



Boston Section

Supporting students, working engineers and retirees through professional development, education and resources.

THE *Reflector*

ISSUE #12
DECEMBER 2023

2024 IEEE INTERNATIONAL
SYMPOSIUM ON PHASED
ARRAY SYSTEMS AND
TECHNOLOGY

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ADVANCED DIGITAL
DESIGN: IMPLEMENTING DEEP
MACHINE LEARNING ON FPGA
(HOSTED BY MITRE)

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PROF. DEV. TRAINING:
PRESERVING INNOVATION:
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Potholes and Teenagers: The Rules of Engagement

by Karen Panetta, Reflector Editor

Do you remember when you were a teenager? Unfortunately, I do and quite vividly. As you probably already know, rule number one for teenagers is that teenagers know everything and are experts on everything, especially on topics, for which they have no prior experience. Teenager rule number two is that parents of teenagers know nothing, and the life experiences and wisdom parents possess is not relevant or applicable for teenagers.

I always get asked, "What advice do you wish someone had given you as a teenager, that you know now?" The answer is quite simple. It does not matter what anyone told me or advice they provided. I would have ignored it.

For instance, my father, who worked in the construction industry, once suggested I consider civil engineering as a possible discipline to study in college. I responded with, "No way, I don't want to fill potholes for the rest of my life."

Being a "binary" teenager, which means everything was either a "yes or no" and nothing in between, I had already made up my mind at his suggestion. The answer was "no". There was no need to conduct any further investigation on the matter and the case was closed.

If I could go back in time, I'd give myself a smack up the side of the head for all the great advice I ignored, especially my father's advice to go into business for myself.

Today, I would be quite content with a multi-million-dollar contract filling potholes on our roadways. Also, knowing there is never a shortage of potholes in our great state, I would have had tremendous job security.

Now, I realize that I know absolutely nothing, even though I am not yet the parent of a teenager, who will eventually tell me this. This realization has turned out to be a good thing. Why? Because now, I try not to make assumptions, jump to conclusions or rip people's faces off for comments that show how truly clueless and uninformed they are about a topic. I look at every interaction, and attendance at a technical meeting as an opportunity to educate myself, and others and most importantly, to keep innovation brewing.

However, I do still hiss and growl at people who engage in unethical behaviors. Some things I just cannot and do not wish to change.

I have mentored and worked with cohorts of students for over twenty years. They come to me with their dreams and aspirations and I have learned quite a bit from them.

In academic engineering programs, all students are required to do a capstone design project. Some choose their own project concepts, others allow the Professors to choose for them. Over the years, I have seen creativity in overdrive from my students. One thing I have learned is that rule number one

applies. They know everything, well almost everything.

The students may not have the exact path carved out on where they are going, but they are confident that they will get there. It is my job to help them do exactly that, even if I don't quite comprehend the value proposition in what they are proposing.

In some cases, colleagues have said, "Why don't you tell the kid what a stupid idea that is?", I always remember the rules. Teenagers know everything and I know nothing. I never tell them they cannot do something or not to bother even trying. I always give them the tools to investigate the options and determine the feasibility for themselves. The proposed projects, where I struggle to understand what customer base on earth would buy the resulting products, are usually the projects that have made my students millionaires.

There is something about young engineers naivety that keeps their perspectives fresh and unbounded. It is truly refreshing.

An IEEE colleague once told me the story of a Venture Capitalist (VC) who saw a thirty second pitch for a start-up company back in the 1980's. The VC said the young entrepreneurs showed him a realistic animation of a person morphing (transforming) into an animal.

The VC's response was "so what?" and made the executive decision not to fund the company.

That company is now known as Pixar. Even today, that VC keeps kicking himself for his poor decision. I have personally exceeded a lifetime limit of poor decision making during my teenage years. So, knowing that teenagers and young adults know almost everything and will most likely ignore advice, which they view as authoritative directives, I always encourage them to make decisions for themselves based on their own investigations and discoveries. I always tell them to never give up on their dream

goals and add that I am still working on achieving my own dream goals.

The fact that I still have my own aspirations surprises them. After all, rule number three of teenagers is that anyone over the age of 25 is considered old. At this point in my life, they think I should just climb in the box and close the lid. Young people expect to be successful right now, and not when they are "old".

Thus, all this has reinforced that unless I see imminent danger including ethical issues, my student mentoring approach is to listen, support, advise and most importantly, learn. One of the best ways I have found to arm students with information without stuffing it down their throats is to introduce them to the networks of individuals who know how to nurture good ideas and turn them into successful entrepreneurial ventures and products.

Here in the IEEE Boston Section, we have many groups that are doing just this. One is the Entrepreneurs' Network (www.boston-enet.org) and the other is the Consultants Network (www.boston-consult.org). These individuals have mastered the art form of knowing how to give young people advice, while making everyone value the advice and use it.

These affinity groups are not only providing resources to help young professionals meet their goals, but are the strongest support network for those of us who aren't quite ready to climb into the box and close the lid on our own innovation dream goals.

To answer the question, "What do I wish I had known back then?" I wish I had known that I didn't know everything and that to be successful, assuming we know nothing can remove all boundaries on innovation.

This is a reprint of previously published editorial

Call for Articles

Now that the Reflector is all electronic, we are expanding the content of the publication. One of the new features we will be adding are technical, professional development, and general interest articles to our members and the local technology community. These will supplement the existing material already in our publication.

Technical submissions should be of reasonable technical depth and include graphics and, if needed, any supporting files. The length is flexible; however, a four to five page limit should be used as a guide. An appropriate guide may be a technical paper in a conference proceeding rather than one in an IEEE journal or transaction.

Professional development or general interest articles should have broad applicability to the engineering community and should not explicitly promote services for which a fee or payment is required.

A maximum length of two to three pages would be best.

To ensure quality, technical submissions will be reviewed by the appropriate technical area(s). Professional/interest articles will be reviewed by the Publications Committee for suitability. The author will be notified of the reviewers' decision.

The Reflector is published the first of each month. The target submission deadline for the articles should be five weeks before the issue date (e.g., June 1st issue date; article submission is April 27). This will allow sufficient time for a thorough review and notification to the author.

We are excited about this new feature and hope you are eager to participate!

Submissions should be sent to:
ieeebostonsection@gmail.com

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically diverse sections of the IEEE. We have over 20 active chapters and affinity groups. If you have an expertise that you feel might be of

interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/>. Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- **Honoraria can be considered for course lecturers**
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course)
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Consumer Technology Society Call for Volunteers!

We are currently looking for volunteers who would be interested in pushing forward the mission of the Consumer Technology (CT-S), Boston Chapter. The chapter is looking for volunteers to help organize chapter meetings and help meet the needs of the local CT-S member needs.

The Boston Section is organizing chapters into groups of similar technical interest areas to pool their resources for easier and better chapter collaboration in planning the chapter events.

If you have interest in volunteering for a chapter leadership position or are interested in learning more about what these volunteer positions may entail, please send an email to Karen Safina in the IEEE Boston Section office at, ieeebostonsection@gmail.com

Aakash Deliwala, Chair, IEEE Boston Consumer Technology Chapter

Engineering in Medicine & Biology Society Call for Volunteers!

We are currently looking for volunteers who would be interested in pushing forward the mission of the Engineering in Medicine & Biology Society (EMBS), Boston Chapter. The EMBS - Boston Chapter was recently approved in July 2021, and we're looking to make a significant impact in the area of Biomedicine, Bioengineering, and Biotechnology in the region. The chapter is looking for volunteers to help organize chapter meetings and help meet the needs of the local EMBS members.

The Boston Section is organizing chapters into groups of similar technical interest areas to pool their resources for easier and better chapter collaboration in planning the chapter events.

If you have interest in volunteering for a chapter leadership position or are interested in learning more about what these volunteer positions may entail, please send an email to Karen Safina in the IEEE Boston Section office at, ieeebostonsection@gmail.com.

Aseem Singh, Marie Tupaj, Co-Chairs, Boston EMBS Chapter



What + If = IEEE

420,000+ members in 160 countries.
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People Driving Technological Innovation.

iee.org/membership

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KNOWLEDGE

COMMUNITY

PROFESSIONAL DEVELOPMENT

CAREER ADVANCEMENT

IEEE Boston Section Online Courses:

(Students have 180 day access to all online, self-paced courses)

Electronic Reliability Tutorial Series

Full course description and registration at ,
<http://ieeeboston.org/electronic-reliability/>

High Performance Project Management

Full course description and registration at ,
<http://ieeeboston.org/high-performance-project-management-online-course/>

Introduction to Embedded Linux Part I

Full course description and registration at ,
<http://ieeeboston.org/introduction-to-embedded-linux-part-i-el201-online-course/>

Embedded Linux Optimization - Tools and Techniques

Full course description and registration at ,
<http://ieeeboston.org/embedded-linux-optimization-tools-techniques-line-course/>

Embedded Linux Board Support Packages and Device Drivers

Full course description and registration at ,
<http://ieeeboston.org/embedded-linux-bsps-device-drivers-line-course/>

Software Development for Medical Device Manufacturers

Full course description and registration at ,
<http://ieeeboston.org/software-development-medical-device-manufacturers-line-course/>

Fundamental Mathematics Concepts Relating to Electromagnetics

Full course description and registration at ,
<http://ieeeboston.org/fundamental-mathematics-concepts-relating-electromagnetics-line-course/>

Reliability Engineering for the Business World

Full course description and registration at ,
<http://ieeeboston.org/reliability-engineering-business-world-line-course/>

Design Thinking for Today's Technical Work

<http://ieeeboston.org/design-thinking-technical-work-line-course/>

Fundamentals of Real-Time Operating Systems

<http://ieeeboston.org/fundamentals-of-real-time-operating-systems-rt201-on-line-course/>

IEEE International Symposium on Phased Array Systems and Technology

15 - 18 October 2024

Hynes Convention Center, Boston, Massachusetts, USA

www.ieee-array.org



Gold Sponsors



About the Symposium

Phased array systems continue to be a rapidly evolving technology with steady advances motivated by the challenges presented to modern military and commercial applications. This symposium will present the most recent advances in phased array technology and offer a unique opportunity for members of the international community to interact with colleagues in the field of phased array systems and technology.

The committee is thrilled to announce two major changes to the symposium to better reflect the interest and pace of technology development: (1) moving to the larger [Hynes Convention Center](https://www.hynesconventioncenter.com) in the Back-Bay neighborhood of Boston; and (2) increasing the symposium frequency to a two-year cadence.

Be a Symposium Sponsor or Exhibitor

For sponsorship and exhibit opportunities please reach out to Mark McClure and Marc Angelucci at: sponsorships@ieee-array.org.

Suggested Topics

- 5G Arrays
- Array Design
- Array Measurements
- Array Signal Processing
- Automotive Arrays
- Beamforming & Calibration
- Digital Array Architectures
- Dual Polarized Arrays
- Low-Cost Commercial Arrays
- MIMO Arrays
- Medical Applications
- Metamaterial Phased Arrays
- mmWave and Terahertz
- T/R Modules
- Low Frequency Arrays
- SATCOM Arrays
- Weather Arrays
- Wideband Arrays

Paper Template and Submission Procedures

Template and submission procedures are available at:

<https://ieee-array.org/paper-submission>

Important Dates

- Full paper submission (2-8 pages including figures): 13 May 2024
- Author notification: 22 July 2024
- Author registration deadline: 01 Sept 2024

We are looking forward to seeing you at this next gathering.

Committee

Symposium Chairs

Sean Duffy (C), MIT LL
Wajih Elsallal (VC), MITRE

Technical Program Chairs

David Mooradd (C), MIT LL
Glenn Hopkins (VC), GTRI

Special Sessions Chairs

Matt Facchine, NGC
Kenneth E. Kolodziej, MIT LL

Plenary Session Chair

Will Moulder, MIT LL
William Weedon, Applied Radar

Student Program

Matilda Livadaru, Raytheon Tech
Justin Kasemodel, Raytheon Tech

Tutorials

Cara Kataria, MIT LL
Frank Vliet, TNO

Sponsorship and Exhibits

Marc Angelucci, LMC
Mark McClure, STR

Digital Platforms Chairs

Pierre Dufile, Raytheon Tech
Jacob Houck, GTRI
Mark Fosberry, MITRE
Shireen Warnock, MIT LL

Publications/Publicity

Philip Zurek, MIT LL
Jack Logan, NRL
Elizabeth Kowalski, MIT LL

Poster Sessions Chair

Honglei Chen, MathWorks

Advisors

Daniel Culkin, NGC
Alan J. Fenn, MIT LL
Jeffery S. Herd, MIT LL
Bradley Perry, MIT LL

Arrangements/Administration

Robert Alongi, IEEE Boston
Kathleen Ballos, Ballos Assoc.

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Technical Co-Sponsors



Media Sponsor



IEEE Video Series

A collaborative discussion panel featuring esteemed members from the Institute of Electrical and Electronics Engineers has convened in 2021 to produce educational video presentations that embrace IEEE's mission of advancing technology for humanity.

Among the programs they've produced include "Electric Vehicles: Fun Saving Our Planet", "Greener Power For More Electric Vehicles", "Overcoming Nuclear Fears To Achieve Net Zero CO2 By 2050" and "Achieving a Net Zero Carbon Future", "Green Energy's Economic Progress", and "Net-Zero CO2 with Nuclear, Hydrogen and Geothermal". Projects currently in production include the expansive topic of futurology, with a focus on increasing the efficiency and transformation of aging electrical power generating stations and infrastructure to accommodate nuclear power; reviewing the viability of alternative energy (such as geothermal, wind and solar); and focusing on 'cleaner' fossil fuels that are more environmentally-friendly to slow the rate of climate change.

These shows are produced and directed by Lennart E. Long, IEEE Senior Life Member from the Executive Committee and Past Chair of the Boston Section; Dr. Paul H Carr, BS, MS, MIT; PhD Brandeis U, IEEE Life Fellow; Dr. Ted Kochanski, SB (MIT), Ph.D (U.Texas, Austin), IEEE Global Education for Microelectronic Systems and former Boston Section Chair; and Dr. Ken Laker, B.E. (Manhattan College), M.S. and Ph.D. (New York University), IEEE Life Fellow and past President of IEEE.

The panel is moderated by five-time Boston/New England Emmy Award-winner and television personality and star of "The Folklorist," John Horrigan. These video programs with presentations and discussions can be accessed at the IEEE Boston Section video portal at <https://vimeo.com/user18608275>.

We are looking for any IEEE members that would like to appear on the program in the role of presenter or discussion expert. Simply reach out to Robert Alongi at the Boston Section at, ieebostonsection@gmail.com.

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IEEE Boston Section Volunteers Wanted!

Are you passionate about technology and eager to contribute to the advancement of your field? The IEEE Boston Section is excited to announce a call for volunteers to join our dynamic team of professionals and enthusiasts. By becoming a volunteer, you'll have the opportunity to collaborate with like-minded individuals, develop new skills, and make a meaningful impact on the local technology community.

About IEEE Boston Section:

The IEEE Boston Section is a thriving community of engineers, researchers, students, and industry professionals dedicated to promoting technological innovation and knowledge sharing. Our section hosts a variety of events, workshops, seminars, and conferences throughout the year, providing members with opportunities to learn, network, and stay updated on the latest developments in their fields.

Volunteer Opportunities:

We are currently seeking volunteers to help on the following committees:

The Fellow and Awards Committee - activities include recommending qualified members of the Section for advancement to Fellow grade and for receipt of the various IEEE (IEEE/Region/MGA/Section) awards. Identifying and building a database of the various IEEE awards available for nomination and searching out qualified candidates, for preparing the necessary written recommendations, and for assembling all required supporting documentation and submit its recommendations directly to the appropriate IEEE body.

Time Commitment: Meets 4 times a year for 1 – 2 hours per meeting (virtual or in person)

Local Conferences Committee - activities include identifying timely topical areas for conference development. Identify champions of these conferences to run the identified conference organizing committees. The section local conference committee is not charged with organizing and executing individual conferences.

Time Commitment: Meets 4 times per year 1 – 2 hours per meeting (virtual or in person)

Professional Development & Education Committee - activities include identifying topics, speakers, and/or organizers for appropriate technical lecture series or seminars. The subject matter should be timely, of interest to a large segment of the membership, and well organized with regard to speakers and written subject matter.

Time Commitment: meets 4 times per year, 1 – 2 hours per meeting (virtual or in person)

The Membership Development Committee - activities include actively promoting membership in the IEEE and shall encourage members to advance to the highest grade of membership for which they are qualified. To these ends this committee shall include wide representation within the Section territory, shall maintain lists of

prospects and members qualified for advancement, and shall provide information and assistance to preparing applications.

Time Commitment: meets 4 times per year, 1 – 2 hours per meeting (virtual or in person)

Student Activities Committee - activities include attracting a broad and diverse group of undergraduate and graduate students to IEEE and to engage them in activities that promote their own professional development as well as the ongoing growth of IEEE. The Student Activities Committee shall include among its members the IEEE Counselors at the universities, colleges, and technical institutes that lie within the Section territory. It shall be responsible for liaison with the Student Branches at these institutions and advise the Executive Committee on all other matters affecting the Student Members of the Section.

Time Commitment: meets 4 times per year, 1 – 2 hours per meeting (virtual or in person)

Young Professionals Affinity Group - activities include organizing programs, and initiatives aimed to address the needs of early-career professionals pursuing technology-related careers in engineering, business, management, marketing, and law. This committee is committed to helping young professionals evaluate their career goals, polish their professional image, and create the building blocks of a lifelong and diverse professional network.

Time Commitment: meets 4 times per year, 1 – 2 hours per meeting (virtual or in person)

Benefits of Volunteering:

Volunteering with IEEE Boston Section offers numerous benefits, including:

- Networking opportunities with professionals in your field.
 - Skill development and enhancement through hands-on experience.
 - Contribution to the local technology community and its growth.
- Access to cutting-edge information and discussions.

How to Get Involved:

If you're enthusiastic about technology and want to make a difference, we invite you to join us as a volunteer. To express your interest and learn more about specific roles, please visit our website and fill out the volunteer application form. Our team will get in touch with you to discuss opportunities that align with your interests and skills.

Thank you for considering this opportunity to contribute to the IEEE Boston Section. Your dedication and passion are what drive the success of our community and its impact on the world of technology.

Volunteer Here!

<https://ieeeboston.org/volunteer/>

Consultants Network – 6:00PM, Friday, December 1
STUDENT MEMBERSHIP DRIVE 88% OFF NORMAL MEMBERSHIP RATE

Come join the IEEE Consultants Network. Our consultants will help you in your career path to guide you towards being a consultant or running an independent business.
 Student rate does not include access to Board of Directors meetings.

Location: Your home
 Registration: <https://boston-consult.org/event-5441351>
 Members only \$15.00
 Nonmember – \$30.00
 Student Membership Drive - Low-Rate Membership
 Date: Anytime you sign up for membership
 Cost: \$10 for annual membership.
 88% off the normal membership rate to any student.

Consultants Network – 6:00PM, Tuesday, December 5

CNET Family and Friends Holiday Party / Larry Rachman Retirement Party

Time: 6:00 PM - 9:00 PM

Location: Residence Inn Marriott Framingham, 400
 Staples Drive, Framingham, Massachusetts 01702

Registration: <https://boston-consult.org/event-5334486>
 Members only - \$15.00
 Non member – \$30.00

Please come and honor Larry Rachman's service, over many years, to Boston CNET. We are hoping for all CNET members to attend.

Onsite Only: Residence Inn by Marriott, Framingham
 Ma Hotel Suite.
<https://www.marriott.com/en-us/hotels/bosfm-residence-inn-boston-framingham/overview/>

Registrants will be emailed with the suite or meeting room number.

Cost: \$15 per CNET member, \$15 per family member of CNET member, \$30 friends and non-members.

Please note, the member ticket cost is less than the actual cost to run this event. CNET is absorbing most of the cost. Your discount is a member benefit!

We want ALL our members to participate in this event. We hope to welcome new members that are part of our membership summer drive.

50% off membership to any member joining from July to September, 2023.

Event Description:

- Larry Rachman (former CNET Board Member and Webmaster since 2005) Retirement Party. Please help us honor Larry's service. Larry's wife will also be present.
- Get to know other CNET members
- Meet the CNET Board of Directors live in person
- Menu: (subject to change and request) BBQ Pulled Pork, BBQ chicken, sauce, buns, salad, dressing, sides, beverages, and desert. Complimentary beer and wine will be served (IEEE requires a signed waiver).
- Music

Antennas and Propagation – 12:00PM, Tuesday, December 5

Design of a Space Based HF Vector Sensor Antenna for the AERO-VISTA Missions

Speaker: Alexander Morris, MIT Lincoln Lab



The Auroral Emissions Radio Observer (AERO) and Vector Interferometry Space Technology using AERO (VISTA) missions are nano-satellite programs funded by NASA Science Mission Directorate (SMD) for Heliophysics. These missions will use identical spacecraft to observe radio emissions in Earth's ion-

osphere at low earth orbit. This talk will describe the design, modeling, and prototyping of a 0.1 MHz to 15 MHz vector sensor antenna. The antenna is comprised of 3 orthogonal dipoles and 3 orthogonal loop antennas and is capable of spatial and polarimetric resolution of radio sources.

Alex Morris an associate staff member at MIT Lincoln Laboratory in the RF Technology Group, where he works on the development of phased array antennas and small HF receiver systems. He attended the University of Alaska Fairbanks where he received B.S. (2011) and M.S. (2014) degrees in Electrical Engineering.

Location: Zoom-only. Zoom link will be emailed to registered attendees.

Registration:

<https://events.vtools.ieee.org/m/383086>

Entrepreneurs' Network – 7:00PM, Tuesday, December 12

Building a Founding Team

Attendees will have the option to join us in-person at the Science and Technology Center, Lasell University, Newton, MA or online via Zoom.

This event will help navigate answering: Who do I need on the team? How do I manage the team to High Performance? What should a Founder's Agreement include?

We will start with identifying the founding team roles, how to attract talent, and prioritizing the hiring based

on the founder's strengths. Then, we will move to processes and techniques to manage the founding to high performance. And we will end with creating a Founders Agreement.

For more information and registration click here:

<https://bostonenet.org/events/building-a-founding-team/#!event-register/2023/12/12/building-a-founding-team-1>

Boston/Providence/New Hampshire Reliability Chapter – 5:00PM, Wednesday, December 13

Complex Electronics Reliability and Life Modeling Based on Physics of Failure Simulation

Complex electronics systems and components are subject to various stressors and uncertainties that can affect their reliability and performance over time. Traditional reliability assessment methods, such as statistical models, MTBF estimations, and testing, may not be able to capture the complex interactions and dependencies among the system elements and the failure mechanisms. Physics of failure is an alternative approach that uses physics-based modeling and simulation to understand the root causes of failure, such as device degradation, fatigue, fracture, wear, and corrosion, and to predict the system reliability and life expectancy under different operating conditions and environments. It can also estimate the remaining useful life and the state of degradation of the system.

Physics of failure can also incorporate probabilistic methods to account for the uncertainties and variabilities in the system parameters, materials properties, loading conditions, and failure mechanisms. In this presentation, we will present the foundation and methods of physics of failure-based tools for reliability modeling of complex electronics systems and components and demonstrate how they can be applied to various domains. We will also discuss the advantages and limitations of the physics of failure-based reliability modeling and compare it with other reliability assessment methods. The capabilities of Ansys Sherlock will be demonstrated for electronics physics of failure.

Agenda:

5:00 PM - Networking
 5:30 PM - Technical Presentation
 6:45 PM - Questions and Answers
 7:00 PM – Adjournment

Speaker: Mohammad Pourgol of Teradyne
 Dr. Mohammad Pourgol is a safety/reliability analyst in multidisciplinary systems analysis with Teradyne and an Associate Professor (adj) of Mechanical engineering at the University of Maryland. He previously held the position of Associate Professor of Reliability Engineering at Sahand University of Technology (SUT). Dr. Pourgol earned his Ph.D. in Reliability Engineering from the University of Maryland (UMD). With over 20 years of work experience, his career includes industrial application, re-

search, and teaching in safety applications and reliability engineering at various institutions, including Teradyne Semiconductor, Johnson Controls, Sahand University of Technology, FM Global, Daikin Comforts, UMD, Massachusetts Institute of Technology (MIT). Dr. Pourgol is an IEEE Senior Member, an elected ASQ Fellow, and ASME Fellow. He also served as the ASME Safety Engineering and Risk/Reliability Analysis Division (SERAD) Chair from 2017 to 2022. Additionally, he is a registered Professional Engineer (PE) in the State of Massachusetts and holds certifications as a reliability engineer (ASQ CRE), Six Sigma Black Belt (CSSBB), and Manager of Quality/Organization Excellence (ASQ CMQ/OE). Dr. Pourgol has authored over 160 papers in archival journals and peer-reviewed conferences on his research and has been an invited/Keynote Speaker at numerous conferences and webinars. He has also filed one US patent, and his efforts have been recognized with several awards. Currently, Dr. Pourgol serves as the Associate Editor for the ASME-ASCE Journal of Risk and Uncertainty in Engineering Systems, both Part A: Civil Engineering and Part B: Mechanical Engineering.

This Meeting is to be delivered in-person at MIT Lincoln Lab Main Cafeteria, 244 Wood St, Lexington, MA 02421, and virtually.

At registration, you must provide a valid e-mail address to receive the Webinar Session link approximately 15 hours before the event. The link will only be sent to the e-mail address entered with your registration. Please double-check for spelling errors. If you haven't received the e-mail as scheduled, please check your spam folder and alternate e-mail accounts before contacting the host. Please indicate in the registration survey if you will be attending in person so that we may plan for food and refreshments.

The meeting is open to all. You do not need to belong to the IEEE to attend this event; however, we welcome your consideration of IEEE membership as a career enhancing technical affiliation. There is no cost to register or attend, but registration is required.

Registration:
<https://events.vtools.ieee.org/m/381012>

Photonics Society - 6:00PM, Thursday, December 14

Visible photonic integrated circuits: From neuroscience to quantum applications



Reconfiguring, modulating, and processing light at visible wavelengths typically requires complex and bulky table-top optics. High resolution optical applications such as optogenetic neural studies, fluorescence microscopy, and quantum information systems have a growing need for

compact and efficient platforms that can control and readout large numbers of optical channels. However, in the visible wavelength range, where key optical transitions lie, this is a significant challenge because the traditional silicon photonics chip-scale platforms cannot be leveraged due to fundamental material absorption limits. Silicon nitride has been demonstrated as a foundry-compatible, low-loss photonic platform operating down to 400 nm wavelength through optimized fabrication processes and mode engineering.

This talk will highlight recent work in visible photonic integrated circuits based on silicon nitride including switching networks, optical phased arrays, chip-scale lasers, modulators and ongoing challenges for their practical application in neuroscience, imaging, and quantum systems. Finally, opportunities in mode-multiplexing and hybrid integration of active optical materials will be discussed for expanding the platform's functional capabilities.

Aseema Mohanty is the Clare Boothe Luce Assistant Professor in Electrical and Computer Engineering at Tufts University. She received her B.S. degree from the Massachusetts Institute of Technology and Ph.D. from Cornell University. During her postdoctoral work at Columbia University, she developed an implantable neural probe based on visible photonic integrated circuits for sub-millisecond and single-cell neural stimulation and readout. Her research focuses on using nanophotonics and engineered light-matter interactions to create miniaturized high performance optical circuits to control, shape, and sense light. Her interest in chip-scale optical devices broadly span the fields of neuroscience, implantable and wearable biomedical sensors, 3D optical beam shaping, quantum information and emerging computing and communication systems. Her work has been published in Nature Photonics, Nature Biomedical Engineering, Nature Communications and was named a Scialog fellow for Advancing BioImaging in 2021.

Agenda

6:00 PM - Networking starts.

6:15 PM - Light meals served.

7:00 PM - Seminar starts.

Registration:

<https://events.vtools.ieee.org/m/384452>

The Microzone: Unveiling the Microsystem Technology Titans on the Podcast Stage

Adarsh Ravi (Chair) and Allison Lemus (Vice-Chair) from the IEEE Microsystems Boston Chapter host The Microzone, which is a podcast show about the leaders of the microsystems community. The interview-style podcasts are released every month on podcast platforms such as Spotify and Google Podcasts.

The first episode with Dr. Stephen Senturia, Emeritus Professor of Electrical Engineering from MIT and Micro electro-mechanical systems (MEMS) legend, was released in September this year. In the podcast, Prof. Senturia talks about his journey from his early days in microsystems engineering to his current works in novel writing and preparing future faculty.

The second episode features an interview with III-V compound semiconductor expert and MIT Professor Dr. Jesus del Alamo. In the interview, he shares his thoughts about what it will take to build a strong semiconductor ecosystem in addition to discussing the role of III-V materials in future microelectronics devices.

Image: Professor Stephen Senturia holding the inaugural podcast mic at the Microzone podcast launch event. (Left to right: Adarsh Ravi, Allison Lemus, Professor Stephen Senturia, and University of Michigan Professor Khalil Najafi)

The most recent podcast episode, released in November, hosts Dr. Baoxing Chen. Dr. Chen is an inventor, a Sr. Fellow, and a VP of Technology at Analog Devices Inc. In the podcast, he talks about the role of digital isolators in future factories and healthcare technologies.

The hosts and producers of the show, Allison and Adarsh, are excited to meet and interview the microsystems titans of the New England region.

Click <https://open.spotify.com/show/6FTRKpJltJ7Y-HIOu8lwLzf>

to listen and follow the IEEE Microsystems Boston Chapter's podcast channel, The Microzone.

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

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YouTube: <https://www.youtube.com/user/IEEEBostonSection>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

IEEE Microsystems Women Leaders Panel Discussion: Breaking the Barriers and Paving a Path for Excellence

The IEEE Microsystems Boston chapter organized the IEEE Microsystems Women Leaders Panel Discussion and brought together four trailblazing high-tech and C-suite women leaders for an engaging and insightful panel discussion on 16th November 2023. This unique event was held at Northeastern University Innovation campus in Burlington, MA and was sponsored by the IEEE UFFC Society, IEEE Sensors Council, Northeastern University SMART Center and the Boston chapters of the IEEE Solid State Circuits Society and IEEE Women in Engineering.

The panel featured distinguished individuals, including Dr. Sophie Vandebroek, a seasoned executive renowned for her C-level roles at IBM, Xerox, and UTC; Dr. Francesca Scire-Scappuzzo, a board member of a few non-profits, and mentor for accelerators and incubators; Dr. Helen Kim, entrepreneur and high-tech scientist at MIT Lincoln Laboratory; and Ms. Susan Feindt, a Fellow at Analog Devices and an advisor to several national and international research institutions and governmental committees. Dr. Maira Samary, an Associate Professor of Practice at Boston College moderated the panel discussion. Together, they created an evening centered on inspiration and empowerment. The conversation, with a focus on overcoming barriers, explored the personal and professional journeys of these accomplished women leaders. Attendees gained valuable insights and a roadmap for navigating challenges within the field.



Image: Panelists and the moderator during the discussion. Left to right: Dr. Maira Samary (Moderator), Dr. Sophie Vandebroek, Dr. Francesca Scire-Scappuzzo, Ms. Susan Feindt, and Dr. Helen Kim.

The engaging session featured a barrage of questions, providing a comprehensive insight into the panelists' individual journeys. The discussion delved into the importance of the role of mentorship in tech careers. Each panelist underscored the significance of mentors in shaping their professional trajectories, emphasizing the values of courage, confidence, effective communication, and collaborative teamwork. The conversation seamlessly transitioned to the importance of diverse teams, not only in terms of academic backgrounds but also in fostering a variety of thoughts crucial for innovative problem-solving. The panelists also shared their perspectives on emerging tech trends, ranging from artificial intelligence and electronic chips to healthcare, automation, and the profound impact of technology in addressing climate change. Furthermore, the discussion ventured into the delicate art of managing work-life balance, offering pragmatic insights into the strategies employed by these accomplished women in maintaining equilibrium amidst the dynamic demands of the tech sector.



Image: Women Leaders panelists with the organizers from the IEEE Microsystems Boston Chapter, Allison Lemus (Vice Chair) and Adarsh Ravi (Chair)

The panel discussion was followed by a networking dinner. This was a great opportunity for the attendees to ask questions and share their thoughts with the panelists in a more relaxed setting. The panelists were able to provide more detailed answers and insights, and the attendees were able to learn more about the topics discussed during the event. This interaction helped to build

a stronger connection between the panelists and the attendees, and it was a great way to end the event on a positive note.

The IEEE Microsystems Women Leaders Panel Discussion not only celebrated the achievements of these executives but also provided a platform for candid conversations about the ongoing journey toward diversity of thoughts and teams in the workplace. The event concluded with a sense of optimism and a renewed commitment to fostering a more inclusive and dynamic future for women in leadership roles within the high-tech sector.

Image: The panelists with a few organizers, sponsors, and a few attendees



Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically diverse sections of the IEEE. We have over 20 active chapters and affinity groups. If you have an expertise that you feel might be of

interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/>. Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- **Honoraria can be considered for course lecturers**
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course)
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Advanced Digital Design: Implementing Deep Machine Learning on FPGA

Times & Dates: 6 - PM ET, Mondays, Jan. 22, 29, Feb. 5, 12, 19, 26, 2024

Speaker: Kendall Farnham, Dartmouth College

Hosted by

Location: MITRE Corporation, Bedford, MA



Course Overview:

Field-programmable gate arrays (FPGAs) are versatile integrated circuits that offer a flexible and reconfigurable hardware platform for implementing custom digital circuits, particularly in applications requiring specialized architectures. Unlike application-specific integrated circuits (ASICs), FPGAs can be programmed and re-programmed after manufacturing using hardware description languages (HDLs), enabling rapid prototyping and iterative design processes. FPGAs can be found in telecommunications, signal processing, aerospace, and other scenarios demanding high-performance computing, parallel processing, low-latency data processing, and real-time operations. The newest trends include integrating FPGAs with systems on chip (SoCs) for implementing low-latency machine learning (ML) and artificial intelligence.

This Advanced Digital Design course is an intensive program designed to build upon foundational concepts in digital logic design and equip students with the skills needed to implement robust high-speed ML algorithms on an FPGA. Through a combination of theoretical lectures, hands-on exercises, and practical projects, students will explore advanced FPGA topics encompassing architectural considerations, signal integrity, timing analysis, and optimization techniques to achieve reliable and efficient high-speed designs. Additionally, this course will encourage students to explore current research papers and real-world industry applications to foster a deeper appreciation for advancements in state-of-the-art FPGA design.

Target audience:

Students and professionals with a base knowledge of FPGA design looking to advance hardware design skills for developing complex customized circuits for efficient implementation of ML.

Benefits of attending:

- Valuable professional development creating skills that lead to job offers
- Reinforce and expand knowledge of VHDL and FPGA-specific design methodology.
- Develop skills for implementing high-speed, robust, reliable circuits on FPGAs.
- Gain understanding of real-world industry applications of FPGAs and SoCs.

Course Objectives:

By the end of this course, students will possess the expertise needed to tackle complex high-speed hardware design challenges using FPGAs. They will be well-prepared to contribute to cutting-edge research, industry projects, and advancements in areas such as telecommunications, data centers, embedded systems, and high-performance computing.

Prerequisites:

- Understanding of digital logic design principles and methodology (e.g., Boolean algebra, finite state machines, data path elements)
- Familiarity with VHDL programming (or Verilog)
- Experience with FPGA development boards and tools (e.g., Vivado)

Speaker Bio:

Kendall Farnham is a PhD candidate in Dr. Ryan Halter's bioimpedance lab at the Thayer School of Engineering, Dartmouth College. She has 10+ years of experience in the electrical and computer engineering (ECE) field and 5+ years of teaching and mentoring experience, having held several leadership positions within academia and industry. She received her bachelor's degree in ECE in 2014, worked in the defense industry as a software engineer for 4 years where she discovered her passion for research, and returned to

school to expand her education to include hardware design for space medicine applications. Specifically, she is interested in FPGA-based biomedical device design, currently working to develop space-compatible technologies that use impedance to monitor and detect physiological effects of space travel. Her expertise includes high-performance FPGA-based digital system design, analog circuit design, multi-modal imaging algorithms, and system integration.

Course Outline:

1. Review of Digital Logic Design and FPGA Programming

- Boolean algebra, combinational and sequential circuits, finite state machines
- FPGA, SoC, and SoM architectures and tool-chains
- VHDL programming techniques and design methodology
- Writing effective testbenches, RTL simulation in Vivado
- Introduction to ML algorithms and FPGA-specific optimization strategies

2. High-throughput Communication on FPGAs

- Pipelining and parallelism for high-speed designs
- Synchronous vs. asynchronous communication protocols (SPI, SCI, UART, LVDS, I2C, PCIe, USB, Ethernet, etc.)
- Compare hardware/software/firmware implementations of ML: throughput speeds, resource utilization, and latency
- Methods used to achieve ultra-high sampling rates ($\gg$ system clock, GS/s range)
- Utilizing advanced IP cores and IO buffers for high-speed interfaces and data storage

3. Advanced FPGA Techniques for High-speed Systems

- Clock domain crossing verification and synchronization techniques

- Resource utilization, critical path identification, and optimization strategies
- Timing constraints, static and dynamic timing analysis
- Signal integrity analysis

4. High-Speed Design Verification and Testing

- Simulation-based verification techniques, advanced debugging, and waveform analysis
- Post-layout verification and back-annotation
- Test and validation strategies for high-speed designs

- Utilizing debug cores for real-time logic analysis

5. Machine Learning on FPGAs

- Algorithm validation and verification in software
- Compare capabilities and implementation strategies of ML on FPGAs, SoCs, and SoMs
- Optimization strategies for efficient ML implementation in hardware (e.g., convolution)

6. Digital Systems in Industry

- Techniques and best practices for scalable, reusable, reliable, and robust FPGA design
- Board-level considerations for high-speed signals: PCB layout guidelines, power distribution and decoupling, transmission line theory and termination techniques
- Emerging trends for FPGA-based digital signal processing (DSP) applications

CEU/PDH are available upon request. A small fee may apply for the credits

**Decision (Run/Cancel) Date for this Course is
Friday, January 12, 2024**

Payment	By Jan. 5	After Jan.5
IEEE Members	\$120	\$140
Non-members	\$300	\$400

https://ieeeboston.org/event/advanced-digital-design/?instance_id=3481

Preserving Innovation:

Navigating the Essentials of Intellectual Property Protection

Dates & Times: 6 - 7PM, Wednesday, January 17, 2024

Speaker: Greg Gerstenzang, and John Spangenberg, Lando & Anastasi

Location: Free Webinar

Overview

In high tech industries intellectual property may be a company's most valuable asset. Protection of a company's IP – patents, trademarks, copyright, and trade secrets – can be a key strategy for obtaining and maintaining competitive advantage in the marketplace. This webinar will focus primarily on patents, including what makes a patent essential for protecting innovation, the legal requirements necessary for obtaining a patent in the U.S., and the particulars of the application process in the U.S.

Target Audience

This webinar is intended for corporate counsel or persons in other leadership positions in companies that are developing innovations that they would like to protect from being copied by competitors. The content would also be beneficial to inventors within such companies that are involved in developing the innovations.

Benefits of Attending

To obtain a better understanding of intellectual property, in particular patent law, as well as an understanding of when a patent might be the best vehicle for protecting an innovation and when other forms of protection may be more appropriate as well as to gain a better understanding about what hurdles must be overcome to obtain a patent and the process involved in doing so.

Agenda/Topics

- Forms of intellectual property and how they might be protected
- What rights/benefits a patent conveys to a patentee
- Legal Requirements for obtaining a patent
 - o Anticipation
 - o Obviousness
 - o Written description/enablement
 - o Patent Eligible Subject Matter
- Procedure for applying for a patent

The notes/slide deck will be available for all that attend the session on January 17

Speaker Bios:

Greg Gerstenzang:

<https://www.lalaw.com/people/gregory-k-gerstenzang/>

John Spangenberg:

<https://www.lalaw.com/people/john-t-spangenberg/>

There is no charge for this webinar but registration is required.

Registration closes on January 17, 2024 at 12PM) noon ET.

Registration:

<https://events.vtools.ieee.org/m/380844>



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