

Boston Section

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

THE *Reflector*

ISSUE #3
MARCH 2024

2024 IEEE INTERNATIONAL
SYMPOSIUM ON PHASED
ARRAY SYSTEMS AND
TECHNOLOGY

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Boston Section

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Engineering Diplomacy: Navigating Global Challenges Using Generative AI Tools

By Wigna Balasingham, Secretary/Treasurer, IEEE Boston Section

Engineering diplomacy defines the basis of global co-operation cultivating its purpose to address issues that exceed national borders. As we stand at a time when technology alters geopolitics and human development, combining engineering with diplomatic efforts becomes increasingly vital. This article discusses the multi-dimensional side of engineering diplomacy outlining the history, challenges, and opportunities, under the context of generative AI tools used in diplomatic initiatives.

In essence, engineering diplomacy presents engineering concepts, innovative approaches, and teamwork to resolve diverse global problems. It is beyond the borders of diplomatic techniques by providing on-ground solutions with technical backup. Through enhancing cooperation, knowledge sharing, and joint implementation, engineering diplomacy enables inter-country trust and mutual understanding. Engineering diplomacy strengthens international cooperation by uniting joint infrastructure projects, disaster response mechanisms, and similar efforts of collective action.

The role of engineering diplomacy becomes understandable when dialing in on immediate global challenges. For instance, natural disasters, global pandemics like COVID 19 and humanitarian crises. These events call for hastened and unified reactions, in which engineering prowess is paramount in boosting readiness, response, and resiliency. Collaborative efforts of engineering diplomacy allow the exchange of resources, technologies, and knowledge among communities enabling priority of lives and reducing the effects of disasters. Similarly, engineers uniting to develop quake-resistant building designs, early warning systems, and cooperative search-and-rescue operations can bring about unity and support amid disastrous conflicts among nations.

Alternatively, engineering diplomacy has the potential to build cooperations despite various hurdles. Geopolitical tensions, supply shortages, technology divide, and regulations complications are usually barriers for collaboration and development. Furthermore, the speed of technological innovation produces new kinds of complexities and ethical concerns that need delicate handling in diplomatic actions. The fluid character of international affairs adds to the headaches of building dialogue and partnership on engineering-related issues.

Despite the challenges at hand, engineering diplomacy signifies a notable departure from conventional diplomatic approaches. This shift prompts society to question: "What role do engineers play in diplomatic affairs?" The traditional view of engineers solely as technical problem-solvers has evolved into a broader understanding that encompasses their active engagement in diplomatic initiatives and their involvement in addressing global issues. A broad range of activities is part of their mandate. These include improving education and research capabilities, technology transfer, and addressing issues like pandemics, climate change, and artificial intelligence.

The use of generative AI as a tool in diplomacy signifies an important milestone in engineering diplomacy. Generative AI means AI systems can produce new content such as text, images, or videos that are patterned based on extensive data sets. These programs can turn diplomacy on its head and lead to better decision-making in complicated geopolitical contexts. AI developed by advanced nations exerts significant influence across military, economic, and social domains. Skillful utilization of generative AI has the potential to reshape global relations, forge strategic partnerships, and transform

the dynamics of the world stage. Hence, the problem of AI has come to the forefront of the diplomatic agenda, discussions around which are, governance, ethics, and norms of AI development and usage.

Generative AI in diplomacy is one of the factors that enable it to explore vast data sets, see trends and big potentials, and depict risks. AI algorithms proceed to draw on a great variety of sources, such as social media, economic indicators, and geopolitical events, to provide input in diplomatic decision-making. Besides, AI-powered natural language models help in effective communication across linguistic divisions, which helps in developing official reports, speeches, official statements, and the list goes on.

Diplomatic interactions can be modeled by AI generative technologies which will include various assessments of given scenarios, forecasting the results, and suggesting the best course of action based on previous evidence and context. The power of generative AI lies in the fact that it gives diplomats new capabilities like advanced analytics, foresight, and the capacity to resolve conflicts while facilitating cooperation both sustainably and effectively on global challenges.

Additionally, the explosive development of AI-generated content such as misinformation, propaganda, and deepfakes results in major threats to diplomatic dialogue pathways. Diplomats and other actors involved in foreign policy should be able to identify and counteract the imprint of AI-generated content to ensure such diplomatic tools remain valid and useful. Moreover, actively supporting the constructive development and utilization of generative AI technologies among major nations is imperative. This involves establishing ethical

standards and implementing regulatory frameworks. Regulation frameworks are essential to ensure responsible and transparent deployment of AI, safeguarding against misuse and promoting equitable access to its benefits. They provide guidelines for ethical conduct, mitigate potential risks, and foster international collaboration in harnessing AI for the greater good.

Despite these concerns, the integration of generative AI into engineering diplomacy offers significant benefits for the advancement of the traditional diplomacy. AI-empowered simulations and modeling can help scenario planning, risk assessment, and decision-making in situations of complex diplomatic negotiations. The algorithms for natural language processing makes it possible for multilingual communication, overcoming language barriers and increasing the inclusivity in diplomatic dialogues. Machine learning algorithms can deal with large amounts of data to detect trends, patterns, and probable fields of engineering project cooperation.

In summary, engineering diplomacy plays a vital role in addressing global challenges by integrating technical innovation, cooperation, and diplomacy. The incorporation of AI in diplomatic efforts anticipates new opportunities for enhancing decision-making, communication, and conflict resolution. Achieving this goal involves the adoption of emerging technologies by policymakers, diplomats, and engineers. As a result, they can forge new avenues for cooperation and sustainable development on the global stage. During an international conference recently, Secretary of State Tony Blinken underscored the importance of technology-oriented partnerships among democracies. Our symphony of innovation echoes across continents, shaping a future where diplomacy dances with AI and human ingenuity.

IEEE Boston Section Social Media Links:

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

Facebook: <https://www.facebook.com/IEEEBoston>

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

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

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, ieebostonsection@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, ieebostonsection@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/>

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.

Silver Sponsors



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.

Call for Articles

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ieebostonsection@gmail.com

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/>



Business Manager

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is looking for a Business Manager for its Boston area operations This person should have experience in overseeing business operations, finance, marketing, social media

Key Responsibilities:

- Assists the IEEE Boston Section in the development of a diverse portfolio of programs and services that drives member engagement
- Facilitates the research, identification, and planning of sources of revenue and funding, such as courses and conferences
- Manages the financial affairs of the Boston Section
- Oversees the planning and implementation of the marketing of the Boston Section and its events, including a social media presence.
- Acts as Managing Editor of the Boston Section newsletter.

Education

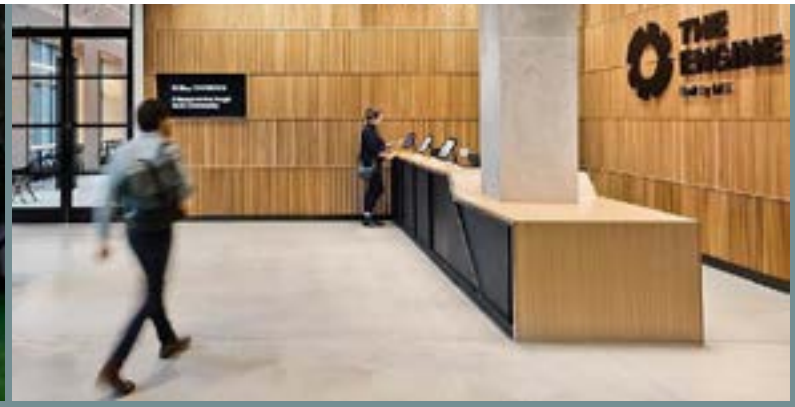
- Bachelor's degree or equivalent experience Consideration may be given to non-degreed individuals whose experience and credentials are considered equivalent.

Work Experience

- 4-7 years relevant experience in management roles, with responsibility for profit-loss
- Experience drafting and managing budgets, and cash flow analysis, including Financial Management and Annual Reporting
- Experience in not-for-profit organization management preferred

For More Details and to Apply

https://ieee.taleo.net/careersection/2/jobdetail.ftl?job=230317&tz=G-MT-05%3A00&tzname=America%2FNew_York



IEEE SiPS 2024

IEEE Workshop on Signal Processing Systems

4–6 November 2024

Cambridge, Massachusetts, U.S.A.

The 37th IEEE Workshop on Signal Processing Systems (SiPS) is a premier international forum in the area of design and implementation of signal processing systems. It addresses all aspects of architecture and design methods of these systems. Emphasis is on current and future challenges in research and development in both academia and industry.

Submitting a Paper

We invite prospective authors to submit original papers (up to 6 pages) in areas including, but not limited to:

Software Implementation of Signal Processing Systems

- Software on programmable digital signal processors
- Application-specific instruction-set processor (ASIP) architectures and systems
- SIMD, VLIW, and multi-core CPU architectures
- GPU-based massively parallel implementations

Hardware Implementation of Signal Processing Systems

- Low-power signal processing circuits and applications
- High-performance VLSI systems
- FPGA and reconfigurable architecture-based systems
- System-on-chip and network-on-chip
- VLSI for sensor network and RF identification systems
- Quantum signal processing
- Processing-in-memory signal processing systems

Design Methods of Signal Processing Systems

- Optimization of signal processing algorithms
- Compilers and tools for signal processing systems
- Algorithm-to-architecture transformation
- Dataflow-based design methodologies
- Error-tolerant techniques for signal processing

Machine Learning for Signal Processing

- Circuits and systems for AI
- Deep learning/machine learning/AI algorithms
- Tools/platforms for AI
- Transfer learning
- Distributed/federated learning
- Hardware/neuromorphic accelerators
- Hardware/software co-design and automation for AI

Signal Processing Application Systems

- Audio, speech, and language processing
- Biomedical signal processing and bioinformatics
- Image, video, and multimedia signal processing
- Information forensics, security, and cryptography
- Sensing and sensor signal processing
- Signal processing for non-volatile memory systems
- Latency-and power-constrained signal processing
- Wireless communications and MIMO systems
- Coding and compression
- Signal processing for mixed-signal technologies

Important Dates

Technical Papers:	03 April 2024
Paper Notifications:	26 June 2024
Special Session Proposals:	31 July 2024
Tutorial Proposals:	31 July 2024

Committee

General Chairs

John McAllister, QUB
Joe Cavallaro, Rice

Finance Chair

Warren Gross, McGill University

Program Chairs

Jari Nurmi, Tampere Univ.
Jani Boutellier, Univ. of Vaasa

Local Organizing Chair

Brian Telfer, MIT Lincoln Laboratory

eee-sips.org



IEEE RFID 2024 - SUBMIT NOW!

The 18th IEEE International Conference on RFID (IEEE RFID 2024) is seeking high-quality submissions for papers and posters (see submission options below) in all areas of technical RFID research and application.

IEEE RFID 2024 offers a unique opportunity to share, discuss, and witness research results in all areas of RFID technologies and their applications.

COME JOIN US IN BOSTON, JUNE 4–6, 2024!



Date: June 4-6, 2024



MIT Media Lab, Cambridge MA



IMPORTANT DATES

PAPER SUBMISSION DEADLINE:
FEBRUARY 26TH, 2024

WORKSHOP PROPOSAL DEADLINE:
MARCH 11TH, 2024

NOTIFICATION OF ACCEPTANCE:
APRIL 22ND, 2024

POSTER SUBMISSION:
APRIL 29TH, 2024

FINAL PAPER SUBMISSION:
MAY 13TH, 2024

ALL DEADLINES ARE AT
11:59PM UTC-12

CALL FOR PAPERS

The IEEE RFID 2024 accepts paper and poster submissions formatted in the IEEE conference style. Manuscripts should be 6 pages, submitted by the advertised conference deadline (Feb 26, 2024). Posters follow the 1-page format (deadline April 29, 2024)

Selected papers will be invited to be published in Journal of Radio Frequency Identification (JRFID)

General Track Topics and Workshops

GENERAL TRACK TOPICS

ANTENNAS & PROPAGATIONS
APPLICATIONS & SOFTWARE
PROTOCOLS & SECURITY
CIRCUITS, DEVICES & INTERROGATIONS
NEXT-GEN RFID & ID+
SENSORS
MOTION CAPTURE (MOCAP)

GENERAL TRACK TOPICS

ENERGY HARVESTING
ARTIFICIAL INTELLIGENCE (AI) FOR RFID
DIGITAL TWINS
OCEAN INTERNET OF THINGS (IOT)
BIOMEDICAL SYSTEMS
SMART MATERIALS
GEN. 3 RFID



Visit the website:



Entrepreneur's Network – 7:00PM, Tuesday, March 5

Artificial Intelligence – Good or Bad?

Location: Lasell University, Newton MA

Virtual via zoom

Cost: Free to ENET members; \$15. Non-members

Registration: <https://bostonenet.org/events/artificial-intelligence-good-or-bad/#!event-register/2024/3/5/artificial-intelligence-good-or-bad>

Artificial intelligence presents the greatest opportunity ever for entrepreneurs to level the playing field against your oversized competitors. It can also provide better access to information with natural language search and summarization. But what exactly is AI and how can you use it effectively?

There are several flavors of AI such as machine learning, neural networks, and natural language processing. Applications can be specific to industries, systems, and processes. There are practical and ethical considerations, too. Lasell University Assistant Professor Kurt Wirth, who's a faculty fellow for AI, will give you an overview of AI technologies, considerations, and issues.

Jeff Ernst, CEO and founder of two companies focused on customer and buyer research and a SaaS customer marketing and advocacy platform, will explain how to make yourself relevant in this new world of AI-empowered buyers by giving entrepreneurs an advantage over larger competitors. Those pros raced to use ChatGPT and its brethren to generate marketing messages, website content, sales letters, you name it. Alas, nothing makes you sound more generic and just like your competitors than content generated by AI bots.

The real opportunity is an area where no one is focused yet. Your buyers would rather have conversations with AI bots like ChatGPT than your sales reps to learn about potential solutions to their problems or ask AI bots questions for insightful answers than do Google searches and get a list of links.

In the legal world, AI has the potential to narrow the justice gap, but it also has the potential to cause serious

ethical issues for lawyers. Kara Peterson, co-founder of describe.ai, will explain how the legal tech market is adapting to the arrival of AI. She will provide examples of good and bad uses of AI in the legal sphere, and how her company is using AI to increase access to the law, and ultimately, access to justice.

During this program, you will learn:

- o The various flavors of AI
- o Custom AI applications for industries
- o AI's massive system processing demands
- o A race to find AI talent
- o Research on how AI affects buyer behavior
- o When, how, and why tech buyers use AI and how start-ups must be part of buyers research
- o How to build a business with AI
- o A legal application to democratize the law

Panel Speakers:

Jeff Ernst is the Founder and CEO of Voice Advice, a Voice of the Customer (VOC) and Buyer (VOB) research company, and Founder and CEO of SlapFive, a SaaS Customer Marketing & Advocacy platform. As the creator of the Customer-Led Growth movement, Ernst guides senior executives on how to mobilize customers to drive profitable revenue growth. He developed this approach as a Principal Analyst at Forrester, where he conducted extensive research into how prospects buy and how customers want to be engaged. Ernst used those insights to help executives devise customer engagement strategies that drive new customer acquisition, onboarding and adoption, expansion, and renewal.
linkedin.com/in/jeffernst/



Kurt Wirth is an Assistant Professor of Communication at Lasell University as well as the school's Faculty Fellow for AI and Pedagogical Innovation. With a Ph.D. in Communication, Wirth built a successful career in marketing digital presences for brands like GEICO and Hilton Hotels and Resorts before turning to a life in education. His background has leaned heavily on digital communication and modern



tech, as his passion for data, emerging technologies, and empowering students has overlapped in his role at Lasell University. Known for leaping first and generally landing on his feet, Wirth is a bold, action-oriented risk-taker who has put innovation first at every stop of his journey.

Kara Peterson is cofounder of *describe.ai*, a legal tech startup founded in June 2024. She is also a marketing communications leader who focuses on organizations with a social justice focus. She currently is the Senior Director of Integrated Marketing Communications at the Museum of Science and previously worked at Harvard University and Boston University. Peterson is also involved in local activism and is a founding member of Newton Upstanders, which is focused on making Newton an inclusive and welcoming community for all. She earned her MBA at Boston University and her undergraduate degree at the University of Wisconsin.



Moderator and Organizer

Howard Sholkin has several decades of marketing communication experience across industry sectors. Since 2018, he has served as President of Newton Community Pride, a non-profit supporting a few dozen events in the city where he is a lifelong resident. In



2014, he formed Sholkin Consulting to deliver digital marketing services to technology and financial services companies. He also served on the adjunct faculty of Boston University and Lasell College for five years.

In 2003, he was hired as director of corporate communications at International Data Group (IDG) where he served Founder Pat McGovern. Sholkin later became director of communication and marketing programs for the CEO of IDG Communications, a global technology media and events subsidiary. IDG brands include Computerworld, PCWorld, Macworld, and CIO. Sholkin has held senior marketing and communication positions at technology product and services companies such as Computervision; Technology Concepts, a subsidiary of Bell Atlantic; Corporate Software; and, Digital Equipment Corp./Compaq. He was a columnist for PR News and for Personal Branding magazine, one of the first publications on social media.

Since 1990, Sholkin has been active in the Public Relations Society of America (PRSA) where he once served as president of the Boston chapter. Currently, he is co-chair of the national PRSA Investment Committee. He serves on the boards of three non-profits: Newton Community Pride, Boston Entrepreneurs Network (ENET) and Temple Shalom of Newton.

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 pay-

ment 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

Boston/Providence/New Hampshire Reliability Chapter, and Life Members – 5:30PM, Wednesday, March 6

Hybrid - Regression and Time Series Mixture Approaches to Predict Resilience

Speaker: Priscila Silva of University of Massachusetts - Dartmouth



Resilience engineering is the ability to build and sustain a system that can deal effectively with disruptive events. Previous resilience engineering research focuses on metrics to quantify resilience and models to characterize system performance. However, resilience metrics are normally computed after disruptions have occurred and existing models lack the ability to predict one or more shocks and subsequent recoveries.

To address these limitations, this talk presents three alternative approaches to model system resilience with statistical techniques based on (i) regression, (ii) time series, and (iii) a combination of regression and time series to track and predict how system performance will change when exposed to multiple shocks and stresses of different intensity and duration, provide structure for planning tests to assess system resilience against particular shocks and stresses and guide data collection necessary to conduct tests effectively.

These modeling approaches are general and can be applied to systems and processes in multiple domains. A historical data set on job losses during the 1980 recessions in the United States is used to assess the predictive accuracy of these approaches. Goodness-of-fit measures and confidence intervals are computed and interval-based and point-based resilience metrics are predicted to assess how well the models perform on the data set considered. The results suggest that resilience models based on statistical methods such as multiple linear regression and multivariate time series models are capable of modeling and predicting resilience curves exhibiting multiple shocks and sub-

sequent recoveries. However, models that combine regression and time series account for changes in performance due to current and time-delayed effects from disruptions most effectively, demonstrating superior performance in long-term predictions and higher goodness-of-fit despite increased parametric complexity.

Location: 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.

Agenda:

5:30 PM - Light repast and Networking

6:00 PM - Technical Presentation

6:45 PM - Questions and Answers

7:00 PM – Adjournment

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/406423>

Please visit: Please visit <https://r1.ieee.org/boston-rl/>

Consultants Network (CNET) – 6:00PM, Wednesday, March 13

CNET Board of Directors Meeting

Location: Kitty's Restaurant North Reading, MA
Free Dinner starts at 6:00 PM
Meeting starts at 7:00 PM - On-site and Zoom

you are unable to attend, then we will also be on Zoom.

Registration: <https://www.boston-consult.org/event-5614112/Registration>

Members in good standing are encouraged to attend. If

IEEE Boston Section Social Media Links:

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

Facebook: <https://www.facebook.com/IEEEBoston>

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

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

Photonics Society – 6:00PM, Thursday, March 14

Silicon Photonics-Powered Coherent Biosensing

Speaker: Dr. Diedrik Vermeulen

Silicon photonics harnesses the power of light to enable high-speed, high-capacity data communication and processing on the silicon platform. When applied to coherent biosensing, this technology facilitates ultra-sensitive and real-time detection of biological molecules. By integrating photonic circuits with biosensing elements, unprecedented resolution and specificity in molecular detection can be achieved. This convergence promises transformative advances in diagnostics, therapeutics, and personalized medicine.

Diedrik is one of the founders of SiPhox Health and serves as its Chief Executive Officer. Prior to joining SiPhox, Diedrik was the Director of Engineering at Analog Photonics commercializing chip-scale LiDAR

and tunable lasers. He was also a research scientist at Massachusetts Institute of Technology and was a principal design engineer at Acacia Communications (IPO, acquired by Cisco) commercializing the first silicon photonics based coherent transceiver for long-haul and metro optical fiber communication. Diedrik's inventions on Fiber-To-The-Home optical transceivers were commercialized in a company Caliopa (acquired by Huawei). Diedrik holds a M.S. in Theoretical Physics, a M.S. in Applied Physics and a PhD in Photonics from Ghent University.

Registration Link:

<https://events.vtools.ieee.org/event/register/407466>

Entrepreneur's Network – 7:00PM, Tuesday, March 19

From Academic Research to Startup

In-person location forth-coming
Virtual via Zoom

Cost: Free to ENET members; \$15. Non-members

Academic research is a critical source of new knowledge, a basic research engine that translates investigator curiosity, energy and resourcefulness into tools, insights and inventions that have the potential to change the world. Sadly, only 5-10 percent of patented academic inventions go on to become commercial products, and only a very small percentage of academic research even gets to the stage of filing a patent. What

does it take to effectively translate academic research to commercial success?

Often, the path to commercialization begins with a start-up. The challenges in launching a start-up based on research emerging from academia are manifold. To say "it takes a village" would be a gross understatement. Tonight's panelists, each having a key role in the academic research to commercialization continuum, will enlighten us with their experienced insights.

Learn more and registration: <https://bostonenet.org/events/university-to-startup/>

Robotics and Automation, and Aerospace and Electronic Systems Societies – 6:00PM, Thursday, March 28

On Safe Autonomous Driving: Past, Present, and Future

Speaker: Dr. Mohan Trivedi



In this distinguished lecture, Dr. Mohan Trivedi from the University of California, San Diego, will highlight major research milestones in the autonomous vehicles area and discuss issues that require deeper, critical examination and careful resolution to ensure the safe, reliable, and robust operation of these highly complex systems in the real world.

Meeting Location: 550 Huntington Avenue, Boston, MA. Building Beatty Hall, Room 426

Mohan Trivedi is a Distinguished Professor of Electrical and Computer Engineering at University of California San Diego and founding director of the Computer Vision and Robotics Research Laboratory (est. 1986), as well as the Laboratory for Intelligent and Safe Automobiles (LISA) (est. 2001). Trivedi and his team are pursuing research in intelligent vehicles, human-centered autonomous driving, machine perception, machine learning, human-robot interactivity, and advanced driver assistance. Trivedi has received Distinguished Alum-

nus awards from BITS-Pilani, India and Utah State University. He has given over 130 keynote/plenary talks. He regularly serves as a consultant to various industry and government agencies in the US and abroad. He frequently serves on panels dealing with technological, strategic, privacy, and ethical issues surrounding research areas he is involved in.

Trivedi has served as the Chair of the Robotics Technical Committee of the IEEE Computer Society, Governing Board member of the IEEE Systems, Man & Cybernetics, and IEEE ITSC societies. Trivedi is a Fellow of IEEE (life), SPIE, and IAPR.

Light Dinner and refreshments!

Registration is required to attend.
<https://events.vtools.ieee.org/m/404113>

Elections will take Place!

Interested in roles in RAS? Contact: giovmi@ieee.org, ieee-ras@nedharvey.com

Introduction to Neural Networks and Deep Learning (Part I)

Web-based Course with live Instructor!

**Last Notice Before
Course Begins, Please
Register Now!!!**

Times & Dates: 9AM - 12:30PM ET, Saturday, March 16, 2024

Speaker: CL Kim

Course Format: Live Webinar, 3.5 hours of instruction!

Series Overview: Neural networks and deep learning currently provides the best solutions to many problems in image recognition, speech recognition, and natural language processing.”

Reference book: “Neural Networks and Deep Learning” by Michael Nielsen, <http://neuralnetworksanddeeplearning.com/>

This Part 1 and the planned Part 2, (to be confirmed) series of courses will teach many of the core concepts behind neural networks and deep learning.

More from the book introduction: We’ll learn the core principles behind neural networks and deep learning by attacking a concrete problem: the problem of teaching a computer to recognize handwritten digits. ...it can be solved pretty well using a simple neural network, with just a few tens of lines of code, and no special libraries.”

“But you don’t need to be a professional programmer.”

The code provided is in Python, which even if you don’t program in Python, should be easy to understand with just a little effort.

Benefits of attending the series:

- * Learn the core principles behind neural networks and deep learning.
- * See a simple Python program that solves a concrete problem: teaching a computer to recognize a handwritten digit.
- * Improve the result through incorporating more and more core ideas about neural networks and deep learning.
- * Understand the theory, with worked-out proofs of fundamental equations of backpropagation for those interested.
- * Run straightforward Python demo code example.

The demo Python program (updated from version provided in the book) can be downloaded from the speaker’s GitHub account. The demo program is run in a Docker container that runs on your Mac, Windows, or Linux personal computer; we plan to provide instructions on doing that in advance of the class.

(That would be one good reason to register early if you plan to attend, in order that you can receive the straightforward instructions and leave yourself with plenty of time to prepare the Git and Docker software that are widely used among software professionals.)

Course Background and Content: This is a live instructor-led introductory course on Neural Networks and Deep Learning. It is planned to be a two-part series of courses. The first course is complete by itself and covers a feedforward neural network (but not convolutional neural network in Part 1). It will be a pre-requisite for the planned Part 2 second course. The class material is mostly from the highly-regarded and free online book “Neural Networks and Deep Learning” by Michael Nielsen, plus additional material such as some proofs of fundamental equations not provided in the book.

Outline:

Feedforward Neural Networks.

- * Simple (Python) Network to classify a handwritten digit
- * Learning with Stochastic Gradient Descent
- * How the backpropagation algorithm works
- * Improving the way neural networks learn:
 - ** Cross-entropy cost function
 - ** Softmax activation function and log-likelihood cost function
 - ** Rectified Linear Unit
 - ** Overfitting and Regularization:
 - *** L2 regularization
 - *** Dropout
 - *** Artificially expanding data set

Pre-requisites: There is some heavier mathematics in learning the four fundamental equations behind backpropagation, so a basic familiarity with multivariable calculus and matrix algebra is expected, but nothing advanced is required. (The backpropagation equations can be also just accepted without bothering with the proofs since the provided Python code for the simple network just make use of the equations.) Basic familiarity with Python or similar computer language.

Speaker Background: CL Kim works in Software Engineering at CarGurus, Inc. He has graduate degrees in Business Administration and in Computer and Information Science from the University of Pennsylvania. He had previously taught for a few years the well-rated IEEE Boston Section class on introduction to the Android platform and API.

**Decision (Run/Cancel) Date for this Course is
Friday, March 8, 2024**

Payment	on/by March 1	After March 1
IEEE Members	\$95	\$110
Non-members	\$115	\$130

https://ieeeboston.org/event/neuralnetworks/?instance_id=3569

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.

Digital Signal Processing (DSP) for Software Radio

Dates & Times: Course Kick-off/Orientation, 6 - 6:30PM ET, Thursday, June 13
 Live Workshops: 6:00 - 7:30PM ET; Thursdays, June 20, 27, July 11, 18, 25
 First Video Release, Thursday, June 13, 2024, additional videos released weekly in advance of that week's live session!

Speaker: Dan Boschen
Location: Zoom

Attendees will have access to the recorded session and exercises for two months (until August 20, 2024) after the last live session ends!

This is a hands-on course providing pre-recorded lectures that students can watch on their own schedule and an unlimited number of times prior to live Q&A/Workshop sessions with the instructor. Ten 1.5 hour videos released 2 per week while the course is in session will be available for up to two months after the conclusion of the course.

Course Summary This course builds on the IEEE course "DSP for Wireless Communications" also taught by Dan Boschen, further detailing digital signal processing most applicable to practical real-world problems and applications in radio communication systems. Students need not have taken the prior course if they are familiar with fundamental DSP concepts such as the Laplace and Z transform and basic digital filter design principles.

This course brings together core DSP concepts to address signal processing challenges encountered in radios and modems for modern wireless communications. Specific areas covered include carrier and timing recovery, equalization, automatic gain control, and considerations to mitigate the effects of RF and channel distortions such as multipath, phase noise and amplitude/phase offsets.

Dan builds an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and real-world applications for mixed

signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges, rather than a tutorial on implementations with DSP processors.

Now with Jupyter Notebooks! This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a "take-it-with-you" interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so.

This course will not be teaching Python, but using it for demonstration. A more detailed course on Python itself is covered in a separate IEEE Course routinely taught by Dan titled "Python Applications for Digital Design and Signal Processing".

All set-up information for installation of all tools used will be provided prior to the start of class.

Target Audience: All engineers involved in or interested in signal processing for wireless communications. Students should have either taken the earlier course "DSP for Wireless Communications" or have been sufficiently exposed to basic signal processing concepts such as Fourier, Laplace, and Z-transforms, Digital filter (FIR/IIR) structures, and representation of complex digital and analog signals in the time and frequency do-

if you are uncertain about your background or if you would like more information on the course.

Benefits of Attending/ Goals of Course:

Attendees will gain a strong intuitive understanding of the practical and common signal processing implementations found in modern radio and modem architectures and be able to apply these concepts directly to communications system design.

Topics / Schedule:

Class 1: DSP Review, Radio Architectures, Digital Mapping, Pulse Shaping, Eye Diagrams

Class 2: ADC Receiver, CORDIC Rotator, Digital Down Converters, Numerically Controlled Oscillators

Class 3: Digital Control Loops; Output Power Control, Automatic Gain Control

Class 4: Digital Control Loops; Carrier and Timing Recovery, Sigma Delta Converters

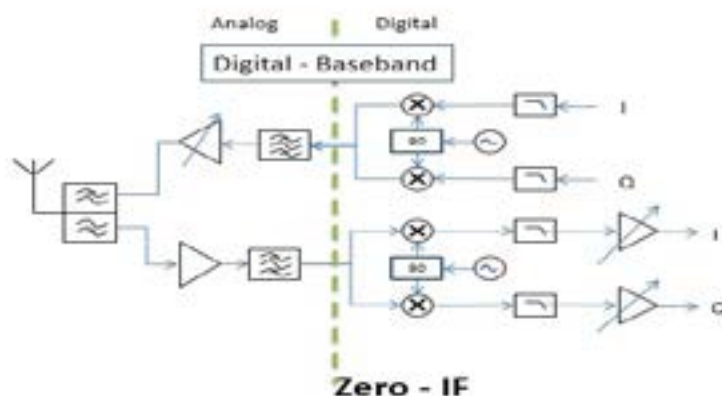
Class 5: RF Signal Impairments, Equalization and Compensation, Linear Feedback Shift Registers

Speaker's Bio:

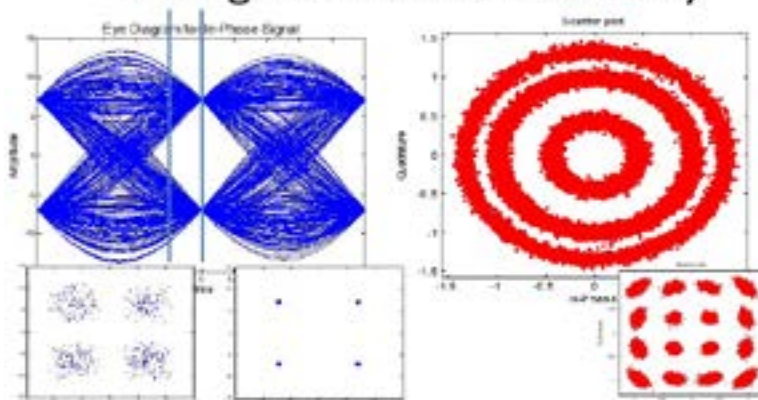
Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems and has taught courses on DSP to international audiences for over 15 years. Dan is a contributor to Signal Processing Stack Exchange <https://dsp.stackexchange.com/>, and is currently at Microchip (formerly Microsemi and Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/dan-boschen>

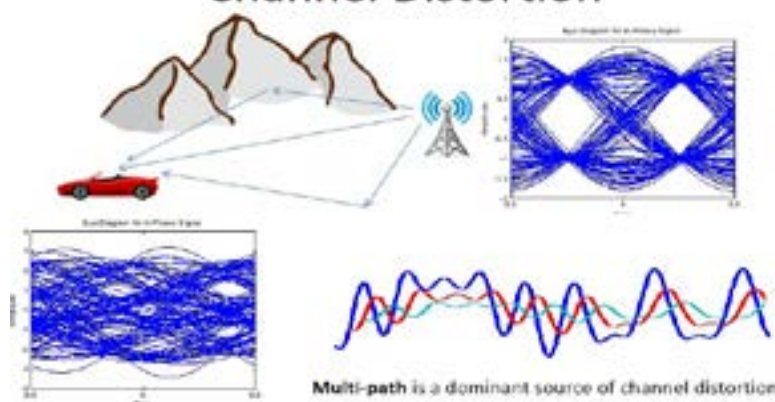
Radio Architectures



Timing and Carrier Recovery



Channel Distortion



**Decision (Run/Cancel) Date for this Course is
Thursday, June 6, 2024**

	By May 30	After May 30
IEEE Members	\$190	\$285
Non-members	\$210	\$315

https://ieeeboston.org/event/dspswradio/?instance_id=3560

Advanced Digital Design: Implementing Deep Machine Learning on FPGA

Times & Dates: Postponed until Spring. See future Reflectors for Updates
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

**Payment
IEEE Members
Non-members**

Will be updated at a later date

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

DSP for Wireless Communications

Dates & Times: Course Kick-off/Orientation, 6 - 6:30PM ET, Thursday, April 18
 Live Workshops: 6:00 - 7:30PM ET; Thursdays, April 25, May 2, 9, 16, 23
 First Video Release, Thursday, April 18, 2024 additional videos released weekly in advance of that week's live session!

Speaker: Dan Boschen
Location: Zoom

New Format Combining Live Workshops with Pre-recorded Video - This is a hands-on course providing pre-recorded lectures that students can watch **on their own schedule** and an **unlimited number of times** prior to live Q&A/Workshop sessions with the instructor. Ten 1.5 hour videos released 2 per week while the course is in session will be available for up to two months after the conclusion of the course...until July 23, 2024

Course Summary

This course is a fresh view of the fundamental and practical concepts of digital signal processing applicable to the design of mixed signal design with A/D conversion, digital filters, operations with the FFT, and multi-rate signal processing. This course will build an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and applications in GPS and mixed signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges in both the analog and digital domains, and not a tutorial on working with specific DSP processor hardware.

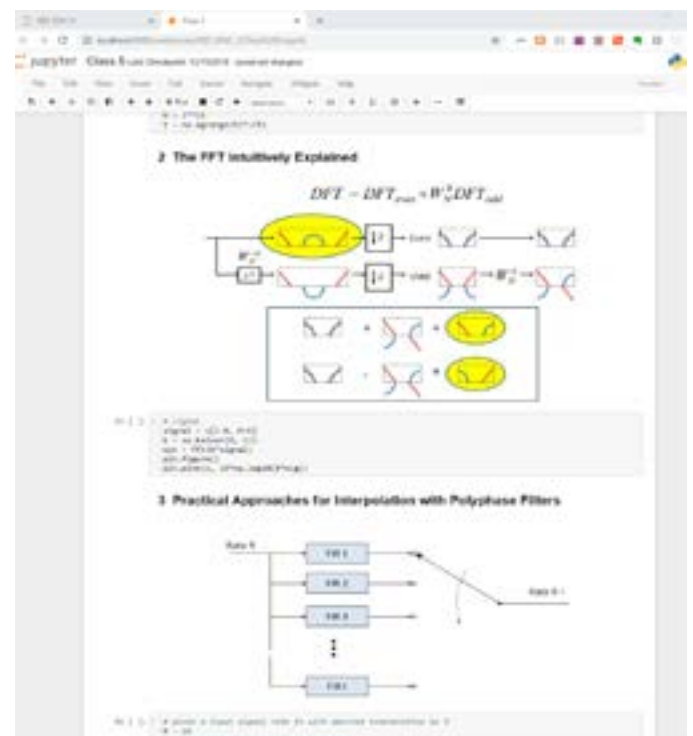
Now with Jupyter Notebooks!

This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a "take-it-with-you" interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so.

This course will not be teaching Python, but using it for

is covered in a separate IEEE Course "Python Applications for Digital Design and Signal Processing".

Students will be encouraged but not required to load all the Python tools needed, and all set-up information for installation will be provided prior to the start of class.



Target Audience:

All engineers involved in or interested in signal processing applications. Engineers with significant experience with DSP will also appreciate this opportunity for an in-depth review of the fundamental DSP concepts from a different perspective than that given in a traditional introductory DSP course.

Benefits of Attending/ Goals of Course:

Attendees will build a stronger intuitive understanding of the fundamental signal processing concepts involved with digital filtering and mixed signal analog and digital design. With this, attendees will be able to implement more creative and efficient signal processing architectures in both the analog and digital domains. The knowledge gained from this course will have immediate practical value for any work in the signal processing field.

Topics / Schedule:

Class 1: Correlation, Fourier Transform, Laplace Transform

Class 2: Sampling and A/D Conversion, Z –transform, D/A Conversion

Class 3: IIR and FIR Digital filters, Direct Fourier Transform

Class 4: Windowing, Digital Filter Design, Fixed Point vs Floating Point

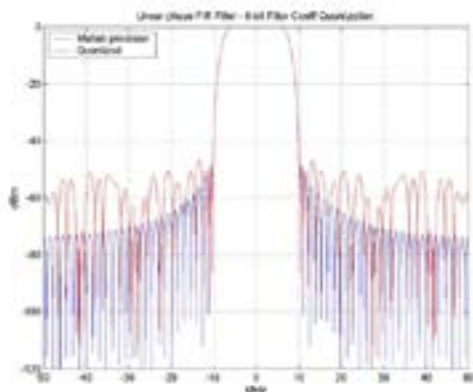
Class 5: Fast Fourier Transform, Multi-rate Signal Processing, Multi-rate Filters

Speaker's Bio:

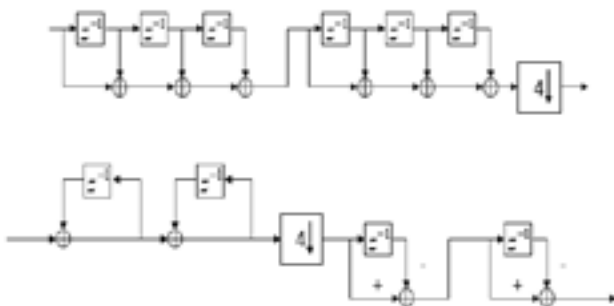
Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems. Dan is currently at Microchip (formerly Microsemi and Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/dan-boschen>

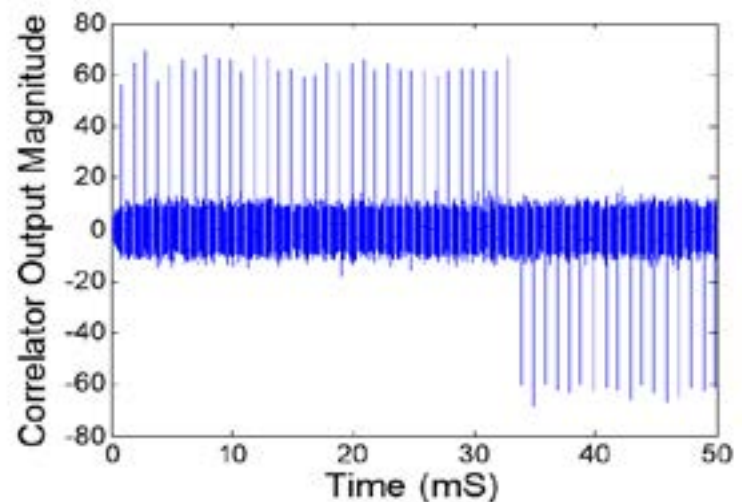
Linear Phase FIR Filter
(8-bit quantized filter coefficients)



Multi-stage CIC



Sliding Correlation



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

By April 11

IEEE Members

\$190

Non-members

\$210

After April 11

\$285

\$315

Python Applications for Digital Design and Signal Processing

Dates & Times: Course Kick-off/Orientation, 6 - 6:30PM ET, Thursday, February 29
 Live Workshops: 6:00 - 7:30PM ET; Thursdays, March 7, 14, 21, 28
 First Video Release, Thursday, February 29, 2024, additional videos released weekly in advance of that week's live session!

**Last Notice Before
 Course Begins, Please
 Register Now!!!**

Speaker: Dan Boschen
Location: Zoom

This is a hands-on course combining pre-recorded lectures with live Q&A and workshop sessions in the popular and powerful open-source Python programming language.

Course Information will be distributed on Thursday, February 29 in advance of and in preparation for the first live workshop session. A live orientation session will be held on February 29. Attendees will have access to the recorded session and exercises for two months (until May 28, 2024) after the last live session ends!

Pre-Recorded Videos: The course format includes pre-recorded video lectures that students can watch on their own schedule, and an unlimited number of times, prior to live Q&A workshop sessions on Zoom with the instructor. The videos will also be available to the students for viewing for up to two months after the conclusion of the course.

Overview: Dan provides simple, straight-forward navigation through the multiple configurations and options, providing a best-practices approach for quickly getting up to speed using Python for modelling and analysis for applications in signal processing and digital design verification. Students will be using the Anaconda distribution, which combines Python with the most popular data science applications, and Jupyter Notebooks for a rich, interactive experience.

The course begins with basic Python data structures and constructs, including key "Pythonic" concepts, followed by an overview and use of popular packages for scientific computing enabling rapid prototyping for system design.

During the course students will create example designs including a sigma delta converter and direct digital synthesizer both in floating point and fixed point. This will include considerations for cycle and bit accurate models useful for digital design verification (FPGA/ASIC), while bringing forward the signal processing tools for frequency and time domain analysis.

Jupyter Notebooks: This course makes extensive use of Jupyter Notebooks which combines running Python code with interactive plots and graphics for a rich user experience. Jupyter Notebooks is an open-source web-based application (that can be run locally) that allows users to create and share visually appealing documents containing code, graphics, visualizations and interactive plots. Students will be able to interact with the notebook contents and use "take-it-with-you" results for future applications in signal processing.

Target Audience: This course is targeted toward users with little to no prior experience in Python, however familiarity with other modern programming languages and an exposure to object-oriented constructs is very helpful. Students should be comfortable with basic signal processing concepts in the frequency and time domain. Familiarity with Matlab or Octave is not required, but the equivalent operations in Python using the NumPy package will be provided for those students that do currently use Matlab and/or Octave for signal processing applications.

Benefits of Attending / Goals of Course: Attendees will gain an overall appreciation of using Python and quickly get up to speed in best practice use of Python.

Topics / Schedule:

Pre-recorded lectures (3 hours each) will be distributed Friday prior to each week's workshop dates. Workshop/ Q&A Sessions are 6 - 7:30PM on the dates listed below:

Kick-off / Orientation: February 29**Class 1 March 7**

Topic 1: Intro to Jupyter Notebooks, the Spyder IDE and the course design examples. Core Python constructs.

Class 2 March 14

Topic 2: Core Python constructs; iterators, functions, reading writing data files.

Class 3 March 21

Topic 3: Signal processing simulation with popular packages including NumPy, SciPy, and Matplotlib.

Class 4 March 28

Topic 4: Bit/cycle accurate modelling and analysis using the design examples and simulation packages

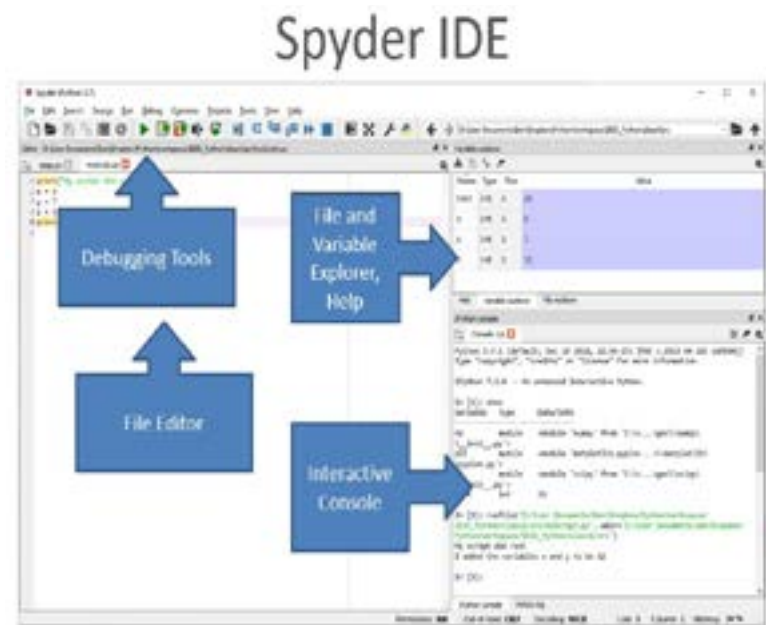
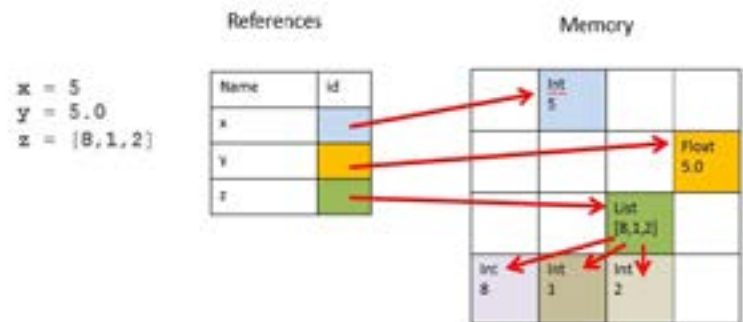
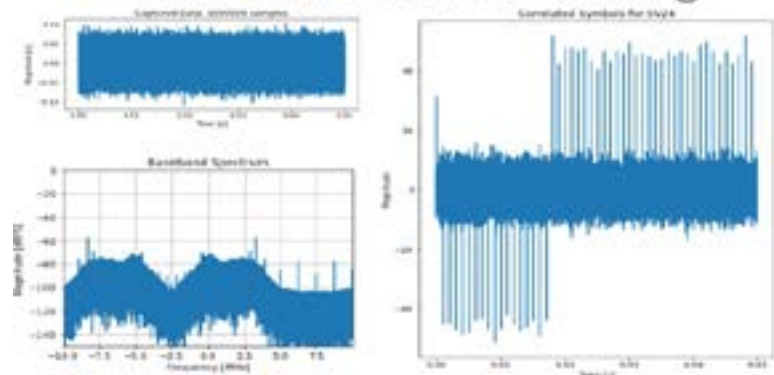
Speaker's Bio: Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems and has taught courses on DSP to international audiences for over 15 years. Dan is a contributor to Signal Processing Stack Exchange <https://dsp.stackexchange.com/>, and is currently at Microchip (formerly Microsemi and Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page (<https://www.linkedin.com/in/dan-boschen/>)

Registration is open through the last live workshop date. Live workshops are recorded for later use.

Decision (Run/Cancel) Date for this Course is Thursday, February 22, 2024

Payment	On/by March 20	After March 20
IEEE Members	\$190	\$285
Non-members	\$210	\$315

**Mutable / Immutable****GPS Waveform Processing**

https://ieeeboston.org/event/pythonapplications/?instance_id=3380

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