

M.E. Huber, M. Leeser, D. Sternad
Development of a Low-Cost, Adaptive, Clinician-Friendly Virtual Rehabilitation System, Proceedings for the 10th International Conference on Rehabilitation, Philadelphia, PA, August 26-29, 2013

Research Projects

Variability and Stability in Skill Acquisition
Principal Investigator, National Institutes of Health

PRISM: Attracting Students to Mathematics, Physics and Biology Through Interdisciplinary Research and Discovery
Co-Principal Investigator, National Science Foundation

Multi-Joint Intelligent Prosthesis Based on EMG Control
Co-Investigator, University of Beijing

Development of an Adaptive Clinician-Friendly Virtual Rehabilitation System and its Evaluation in Post-Operative Shoulder Therapy
Principal Investigator, Northeastern University

Prosody in Congenital and Acquired Dysarthria
Co-Investigator, National Institutes of Health

Training Dual-Task Walking After Stroke: Effects on Attentional and Locomotor Control
Co-Investigator, American Heart Association

MILICA STOJANOVIC

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Northeastern University, 1993. Joined Northeastern in 2008

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Scholarship Focus

- Communications
- Signal processing
- Wireless networks

Honors and Awards

Fellow, Institute of Electrical and Electronics Engineers

Selected Recent Publications

Papers in refereed journals

E. Zorita, M. Stojanovic

Space-Frequency Block Coding for Underwater Acoustic Communications, IEEE Journal of Oceanic Engineering, Special Issue on Underwater Communications

P. Qarabaqi, M. Stojanovic

Statistical Characterization and Computationally Efficient Modeling of a Class of Underwater Acoustic Channels, IEEE Journal of Oceanic Engineering, Special Issue on Underwater Communications, vol. 38, No. 4, October 2013, p 701-717

A. Radosevic, R. Ahmed, T. Duman, J. Proakis, M. Stojanovic

Adaptive OFDM modulation for Underwater Acoustic Communications: Design Considerations and Experimental Results, IEEE Journal of Oceanic Engineering, 2013

C. Murphy, J. Walls, T. Schneider, R. Eustice, M. Stojanovic, H. Singh

CAPTURE: A Communications Architecture for Progressive Transmission via Underwater Relays with Eavesdropping, IEEE Journal of Oceanic Engineering, vol. 39, No.1, January 2014, p 120-130

F. Fazel, M. Fazel, M. Stojanovic

Random Access Compressed Sensing over Fading and Noisy Communication Channels, IEEE Transactions on Wireless Communications, vol.12, No.5, May 2013, p 2114-2125

K. Tu, T. Duman, M. Stojanovic, J. Proakis

Multiple Resampling Receiver Design for OFDM over Doppler-Distorted Underwater Acoustic Channels, IEEE Journal of Oceanic Engineering, vol.38, No.2, April 2013, p 333-346

D. Lucani, M. Medard, M. Stojanovic

Capacity Scaling Laws for Underwater Networks, Journal of Internet Mathematics, vol. 9, No. 2-3, June 2013, p 241-264

W.Y. Shin, D. Lucani, M. Medard, M. Stojanovic, V. Tarokh

On the Order Optimality of Large-Scale Underwater Networks Part I: Extended Network Model, Springer: Wireless Personal Communications, vol. 71, No. 3, August 2013, p 1683-1700

Papers in refereed conferences

B. Reed, J. Leighton, M. Stojanovic, F. Hover

Multi-Vehicle Dynamic Pursuit using Underwater Acoustics, in Proc. International Symposium on Robotics Research (ISRR), Singapore, December 2013

MILICA STOJANOVIC continued

FACULTY

P. Ponnavaikkoy, K. Yassiny, S.K. Wilsony, M. Stojanovicz, J. Holliday
Energy Optimization with Delay Constraints in Underwater Acoustic Networks, in Proc. IEEE Globecom Conference, Atlanta, GA, December 2013

K. Kerse, F. Fazel, M. Stojanovic
Target Localization and Tracking in a Random Access Sensor Network, invited paper, in Proc. 47th Asilomar Conference on Signals, Systems and Computers, November 2013

D. Parker, M. Stojanovic, C. Yu
Exploiting Temporal and Spatial Correlation in Wireless Sensor Networks, in Proc. 47th Asilomar Conference on Signals, Systems and Computers, November 2013

P. Qarabaqi, Y. Aval, M. Stojanovic
Computationally Efficient Simulation of Underwater Acoustic Communications, in Proc. IEEE Oceans 2013 Conference, San Diego, CA, October 2013

R. Ahmed, M. Stojanovic
Random Linear Packet Coding for Fading Channels, in Proceedings of IEEE Oceans 2013 Conference, San Diego, CA, October 2013

Y. Aval, M. Stojanovic
Partial FFT Demodulation for Coherent Detection of OFDM Signals Over Underwater Acoustic Channels, in Proceedings of IEEE Oceans'13 Europe Conference, Bergen, Norway, June 2013

F. Fazel, M. Stojanovic
Resource Allocation for Hierarchical Underwater Sensor Networks, in Proc. Information Theory and Applications Workshop (ITA), San Diego, CA, February 2013

Research Projects

Intelligent Coordination and Adaptive Classification for Naval Autonomous Systems
Principal Investigator, Office of Naval Research

MURI: Underwater Acoustic Propagation and Communications: A Coupled Research Program
Principal Investigator, Office of Naval Research

NeTS: Large: Collaborative Research: Exploration and Exploitation in Actuated Communication
Principal Investigator, National Science Foundation

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NIAN SUN

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Stanford University, 2002. Joined Northeastern in 2004

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Scholarship Focus

- Magnetic, ferroelectric and magnetoelectric materials
- RF/microwave magnetic and magnetoelectric devices design, fabrication and testing
- Materials properties at RF/microwave frequency range
- Self-assembly of magnetic nanostructure

Honors and Awards

- Fellow, Institute of Physics
- Fellow, Institute of Engineering and Technology
- Office of Naval Research Young Investigator Award
- National Science Foundation CAREER Award
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Books and book chapters

X. Xing, N. Sun

Nonlinear Vibration Energy Harvesting with High-Permeability Magnetic Materials, in Advances in Energy Harvesting Methods, Springer, p 437-455, 2013

Papers in refereed journals

Z. Zhou, T. Nan, Y. Gao, X. Yang, S. Beguhn, M. Li, Y. Lu, J. Wang, Y. H. Lin, C.W. Nan, M. Liu, K. Mahalingam, B. Howe, G. Brown, N. Sun

Quantification of Charge Mediated Magnetoelectric Coupling Strength in Magnetic/Dielectric Thin Film Heterostructures, Applied Physics Letters, 103, 232906, 2013

G. Wu, T. Nan, R. Zhang, N. Zhang, S. Li, N. Sun

Inequivalance of Direct and Converse Magnetoelectric Coupling Coefficients at Electromechanical Resonance, Applied Physics Letters, 103, 182905, 2013

G. Subramanyam, M. W. Cole, N. Sun, T. Kalkur, N. Sbrockey, G. Tompa, X. Guo, C. Chen, S. P. Alpay, G. A. Rossetti, Jr., K. Dayal, L.Q. Chen, D. Schlom

Challenges and Opportunities for Multi-Functional Oxide Thin Films for Voltage Tunable RF/Microwave Components, Journal of Applied Physics, 114, 191301, 2013

X. Yang, J. Wu, Y. Gao, T. Nan, Z. Zhou, S. Beguhn, M. Liu, N. Sun

Compact and Low Loss Phase Shifter With Low Bias Field Using Partially Magnetized Ferrite, IEEE Trans. Mag., 2013

G.M. Yang, J. Wu, J. Lou, M. Liu, N. Sun

Low-Loss Magnetically Tunable Bandpass Filters With YIG Films, IEEE Trans Magn. 49, 5063, 2013

X. Yang, Y. Gao, J. Wu, S. Beguhn, T. Nan, Z. Zhou, M. Liu, N.X. Sun

Dual H-and E-Field Tunable Multiferroic Bandpass Filter at Ku Band Using Partially Magnetized Spinel Ferrites, IEEE Trans. Magn., 49, 5485, 2013

F.R. Liu, N. Bai, J.J. Zhao, X.X. Han, W. P. Zhou, X. Lin, N.X. Sun

An Explanation of the Crystallization of Amorphous $Ge_2Sb_2Te_5$ Films Induced by a Short Gaussian Laser Pulse, Applied Physics Letters, 103, 051905, 2013

T. Nan, Y. Hui, M. Rinaldi, N. Sun

Self-Biased 215MHz Magnetoelectric NEMS Resonator for Ultra-Sensitive DC Magnetic Field Detection, Scientific Reports, 3, 1985, 2013

M. Liu, B. Howe, L. Grazulis, K.Y. Mahalingam, T. Nan, N. Sun, G. Brown
  Voltage-Impulse-Induced Non-Volatile Ferroelastic Switching of Ferromagnetic Resonance for Reconfigurable Magnetoelectric Microwave Devices, Advanced Materials, 25, 4886, 2013

M. Li, Z. Zhou, M. Liu, J. Lou, D. Oates, G. Dionne, M. Wang, N. Sun
  Novel Niznal-Ferrites And Strong Magnetoelectric Coupling In Niznal-Ferrite/Pzt Multiferroic Heterostructures, J. Phys. D: Appl. Phys. 46, 275001, 2013

S. Li, M. Liu, W. Shao, J. Xu, S. Chen, Z. Zhou, T. Nan, N. Sun, J.G. Duh
  Large E-Field Tunability of Microwave Ferromagnetic Properties in Fe50co50-Hf/Lead Zinc Niobate-Lead Titanate Multiferroic Laminates, J. Appl. Phys.113, 17C727, 2013

Z. Zhou, O. Obi, S. Beghun, T. X. Nan, S. Stoute, M. Liu, J. Lou, X. Yang, Y. Gao, M. Li, X. Xing, N. X. Sun, J. Warzywoda, A. Sacco Jr., T. Guo, C. W. Nan
  Growth Behaviors And Characteristics Of Low Temperature Spin-Sprayed Zno And Al-Doped Zno Microstructures, J Mater Sci: Mater Electron, 12, 1056, 2013

Li, M. Liu, J. Lou, X. Xing, J. Qiu, J. Lin, Z. Cai, F. Xu, N.X, Sun, J.G. Duh
  Microwave Frequency Performance and High Magnetic Anisotropy of Nanocrystalline Fe70Co30-B Films Prepared by Composition Gradient Sputtering, Journal of Nanoscience and Nanotechnology 2013

X. Yang, J. Wu, S. Beguhn, T. Nan, Y. Gao, Z. Zhou, N. X. Sun
  Tunable Bandpass Filter Using Partially Magnetized Ferrites With High Power Handling Capability, IEEE Microwave and Wireless Components Letters, 23, 184, 2013

S. Li, M. Liu, J. Lou, X. Xing, J. Qiu, J. Lin, Z. Cai, F. Xu, N.X. Sun, J.G. Duh
  Tunable Microwave Frequency Performance of Nanocomposite Co2MnSi/PZN-PT Magnetoelectric Coupling Structure, Journal of Nanoscience and Nanotechnology, 13, 1182, 2013

X. Xing, N. X. Sun, B. Chen
  High-Bandwidth Low-Insertion Loss Solenoid Transformers Using FeCoB Multilayers,IEEE Trans Power Electronics, 28, 4395, 2013

M. liu, Z. Zhou, T. Nan, B. Howe, G.J. Brown, N. X. Sun
  Voltage Tuning of Ferromagnetic Resonance with Bistable Magnetization Switching in Energy-Efficient Magnetoelectric Composites, Advanced Materials, 25, 1435, 2013

Papers in refereed conferences

Q. Sun, S. Patil, N.X. Sun, B. Lehman
  Inductive Magnetic Harvester with Resonant Capacitive Rectifier Based on Synchronized Switch Harvesting Technique, Energy Conversion Congress and Exposition (ECCE), 2013 IEEE, 4940-4947

Shawn Beguhn, X. Yang, N. Sun
  Design of a Magnetization Gradient Ferrite Substrate Integrated Waveguide Isolator to Mitigate Higher Order Mode Effects, International Microwave Symposium (IMS), June 2~6, 2013, Seattle, WA, USA

Q. Wang, J.G. McDaniel, N.. Sun, M. Wang
  Road Profile Estimation of City Roads Using DTPS, Proc. SPIE 8692, Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems, 86923C, April 19, 2013

Y. Hui, T. Nan, N. Sun, M. Rinald
  MEMS Resonator Magnetic Field Sensor Based on an AlN/FeGaB Bilayer, The 26th IEEE International Conference on Micro Electro Mechanical Systems, IEEE MEMS, January 20 - 24, 2013, Taiwan

MARIO SZNAIER

Dennis Picard Trustee Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, University of Washington, 1989 Joined Northeastern in 2006

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Scholarship Focus

- Robust control

- Identification and model (In) validation

- Information extraction from high volume data streams

- Vision based control

- Applications of dynamical systems theory to imaging and video processing

Honors and Awards

IEEE Control Systems Society Distinguished Member Award

Selected Recent Publications

Papers in refereed journals

S. Markovic, B. Li, V. Pera, M. Sznaier, O. Camps, M. Niedre, M. Cytometry

A Computer Vision Approach to Rare Cell in Vivo Fluorescence Flow Cytometry, Dec. 2013

F. Dabbene, M. Sznaier, R. Tempo

Probabilistic Optimal Estimation and Filtering Under Uncertainty, IEEE Transactions on Automatic Control, 2014

M. Sznaier, M. Ayazoglu, T. Inanc

Fast Constrained Nuclear Norm Minimization with Applications to Control Oriented Systems Identification, IEEE Trans. Automatic Control, 2014

N. Ozay, M. Sznaier, C. Lagoa

Convex Certificates for Model (In) Validation of Switched ARX Systems with Unknown Switches, IEEE Trans. Aut. Control, 2014

Papers in refereed conferences

K. Bekiroglu, M. Sznaier, C. Lagoa, B. Shafai

Vision Based Control of an Autonomous Blimp with Actuator Saturation Using Pulse Width Modulation, Proc. 2013 IEEE Conf. Control Applications, p 1036-1041

M. Ayazoglu, B. Yilmaz, M. Sznaier, O. Camps

Finding Causal Interactions in Video Sequences, IEEE Int. Conf. on Computer Vision, Sydney, Dec. 2013

C. Dicle, O. Camps, M. Sznaier

The Way They Move: Tracking Multiple Targets with Similar Appearance, IEEE Int. Conf. on Computer Vision, Sydney, Australia, Dec. 2013

Y. Cheng, Y. Wang, M. Sznaier

Worst Case Optimal Estimators for Switched Linear Systems, Proc. 52 IEEE Conf. Dec. Control, Dec. 2013, p 4036-4041

B. Yilmaz, C. Lagoa, M. Sznaier

An Efficient Atomic Norm Minimization Approach to Identification of Low Order Models, Proc. 52 IEEE Conf. Dec. Control, Dec. 2013, p 5834-5839

FACULTY

F. Xiong, Y. Cheng, O. Camps, M. Sznaier, C. Lagoa

Hankel Based Maximum Margin Classifiers: A Connection Between Machine Learning and Wiener Systems Identification, Proc. 52 IEEE Conf. Dec. Control, Dec. 2013, p 6005-6010

Y. Wang, M. Sznaier, F. Dabbene

A Convex Optimization Approach to Worst Case Optimal Sensor Selection, Proc. 52 IEEE Conf. Dec. Control, Dec. 2013, p 6353-6358

J. Lopez, Y. Wang, M. Sznaier

Sparse H2 Optimal Filter Design via Convex Optimization, 2014 American Control Conference, June 2014

Research Projects

Compressive Information Extraction: A Dynamical Systems Approach

Principal Investigator, AFOSR

Robust Identification of a Class of Structured Systems with High Dimensional Outputs and Applications

Principal Investigator, National Science Foundation

Dynamic Invariants for Video Scenes Understanding

Co-Principal Investigator, National Science Foundation

ALERT DHS HS-STEM Career Development Program at Northeastern University

Participant, Department of Homeland Security

GILEAD TADMOR

Professor, Electrical and Computer Engineering; affiliated faculty, Bioengineering

PhD, Weizmann Institute of Science,1984. Joined Northeastern in 1989

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Scholarship Focus

- Robust and nonlinear control

- Reduced order models

- Fluid flow control

- Applications of dynamics in imaging

- Real time video analysis

- Information extraction from massive data systems

Selected Recent Publications

Papers in refereed journals

L. Mirkin, T. Shima, G. Tadmor

Sampled-Data H2 Optimization of Systems with I/O Delays via Analog Loop Shifting, IEEE Trans. Aut. Control, July 2013

K. Aleksic´-Roeßner, R. King, O. Lehmann, G. Tadmor, M. Morzyn´ski

On the Need of Nonlinear Control for Efficient Model-Based Wake Stabilization, Theor. Comput. Fluid Dyn. (Online First) March 2013

Papers in refereed conferences

L. Mirkin, T. Shima, G. Tadmor

Analog Loop Shifting in H2 Optimization of Input-Delay Sampled-Data Systems, 52nd IEEE Conf. on Decision and Control, December 2013

FACULTY

CARMINE VITTORIA

COE Distinguished Professor, Electrical and Computer Engineering

PhD, Yale University, 1970. Joined Northeastern in 1985

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FACULTY

Scholarship Focus

- Development of new microwave materials
- Ferrites
- Ferroelectrics
- Superconductors
- Magneto-dielectrics
- Composite electrical and magnetic materials
- Magnetic super lattices
- Nano particles and sub-micron planar devices
- Fundamental excitations in magnet-dielectric materials

Honors and Awards

- Fellow, Institute of Electrical and Electronics Engineers
- Søren Buus Outstanding Research Award, College of Engineering

Selected Recent Publications

Papers in refereed journals

M. Mohebbi, K. Ebnabbasi, C. Vittoria
   In-Situ Deposition of C-Axis Oriented Barium Ferrite Films for Microwave Applications, IEEE
Transactions on Magnetics, vol. 49, No. 7, 2013

M. Mohebbi, C. Vittoria,
   Growth of Y-Type Hexaferrite Thin Films by Alternating Target Laser Ablation Deposition, Journal of
   Magnetism and Magnetic Materials, 344, p 158–161, 2013

M. Mohebbi, K. Ebnabbasi, C. Vittoria
   First Observation of Magnetoelectric Effect In M-Type Hexaferrite Thin Films, J. Appl. Phys. 113,
   17C710, 2013

K. Ebnabbasi, M. Mohebbi, C. Vittoria
   Strong Magnetoelectric Coupling in Hexaferrites at Room Temperature, J. Appl. Phys. 113,
   17C707, 2013

K. Ebnabbasi, M. Mohebbi, C. Vittoria
   Room Temperature Magneto-Electric Effects in Bulk Poly-Crystalline Materials Of M- and Z- Type
   Hexaferrites, J. Appl.Phys. p 113, 17C703, 2013

K. Ebnabbasi, M. Mohebbi, C. Vittoria
   Coaxial Line Technique to Measure Constitutive Parameters in Magnetoelectric Ferrite Materials,
   Microwave and Optical Components Letters, vol. 23, No. 9, 2013

Completed Dissertations Supervised

Marjan Mohebbi
   Magnetoelectric Hexaferrite Thin Films Growth for Next Generation Device Applications

EDMUND YEH

Associate Professor, Electrical and Computer Engineering

PhD, Massachusetts Institute of Technology, 2001. Joined Northeastern in 2011

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Scholarship Focus

- Data-centric network architectures
- Network science
- Network information theory and coding
- Control and optimization of wireless networks
- Network economics
- Smart power grids

Honors and Awards

- Army Research Office Young Investigator Program Award
- IEEE Smart Grid Activities Liaison Officer, IEEE Information Theory Society
- Senior Member of the Institute of Electrical and Electronics Engineers
- Secretary, IEEE Information Theory Society

Selected Recent Publications

Papers in refereed journals

E. Sasoglu, E. Telatar, E.M. Yeh

Polar Codes for the Two-user Multiple-access Channel, IEEE Transactions on Information Theory, vol. 59, no.10, October 2013, p 6583-6592

Papers in refereed conferences

Y. Cui, E. Yeh

Enhancing the Delay Performance of Dynamic Back Pressure Algorithms, Proceedings of the Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, November 3-6, 2013

Y. Cui, E.M. Yeh

Delay Optimal Control and Its Connection to the Dynamic Backpressure Algorithm, Proceedings of the International Symposium on Information Theory (ISIT), Honolulu, HI, June 29 - July 4, 2014

Y. Xu, E.M. Yeh, M. Medard

Approaching Gaussian Relay Network Capacity in the High SNR Regime: End-to-End Lattice Codes, Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC), Istanbul, Turkey, April 6-9, 2014

Research Projects

FIA: Collaborative Research: Named Data Networking

Principal Investigator, National Science Foundation

NeTS: Small: Collaborative Research: Large Scale Networks and Information Flow: From Emergent Behavior to Algorithm Design

Principal Investigator, National Science Foundation

Modeling, Analysis and Control for Robust Interdependent Networks

Co-Principal Investigator, Defense Threat Reduction Agency

Joint Forwarding and Caching Algorithms for Named Data Networking

Principal Investigator, Cisco Systems Inc.

FACULTY

MALAK ALSHAWABKEH

PhD, 2013 Electrical and Computer Engineering
Advisor, David Kaeli | Computer and Systems Architecture

Hypothesis Margin Based Weighting for Feature Selection Using Boosting: Theory, Algorithms and Applications

This dissertation presents work focused on Boosting based feature selection techniques for imbalanced and noisy training data. Feature selection allows one to deal with high dimensions, retaining only the features that are most important for the classification task. Traditional feature selection methods, however, fail to account for a sample data value distribution and the existing of outliers, leading to poor predictions for minority class examples. This thesis proposes a new feature selection based on the hypothesis-margins induced by Boosting. It considers Boosting decision stumps and the effect that individual features have on the margin distribution associated with the weighted linear combination that Boosting produces. Experiments on imbalanced noisy data sets taken from a range of application domains demonstrate the effectiveness of the proposed method in selecting informative features.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/22**

ANIRBAN BASU

PhD, 2014 Electrical and Computer Engineering
Advisors, Nicol McGruer, George Adams | Electronic Devices and Semiconductor Manufacturing

An Experimental Investigation of Hot Switching Contact Damage in Rf Mems Switches

This dissertation presents work focused on contact damage in Ruthenium-on-Ruthenium micro-contacts has been investigated under hot switching conditions. Using an AFM based test setup, developed at Northeastern University for the purpose of contact testing, a large number of experiments were performed to observe and understand the mechanisms that lead to micro-contact damage and ultimately its failure. The structure used was a clamped-clamped beam structure with a contact bump at its center. A flat topped mating pillar formed the other end of the contact and this pillar was mounted on a piezoactuator whose expansion and contraction, leading to contacts closing and opening, replicated switching cycles.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/81**

SHAWN BEGUHN

PhD, 2013 Electrical and Computer Engineering
Advisor, Nian X. Sun | Electromagnetics and Photonics

Substrate Integrated Waveguide Isolators Utilizing Magnetic Materials

This dissertation presents work focused on a series of SIW isolators using tunable, non-reciprocal magnetic materials are presented. A 20 mil thick SIW with micro strip transition elements was designed utilizing Rogers TMM-3 and 4003 substrate material using both standard PCB fabrication as well as a cheaper and faster milled circuit approach not previously demonstrated. Incorporating the non-reciprocal effects of magnetic materials a nominal, magnetization gradient and wideband isolator is demonstrated. The nominal isolator utilizes a single ferrite as a proof-of-concept device, as well as being the first ferrite isolator to be implemented in SIW. The magnetization gradient isolator utilizes a stack of ferrites to form a novel saturation magnetization gradient used to mitigate high order mode effects. The wideband isolator also uses a stacked ferrite configuration to create a tunable wideband response through tailored shape demagnetization terms. In addition to these three devices a fourth isolator with more efficient tapered ferrite transitions was studied for high-power effects and compared to the nominal configuration.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/76**

STEVEN BENNETT

PhD, 2014 Electrical and Computer Engineering
Advisor, Vincent Harris | Materials Science and Engineering

The Realization of a New Band Gap Engineered Photoferroelectric Photovoltaic Device with High Photocurrent

This dissertation presents work focused on incorporating a bandgap engineered, discontinuous nano-granular thin film ferrite, ($CdxMn(1-x)Fe2O4$ [CMFO]), with BFO in a heteroepitaxial structure. The result is a photovoltaic device that has a spontaneous electric polarization and high photocurrent without the need for a p-n junction. An order of magnitude increase and record photocurrent was measured by incorporation of this discontinuous CMFO layer. The giant photo current enhancement can be explained by the overall increase in photo-induced charge carriers originating from the added narrow bandgap CMFO. Furthermore, the magnetic characteristics of both layers could lend to the possibility of tuning the absorption of the device by use of an external applied magnetic field.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/91**

PASCAL MAURICE BRUNET

PhD, 2014 Electrical and Computer Engineering
Advisor, Bahram Shafai | Acoustics, Dynamics, and Controls

Nonlinear System Modeling and Identification of Loudspeakers

This dissertation considers modeling and identification of nonlinear systems pertinent to loudspeakers with nonlinear distortion effects. It is well known that when loudspeakers are driven at high playback levels the nonlinear characteristics of these speakers become a major source of sound degradations. Nonlinear distortion not only diminishes listening pleasure but more importantly impairs speech intelligibility. Consequently it is essential to find a good model that matches to the loudspeaker response for the purpose of predicting and preventing the nonlinear distortion. This becomes particularly important for the purpose of improving sound quality of mobile phones. This report analyzes the loudspeaker operation and provides nonlinear modeling techniques that can reliably be used for its identification process. Frequency domain and state-space modeling are considered and emphasis is given towards model that mix polynomial nonlinear state-space models and fractional order state-space models.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/93**

SONG CHEN

PhD, 2014 Electrical and Computer Engineering
Advisor, Bradley Lehman | Power and Energy

A Non-Superconducting Fault Current Limiter (NSFCL)

This dissertation presents work focused on studying and reviewing the various topologies of the emerging FCL technology, compare their advantages and limitations, and propose a Non-Superconducting Fault Current Limiter (NSFCL) topology. The NSFCL is optimized to protect against short transients and to work in conjunction with existing protection devices, hence it is simple, low-cost, and more compact than prior art. We analyze the operation of the proposed NSFCL topology under normal condition and different fault conditions, and validate the concept with simulations and experiments of a prototype on a 3-phase 600V system in a UL-certified high power lab. In the tests, the NSFCL successfully protects the system from 100kA potential fault current, by limiting the fault current to a pre-determined level of 50A. Additionally, it analyzes the stresses of the critical components under fault conditions, and specifies guidelines for part sizing and parameter design for the NSFCL. Moreover, this dissertation discusses design optimizations of the proposed topology to make the NSFCL more efficient under normal conditions and smaller in size.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/89**

RODRIGO DOMINGUEZ

PhD, 2013 Electrical and Computer Engineering
Advisor, David R. Kaeli | Computer and Systems Architecture
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Dynamic Translation of Runtime Environments for Heterogeneous Computing

This dissertation presents work focused on the design of Caracal, a dynamic compiler that can translate between runtime environments used in heterogeneous computing. A major challenge of developing such a translation system is the inherent difference in both the underlying instruction set architecture, as well as the runtime system. One of the more challenging questions across different runtime environments is the handling of program control flow by the compiler and the hardware. Some implementations can support unstructured control flow based on branches and labels, while others are based on structured control flow relying solely on if-then and while constructs. Also explored in this dissertation is the difference between heterogeneous parallel processors architectures that will impact the design of a translator when attempting to optimize code. Two specific compiler optimizations that are highly sensitive to the underlying architecture are vectorization and loop unrolling. The experiments show that by tuning these two optimizations in the translation system, execution time can be reduced by 90%.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/23**

BURAK EREM

PhD, 2013 Electrical and Computer Engineering
Advisor, Dana Brooks | Biomedical
berem@ece.neu.edu | http://burak.nu

Differential Geometric Models and Optimization Methods for Dynamic Analysis of Electrocardiographic Signals and the Inverse Problem of Electrocardiography

This dissertation presents work focused on algorithmic approaches that exploit the dynamical properties in the ECG signals, and to a lesser extent EEG as well. This thesis leverages ideas from differential geometry and optimization theory to model the signals as lying on trajectories confined by their biophysical origins to a subset of the space in which the measured signals reside. These trajectories can be characterized by the spatio-temporal properties of the signals. First, characterizing these geometric subsets as smooth manifolds, we apply Laplacian eigenmaps—an established manifold learning method from the machine learning literature—to these data, along with several extensions which we have developed expressly to relate the learned low-dimensional dynamic structure to the underlying physiological behavior without specifying an explicit dynamical model. We concentrate primarily on ECG signals, but also present examples of the methods applied to EEG data containing frequent episodes of interictal epileptic spiking.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/74**

JING FAN
PhD, 2013 Electrical and Computer Engineering
Advisors, Jennifer Dy, Stephen Wang | Neuroscience and Neurobiology

Understanding Neurodegeneration with Multi-Scale Images - an Integrated Neural Image Analysis System

This dissertation presents work focused on a system approach designed for large-scale mechanism studies and drug development by analyzing multi-scale neuron images of synaptic structures, including dendritic spines, synaptic vesicles and neurites. These three structures are the most important components in synapse functions including synaptic information transmission and storage. We propose curvilinear structure detector based dendritic spine detection strategy and employ a novel level set method to segment the spines. A pipeline based on multi-scale variance stabilizing transform followed by region based adaptive thresholding is proposed to accurately segment and quantify synaptic vesicles in an automated manner. To illustrate how the system can be used in large-scale screenings, an example of screening more than one thousand small molecules to identify inhibitors of neurite loss induced by A peptide is provided using proposed neurite image processing module. The screening results are further analyzed as potential treatment for Alzheimer's. With the proposed system, scientists and biologists could employ it to large-scale study on responses of a population of neural cells under different chemical, genetics, or radiation perturbations without manual labeling and quantification to promote the neurodegenerative disease research and treatment development.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/27**

ANKITA SHAH FAULKNER
PhD, 2014 Electrical and Computer Engineering
Advisor, Ahmed A. Busnaina | Materials Science and Engineering

Electrode Architectures for Efficient Ionic and Electronic Transport Pathways in High-Power Lithium Ion Batteries

This dissertation focuses on developing electrode architectures that enhance electronic and ionic transport pathways in large and small area lithium ion electrodes. These architectures will utilize the unique electronic and mechanical properties of carbon nanotubes to create robust electrode scaffolding that improves electrochemical charge transfer. Using extensive physical and electrochemical characterization, the second aim is to investigate the effect of electrode parameters on electrochemical performance and evaluate the performance against standard commercial electrodes. These parameters include surface morphology, electrode composition, electrode density, and operating temperature. Finally, the third aim is to investigate commercial viability of the electrode architecture. This will be accomplished by developing pouch cell prototypes using a high-rate and low cost scale-up process. Through this work, we aim to realize a commercially viable high-power electrode technology.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/95**

SELECTED PhD THESES

TRIFON FITCHOROV

PhD, 2014 Electrical and Computer Engineering
Advisor, Vincent G. Harris | Electromagnetics and Photonics

Electric Field-Driven Tuning of Multiferroic Transducers and Antennas Through Changes in Field Strength and Material Morphology

This investigation demonstrates experimentally and theoretically that tuning of magnetic properties of the heterostructures can be controlled through applied electric field. Significant CME effect is found in all three heterostructures: FeCoV/PZN-PT (31 Oe cm kV-1), Metglas/PMN-PT (23 Oe cm kV-1), and FeGa/PMN-PT (12.5 Oe cm kV-1). The tunabilities of remanence (Mr), coercivity (Hc), and squareness (SQ = Mr / Ms) are demonstrated. A sensitive dependence of CME effect on the magnitude of the applied electric field is discovered in the time and frequency domains, especially near the electric coercive field, and an alternative path to magnetization reversal is identified. The change in sign of magnetization is shown in the vicinity of magnetic coercivity. Tuning of induced magnetic fringe field (4.5 Oe cm kV-1) is shown for the FeGa/PMN-PT heterostructure, which could be used as a magnetic field generator. Results of low temperature characteristics of magnetization and magnetostriction of a novel terbium-doped FeGa alloy show this material can be applied to actuators and sensors requiring operability in wide temperature ranges. Indirect electric-field tuning can also be applied to patch antennas with a dielectric substrate.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/82**

SCOTT GILLETTE

PhD, 2014 Electrical and Computer Engineering
Advisor, Vincent Harris | Materials Science and Engineering

Dynamic Translation of Runtime Environments for Heterogeneous Computing

This dissertation focuses on development and characterization of tube-topology ME composites as magnetic field sensors. The novel topology is most notable for demonstrating high zero-external-bias sensitivity, low noise floor, low-frequency bandwidth, and self-powered, stable room temperature operation. Numerous characterization studies are included in this work where several devices are analyzed as a function of test-field, DC-bias field, geometry, material choice, and more. The overall conclusions drawn upon these results indicate strongly that the tube-topology ME magnetic field sensor holds promise to compete with existing hall-effect and flux-gate magnetometers. ME composites are at the tipping point of commercialization for use in magnetometry applications and are emerging as a valuable technology for use in numerous creative ways.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/83**

FATEMEH NOUSHIN GOLABCHI

PhD, 2014 Electrical and Computer Engineering
Advisor, Dana H. Brooks | Biomedical

Graphical Model Based Segmentation of Massive Numbers of Irregular Small Objects in Images, with Application to Axon Characterization in Histological Sections

This dissertation focuses on the particular problem of automated identification and characterization of very large numbers of small objects of interest, where the objects have similar but variable structure, are embedded in a complex cluttered background, and may have low contrast and other imaging aberrations. The motivating application is the analysis of microscopy images of stained histological sections of brain or spinal cord tissue, where quantitative measurements from closely packed axons are useful to elucidate possible physiological mechanisms underlying contrast in diffusion-weighted magnetic resonance (DW-MR) images.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/80**

PETER GROSSMANN

PhD, 2013 Electrical and Computer Engineering
Advisors, Miriam Leeser, Marvin Onabajo | Power and Energy

Design and Analysis of Minimum Energy Fpgas

This dissertation presents work focused on multiple steps forward in the design and analysis of FPGAs targeting minimum energy operation. A fabricated FPGA test chip capable of single-supply subthreshold operation is presented, with measurement results demonstrating FPGA programming and operation as low as 260 mV. The capability to minimize energy per clock cycle at subthreshold supply voltages for a high activity factor test case is also shown, indicating that the flexible nature of FPGAs does not inherently prevent their energy minimum occuring below threshold. A simulation flow for performing pre-fabrication chip-level minimum energy analysis for FPGAs has also been developed in this work. By combining industry-standard integrated circuit design verification software with academic FPGA software and custom scripts, the minimum energy point sensivity of an FPGA to its programming was investigated. The FPGA was programmed with 21 different ISCAS '85 benchmarks, and a minimum energy supply voltage was estimated for each with a nominal input activity factor. The benchmarks had minimum energy points ranging from 0.42-0.54 V, or slightly above threshold. The minimum energy point was not a strong function of benchmark circuit size or input count, suggesting that the topology of the benchmark circuit influenced the FPGA minimum energy point.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/73**

MERT KORKALI
PhD, 2014 Electrical and Computer Engineering
Advisor, Ali Abur | Power and Energy

Robust and Systemwide Fault Location in Large-Scale Power Networks via Optimal Deployment of Synchronized Measurements

This dissertation addresses a novel method for fault location in power systems, while providing a new vision for the deployment of wide-area measurement systems and the application of robust estimation techniques in an effort to achieve system wide, cost-effective, and resilient fault-location capability in large-scale power systems.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/83**

YOUNG LAE KIM
PhD, 2013 Electrical and Computer Engineering
Advisor, Yung Joon Jung | Nanotechnology Fabrication

Engineering Highly Organized and Aligned Single Walled Carbon Nanotube Networks for Electronic Device Applications: Interconnects, Chemical Sensor, and Optoelectronics

This dissertation presents work focused on single walled carbon nanotubes (SWNTs). They offer the potential to serve as building blocks for future electronic devices such as field effect transistors (FETs), electromechanical devices, and various sensors. In order to realize these applications, it is crucial to develop a simple, scalable, and reliable nanomanufacturing process that controllably places aligned SWNTs in desired locations, orientations, and dimensions. Also electronic properties (semiconducting/metallic) of SWNTs and their organized networks must be controlled for the desired performance of devices and systems. These fundamental challenges are significantly limiting the use of SWNTs for future electronic device applications. Here, we demonstrate a strategy to fabricate highly controlled micro/nanoscale SWNT network structures and present the related assembly mechanism to engineer the SWNT network topology and its electrical transport properties. A method designed to evaluate the electrical reliability of such nano- and microscale SWNT networks is also presented.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/71**

YUEQIAN LI

PhD, 2013 Electrical and Computer Engineering
Advisor, Masoud Salehi | Digital Communications and Networking

Code Design for SISO and MIMO Block-Fading Channels

This dissertation focuses on the diversity order and the coding gain. At high signal to noise ratios, the diversity order determines the slope of the codeword error probability curve, while the coding gain shifts the curve horizontally. Therefore, the diversity order is the determining factor in code design. The optimal diversity order achievable by coding scheme is upper bounded by the Singleton bound, which establishes the fundamental tradeoff between coding rate and diversity order. The family of codes which can achieve the optimal diversity order are referred as blockwise maximum distance separable (MDS) codes. The general approach for code construction on block-fading channels is to design MDS codes with large coding gain.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/24**

BINLONG LI

PhD, 2014 Electrical and Computer Engineering
Advisor, Octavia Camps | Systems and Communications

Dynamics-Based Invariants for Video Analytics

In this thesis exploiting dynamics-based invariants as an information encapsulating paradigm is explored. The approach is inspired by the fundamental fact that visual data comes in streams: videos are temporal sequences of frames, images are ordered sequences of rows of pixels and contours are chained sequences of edges. We make this ordering explicit by treating the data streams as outputs of dynamic systems that have associated quantities which are invariant to affine transformations, initial conditions, and viewpoint changes. These invariants provide compact representations of the dynamic information in the data, yet they can be efficiently extracted while avoiding identifying the underlying models. The power of the proposed framework is illustrated by applying it to several problems in dynamic scene understanding: activity recognition, shape representation, and multi-camera tracking.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/77**

SELECTED PhD THESES

MING LI
PhD, 2014 Electrical and Computer Engineering
Advisors, Nian Sun, Ming Wang | Geotechnical Engineering
li.mi@neu.edu

Robust and Systemwide Fault Location in Large-Scale Power Networks via Optimal Deployment of Synchronized Measurements

This dissertation focuses on the study and development on a number of planar antennas that have been manufactured with low-cost printed circuit board (PCB) technology. It also presents a brief methodology for the design process in order to frame the context and boundary conditions of the antenna problem, and to satisfy the regulatory specifications such as FCC compliance.

The antenna dispersion problem is also summarized and clarified in detail with theoretical analysis, simulation models and experimental characterization to aid the UWB antenna development for impulsive GPR system.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/92**

ASANTERABI MALIMA
PhD, 2013 Electrical and Computer Engineering
Advisor, Ahmed A. Busnaina | Biomedical

Design, Fabrication and Assembly of Multiple Biomarker in-Vivo Biosensor

In this thesis, a design for highly sensitive micron scale in-vivo sensor platform device for simultaneous detection of multiple disease biomarkers is presented. The biosensor microchip is 0.25mm in diameter, based on SU-8 polymeric platform fabricated incorporating four active isolated areas as small as 70μm x 70μm. Conventional micro and nanofabrication processes were used for fabrication of these biocompatible microchips to enable large-scale production of such biosensors at lower manufacturing cost.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/70**

JENNIFER ELIGIUS MANKIN

PhD, 2014 Electrical and Computer Engineering
Advisor, David R. Kaeli | Hardware Systems

Classification of Malware Persistence Mechanisms Using Low-Artifact Disk Instrumentation

This dissertation focuses on DIONE, a flexible rule-based disk I/O monitoring and analysis infrastructure. DIONE interposes between a system-under-analysis and its hard disk, intercepting disk accesses and reconstructing high-level file system and registry changes as they occur. We evaluate the accuracy and performance of DIONE, and show that it can achieve 100% accuracy in reconstructing file system operations, with a performance penalty less than 2% in many cases.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/28**

JUAN CARLOS MARTINEZ SANTOS

PhD, 2013 Electrical and Computer Engineering
Advisor, Yunsi Fei | Computer and Systems Architecture

Architectural Support for Software Security

This dissertation investigates a series of hardware/software co-design techniques that advance the state-of-the-art in low-overhead security architectural design: leveraging speculative architectures for run-time program control-flow validation; adding compile-support to reduce the overhead of dynamic information flow tracking (DIFT); micro-architectural support to ensure consistency between data processing and metadata processing in multi-core DIFT; integrating architectural support, compiler, and operating system for thread isolation to avoid memory corruption and information disclosing in multi-threaded applications.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/78**

SELECTED PhD THESES

YAIR MEGA
PhD, 2013 Electrical and Computer Engineering
Advisor, Charles A. DiMarzio | Electromagnetics and Photonics

Using Second Harmonic Generation Microscopy to Study the Three Dimensional Structure of Collagen and its Degradation Mechanism

This dissertation investigates a new model, intended to be used together with second harmonic generation (SHG) microscopy, to thoroughly investigate collagen-based tissues. In this dissertation the use of the SHG model reveals information in real time from enzymatic biochemical processes. Also a novel method used to measure quantitatively the direction of the fibers within the tissue, from SHG images is presented. Using this method, the ablity to reconstruct an angular map of the orientation of collagen fibers from multiple sections across the entire area of a human cornea. The structure we obtained demonstrates the criss-crossing structure of the human cornea, previously suggested in the literature. In addition is reported work on a unique step-wise three-photon fluorescence excitation discovered in melanin.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/69**

BABAK MEMARZADEH ISFAHANI
PhD, 2014 Electrical and Computer Engineering
Advisor, Hossein Mosallaei | Electromagnetics and Photonics

Plasmonic Metasurfaces With Tailored Linear and Nonlinear Building Blocks

This dissertation investigates applications for plasmonic metasurfaces. In the first chapter there is brief review of metamaterials and plasmonic metasurfaces. In the second chapter we present the concept of transmitarray concentrator implemented in optics. Planar concentric loop antennas are used as the elements for a 21 × 21 array to concentrate the incident plane wave at a desired distance... Third chapter investigates the concept of multi-layered tripod frequency selective surfaces in infrared. A full wave analysis based on finite difference time domain technique is applied to comprehensively characterize the structure and obtain the performance for both normal and oblique waves (for TE and TM polarizations). The layered tripod structure can be envisioned as a mean to realize cascaded LC circuit configurations achieving desired filter performance. A wide stop-band IR nano-filter which is almost independent of incident angle and polarization is demonstrated. Chapter 4 is concentrated on a functional metasurface building block which is multi-material loops. Plasmonic nano loops has been shown to be a capable candidate for creating building blocks of metasurfaces to manipulate the light in desired ways... The effects of coupling between the plasmonic loops on the bistability curve are studied and the trade-off between the required intensity for switching and the extinction ratio of the two states of the switch is explored systematically. The dissertation is finished by a number of recommendations for the future directions for this research.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/98**

MARJAN MOHEBBI

PhD, 2014 Electrical and Computer Engineering
Advisor, Carmine Vittoria | Electromagnetics and Photonics

Magnetoelectric Hexaferrite Thin Films Growth for Next Generation Device Applications

This dissertation focuses on alternating target laser ablation deposition (ATLAD) is used for in-situ deposition of M-type and Y-type hexaferrites. There have been considerable reports on epitaxial growth of M-type hexaferrite but not on Y-types, since it is very difficult and challenging to produce them. One of the main problems is the need of substrate temperatures in excess of 1150°C which requires additional expensive high temperature equipment. Our developed process can be done at lower temperatures by PLD equipment and can form unique crystal structures which cannot be achieved by other techniques.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/88**

SIDI NIU

PhD, 2014 Electrical and Computer Engineering
Advisors, Vinay Ingle, Dimitris Manolakis | Chemical Plume Quantification

Quantification of Chemical Gaseous Plumes on Hyperspectral Imagery

This dissertation focuses on evaluating and investigating the advantages and limitations of a number of quantification algorithms that span a variety of such assumptions. With these in-depth insights we gain, a new quantification algorithm is proposed for single gas quantification which is superior to all state-of-the-art algorithms in almost every aspect including applicability, accuracy, and efficiency.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/84**

UMUT ORHAN

PhD, 2014 Electrical and Computer Engineering
Advisor, Deniz Erdogmus | Biomedical Devices and Instrumentation
orhan@ece.neu.edu | ece.neu.edu/~orhan

RSVP keyboard: An EEG Based BCI Typing System with Context Information Fusion

This dissertation focuses on the design of an EEG based letter-by-letter BCI typing system, RSVP KeyboardTM, which utilizes rapid serial visual presentation (RSVP). Differently from the commonly used visual BCI presentation schemes, RSVP aims to be accessible to the population with limited eye gaze control by presenting sequences of symbols on a screen over time at a fixed focal area and in rapid succession. As a response to the infrequent novel target stimulus (oddball paradigm), brain generates P300, an event related potential which is a positive deflection in the scalp voltage mainly in the centro-parietal areas with an average latency just over 300 ms. This natural novelty response allows us to design interfaces by detecting the intent using EEG.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/85**

HUIYAN PAN

PhD, 2014 Electrical and Computer Engineering
Advisors, Nicol McGruer, George G. Adams | Nanotechnology Fabrication
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Determination of Shear Stress Between Single-Walled Carbon Nanotubes and Substrates Using NEMS Devices

This dissertation focuses on a novel and easily controllable technique based on a NEMS device, a ZYVEX nanomanipulator, and a scanning electron microscope (SEM) along with a theoretical model is developed to study the shear stress between SWNTs and substrates. A small SWNT bundle is assembled across two cantilevers by dielectrophoresis, with one cantilever much more flexible than the other. The flexible cantilever is then pushed away from the stiffer cantilever in order to produce slip between the SWNTs and the cantilever surface. When the cantilever returns to its initial position, axial slack is observed in the SWNTs. A theoretical model has been developed to calculate the shear stress between the SWNT bundle and the cantilever surface, based on the measured axial slack. This new technique overcomes some disadvantages of the AFM-based methods and gives the first determination of the shear stress between dielectrophoretically assembled SWNTs and substrates.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/79**

SELECTED PhD THESES

ANUP KUMAR SINGH
PhD, 2014 Electrical and Computer Engineering
Advisor, Nicol McGruer | Power and Energy

Organic Photovoltaics Using Novel Pentacene Derivatives

This dissertation focuses on exploring the efficacy of various new, very stable pentacene derivatives synthesized by Prof. Glen Miller's group at University of New Hampshire, Durham. These pentacenes are water soluble pentacene (WSP); 5,6,7-trithiapentacene-13-one (TTPO), and Bis-C60 adduct of 6,13-(decylthio)pentacene (BC60DTP). This thesis presents the OPV cell designs (bilayer or planar and bulk heterojunction type), fabrication steps, electrical results and discuss them to correlate the experimental findings with simulation data.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/86**

OSSO VAHABZADEH
PhD, 2014 Electrical and Computer Engineering
Advisor, Masoud Salehi | Signal Processing

Efficient Low-Density Parity-Check Codes for Cooperative Communication

This dissertation focuses on addressing code design problem for cooperative communication over different channel models with emphasis on low complexity designs and structured codes that are attractive for practical implementation. Starting with the problem of designing efficient codes for the relay node in Gaussian relay channels. For a class of capacity approaching codes for this channel model, called bilayer lengthened LDPC (BL-LDPC) codes, we calculate a measure of decoding complexity as a function of the number of decoding iterations and propose a technique to design complexity-optimized BL-LDPC codes by minimizing the complexity measure of these codes...Next, we study the achievable rates for the decode-and-forward (DF) relaying strategy for the Rayleigh fading relay channel where the links have independent normalized Rayleigh fading coefficients and the channel side information is perfectly known at the corresponding receivers but not at the transmitters...Finally, we introduce rate-compatible protograph-based root LDPC (RCPB-R-LDPC) codes for cooperative communication over block fading channels and propose two methods to construct these codes.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/99**

NIKSA VALIM

PhD, 2014 Electrical and Computer Engineering
Advisor, Mark Niedre | Biomedical

Instrumentation and Methods for Time-Resolved Diffuse Fluorescence Imaging

This dissertation focuses on the development of a novel instrument that allows simultaneous collection of spectral and temporal data sets. Chemometric analysis of joint temporal and spectral data sets allowed us to separate, quantify, and image up to five fluorochromes concurrently with 93% accuracy. This significantly outperformed more conventional methods, where only spectral or temporal information was used independently.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/90**

QI WANG

PhD, 2013 Electrical and Computer Engineering
Advisor, Ming Wang | Industrial Technology

Pavement Assessment Using Dynamic Pressure Sensor System

This dissertation presents a non-destructive and non-contact acoustic sensing approach for fast inspection of road and bridge deck conditions with vehicles running at normal speed without stopping traffic. This approach, which uses an instantaneous and real-time dynamic tire pressure sensor (DTPS), possesses the capability to inspect pavement conditions from a moving vehicle. In this dissertation, verifications of the DTPS concept of sensing pressure inside the tire have been carried out. By measuring dynamic pressure changes (the pressure variation rather than static pressure) inside the tire, useful signals from tire/road interaction can be amplified and isolated from environmental noise. Comparisons between the DTPS, ground-mounted accelerometer, and directional microphone are made. In addition, the DTPS can also measure dynamic response of the tire-road interaction and reduce the cost of currently used road profile measuring systems with vehicle body-mounted profilers and axle-mounted accelerometers. A prototypes of the real-time DTPS with both wired and wireless systems together with an alternative rotating energy harvester design have been developed and demonstrated on a testing van at speeds from 5 to 80 mph.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/68**

CURTIS WATSON
PhD, 2014 Electrical and Computer Engineering
Advisor, Waleed Meleis | Digital Communications and Networking

Signal Detection and Digital Modulation Classification-Based Spectrum Sensing for Cognitive Radio

In this dissertation, we describe a spectrum sensing architecture that characterizes the carrier frequency and bandwidth of all narrowband signals present in the spectrum, along with the modulation type of those signals that are located within a licensed portion of the spectrum. From this radio identification, a cognitive radio can better determine an opportunity to access the spectrum while avoiding primary users.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/26**

XI YANG
PhD, 2013 Electrical and Computer Engineering
Advisor, Nian-Xiang Sun | Electromagnetics and Photonics

Compact, Lightweight and Power Efficient Voltage Tunable Multiferroic Rf/ Microwave Components

In this dissertation a method of measuring the complex permeability using a CPW and a network analyzer is presented. The permeability spectra under varied magnetic field is discussed. The measured permeability spectra show a negative region which prohibits the wave propagation. Therefore, the energy of the RF source dissipated in the material, and the attenuation depends on the magnitude of the negative value. In addition, a resonator was fabricated on the ferrite substrate. The device showed an absorption band gap under a magnetic field from 200 Oe to 600 Oe, which was in good agreement with the measured permeability spectra.

See full dissertation at **iris.lib.neu.edu/elec_eng_diss/75**

AYSE YILMAZER
PhD, 2014 Electrical and Computer Engineering
Advisor, David Kaeli | Computer Engineering
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Micro-Architectural Support for Improving Synchronization and Efficiency of SIMD Execution on GPUS

This dissertation presents a new approach to enhance the efficiency and scalability of GPU synchronization. The proposed scheme can enable applications that work on shared data to effectively communicate at finer levels of granularity. To achieve this ambitious goal, a new synchronization approach called Hierarchical Queuing Locks (HQL) is proposed. HQL is a novel hardware-based synchronization mechanism which provides efficient use of resources through execution blocking and hierarchical queuing.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/29**

MASOUD ZAMANI
PhD, 2013 Electrical and Computer Engineering
Advisor, Mehdi Tahoori | Nanotechnology Fabrication

Robust Design Techniques for Emerging Technologies of Computing

This dissertation focuses on the reliability issues in crossbar nano-architectures, as an example of alternative implementation, as well as reversible logic, as an example of alternative computational technology.
Two approaches are studied, namely logic mapping and architectural techniques, to incorporate variation and defect tolerance in crossbar nano-architectures.

See full dissertation at **iris.lib.neu.edu/comp_eng_diss/21**

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The Interdisciplinary Science and Engineering Complex (ISEC)

at Northeastern is a 220,000 square foot complex scheduled to open in 2016. This facility will help grow Northeastern's research by providing state of the art infrastructure, and increasing the capacity to attract top students, faculty and academic leaders. The ISEC will connect the main campus to the expanded area with a fly-over pedestrian bridge. The six story building will contain wet, dry, and computational research facilities plus interactive teaching and learning spaces. The project was recently featured in ASCE's Civil Engineering Magazine (bit.ly/NU_ASCE). **Learn more at northeastern.edu/isec.**

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