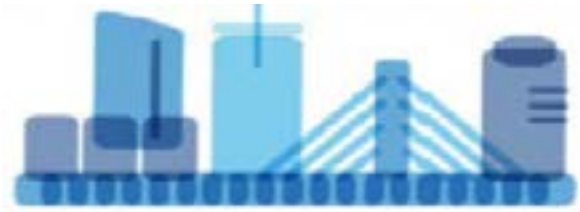

Boston Section

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

ISSUE #1
JANUARY 2024

IEEE
Advancing Technology for Humanity

ieeeboston.org

TABLE OF CONTENTS

The Impact of AI in Education

by Maira Samary, 2024 Chair, IEEE Boston Section

Last November when I heard about ChatGPT for the first time, from a student that was telling me about a "boring" philosophy essay he had to submit in less than 24 hours. He told me about a new software that did the whole thing for him. According to him, only minor editions were needed; and he was sure this would be an "A" essay. I decided to take a look, I played with it a bit, and I realized that the world had changed.

Very soon faculty around all departments on my institution were talking about it. Almost all Computer Science faculty tried to use ChatGPT to see if would solve students' homework, quizzes and coding questions. At that moment, it could answer a few of them, especially on the introductory course level. A few of us had moved to computer-based student evaluations, after the pandemic. Spring 2023 semester started with the definition that everything would be evaluated on paper, again.

With time passing, more Large Language Models were made available to the public, and ChatGPT become even better with newer versions. Faculty in many departments decided to embrace the inevitable, use these tools to help students learn and understand the world. Many humanity courses, have assignments where you have to give context to ChatGPT or Llama or Bard about a topic, then, you ask it to write or answer something. Students are supposed to analyze/edit/verify the answer. During the process of setting up the context, asking the question, analyzing/verifying they learn to be critical, to not take a computer answer as the truth. In a world where misinformation is a plague, that is critical. To achieve that ability to read, understand and analyze what the LLM answered, students had years of reading/writing/critiquing experience.

In the mathematical/science side, we can say that the Large Language Models (LLM) could be a compared to how the world evolved around calculators. At the time I was at high school they were banned; you couldn't use one. Now, my high school daughter needs to bring one to school every day. Math educators found a middle ground and embraced technology. But before they allow students to really use it, students are exposed to years of math in elementary and middle school.

In Computer Science, we see that industry has also embraced the technology; CodePilot (GitHub) can create a boiler plate code for subscribers in any programming language, with different features, according to what the user need. Then the user just has to edit to add the specific contents/model that is required. The professionals that are doing that, they have many years of experience in coding, so they are capable of critically analyzing the code the LLM is presenting to them.

In Computer Science courses, homework assignments were the bulk of the grade in the past, now they do not have a meaningful weight anymore. If faculty decides to pass code assignments through plagiarism detection, the number of cases being totally solved by a LLM is huge (in my last attempt – 35%). LLM is something that come to stay and everybody will use it in their day-to-day CS jobs, but students don't understand that they have to learn the basics, to code, get stuck debug, solve, learn. These things are part of the learning process of CS and coding, and students assume that they can learn how to run (use this tools) before they learn how to walk (basics of code, algorithmic thinking). The issue gets even worse, when we take into consideration that the new generation are growing up with reels and

Tik Tok videos, where anything can be done/explained/understood in 30-50 second videos. And the process of learning something like that does not happen this way. How do we tackle this? How do we make students understand the relevance of the basics, that instant solving/reward is not always possible or even desirable. This is a complicated equation, that needs a lot of patience and creativity to solve.

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.

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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, ieeebostonsection@gmail.com.

Entrepreneurs' Network – 7:00PM, Tuesday, January 9

The Art and Science of Marketing

For more information and registration:
https://bostonenet.org/events/art-and-science-of-marketing/#!event-register/2024/1/9/the-art-and-science-of-marketing

Call for Articles

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We are excited about this new feature and hope you are eager to participate!
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Call for Course Speakers/Organizers

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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 divers 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

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

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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 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 Dufilie, 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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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/

Photonics Society – 6:00PM, Thursday, January 11

Leveraging Ultra-Fast Optics To Capture Dynamic Responses Of Mechanical Metamaterials

Speaker Name: Prof. Carlos Portela

Mechanical metamaterials across length scales—from nanometers to centimeters—have demonstrated unique mechanical properties enabled by a variety of 3D material morphologies. Significant advances in our understanding of these materials have pointed to structure-property relations that lead to unique macroscopic mechanical properties. Despite this progress, our knowledge of these materials is primarily limited to quasi-static deformation, while their dynamic properties remain to be fully understood. In this talk, we present explorations on the dynamic response of nano- and micro-architected materials under extreme dynamic conditions—enabled by various uses of ultra-fast optical excitation and probing—presenting novel non-contact and impact characterization techniques to determine acoustic and energy dissipation properties. Specifically, we will discuss high-throughput dynamic elastic-property characterization and supersonic microparticle impact testing on periodic architected materials at the nano- and microscale, along with explorations on the design and implementation of microscale acoustic metamaterials.

Carlos Portela is the d'Arbeloff Career Development Professor in Mechanical Engineering at MIT. Dr. Portela received his Ph.D. and M.S. in mechanical engineering from the California Institute of Technology, where he was given the Centennial Award for the best thesis in Mechanical and Civil Engineering. His current research lies at the intersection of materials science, mechanics, and nano-to-macro fabrication with the objective of designing and testing novel materials—with features spanning from nanometers to centimeters—that yield unprecedented mechanical and acoustic properties. Dr. Portela's recent accomplishments have provided routes for fabrication of these so-called 'nano-architected materials' in scalable processes as well as testing nanomaterials in real-world conditions such as supersonic impact. Dr. Portela received the 2023 Spira Award for Excellence in Teaching at MIT, was recognized as an MIT TR Innovator Under 35 in 2022, and was a recipient of the 2022 NSF CAREER Award and the 2019 Gold Paper Award from the Society of Engineering Science (SES).

Event Link:
https://events.vtools.ieee.org/m/392434

Registration Link:
https://events.vtools.ieee.org/event/register/392434

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

Power & Energy Society – 6:00PM, Tuesday, January 16

IEEE Standard 3002.8: Industrial and Commercial Power Systems Harmonic Studies

Peter Sutherland, PhD, Life Fellow IEEE, Fellow IET, Distinguished Lecturer, Retired

Refreshments start at 6:00pm; Talk begins at 6:30pm

The material in this recommended practice originally comes from Chapter 10 of the IEEE Brown Book™, IEEE Std 399™-1997, Recommended Practice for Industrial and Commercial Power Systems Analysis but includes major modifications based on the latest technological advancements. This publication provides a recommended practice for conducting harmonic studies and analysis of power systems in commercial and industrial facilities. It is likely to be of greatest value to the power-oriented engineer with limited commercial or industrial plant experience. It can also be an aid to all engineers responsible for the electrical design of commercial and industrial facilities. It should be considered a guide and general reference on analysis of commercial and industrial facilities.

Peter E. Sutherland received the B.S at University of Maine at Orono, the MScE at the University of New Brunswick (Canada) and the PhD at Rensselaer Polytechnic Institute. For over thirty years, Dr. Sutherland has specialized in electrical power system studies. After joining GE in 1987, he worked in GE's Industrial Power Systems Engineering Operation, the GE Training and Development Center, GE Installation and Service Engineering, GE Power Systems Energy Consulting, GE Renewables and GE Industrial Solutions, which became part of ABB in 2018. He has also worked for EPRI and SuperPower in Schenectady, NY. He retired from ABB in 2022. He is a Life Fellow of the IEEE, a Fellow of the IET (UK), and has had PE licenses in several states.

Location: Wentworth Institute of Technology, Beatty 426 (Building: Beatty Hall) 550 Huntington Ave, Boston, MA 02115. (Free Parking at West Parking Lot)

Free and Open to the Public; RSVP is appreciated.

Visit the IEEE PES Boston Chapter website for further details - https://site.ieee.org/boston-pes/

For any questions regarding this presentation or any IEEE PES Boston Technical Meetings, please contact Risa Karanxha (risa.karanxha@nationalgrid.com) or Chris Sweeny (christopher.sweeny@1898andco.com)

IEEE Boston/Providence/New Hampshire Reliability Chapter – 11:00AM, Wednesday, January 17

Webinar - Transforming Reliability with AI

Speaker: Arun Gowtham of Apex Ridge Reliability

To view complete details for this event, click here to view the announcement.
Please visit https://r1.ieee.org/boston-rl/

Artificial Intelligence (AI) is upending businesses by unlocking value & drastically changing operating models. Will Reliability Engineering be transformed? The data-intensive exercises of reliability testing, verification & validation, and fleet monitoring can be improved vastly by deploying AI tools. How should the AI implementation be done to get the maximum benefits?

The presentation explores answers to these questions in the context of implementing a Predictive Maintenance (PdM) program where repair work is always planned & executed at optimal times. A strategic framework is needed to plan, execute, and sustain an AI program. Utilizing algorithms to predict machine failures empowers Reliability Engineers with information that they use to manage design iterations, repair work, spare parts, and production. No more reacting to failures after a breakdown resulting in huge losses; project teams will be proactive & efficient. Whether you're an Executive, an Engineer, or a student, the talk will have key takeaways to set you up on the reliability transformation journey.

Date and Time
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:
11:00 AM Technical Presentation
11:45 AM Questions and Answers
12:00 PM Adjournment

Speaker: Arun Gowtham of Apex Ridge Reliability
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Arun Gowtham is a Reliability Consultant at Apex Ridge Reliability. Arun is a Certified Reliability Engineer (CRE) with international experience in leading organizational Reliability programs at Hydrogen Fuel Cells, Semiconductors, Pharmaceuticals, and Composite manufacturing industries. His journey into the exciting field of Reliability Engineering started with thesis work 'Predictive Modeling & IETM support for RCM' and since then has extended into various Industry 4.0 technologies such as Industrial Internet of Things (IIoT), Automation, Remote Fleet Management, and Predictive Maintenance. Arun's current focus is on applying AI to augment Reliability and maintenance tasks. His research work on ML-based Predictive Maintenance was well received at RAMS & MainTrain conferences, leading to a patented approach. He holds an MS in Mechanical Engineering from Drexel University, PA, USA. He volunteers as President at PEMAC Toronto Chapter; and is a licensed Engineer in Ontario, Canada (PEO).

Registration: https://events.vtools.ieee.org/m/390437
Starts 02 January 2024 12:00 AM
Ends 16 January 2024 05:30 PM
All times are (UTC-05:00) Eastern Time (US & Canada)

No Admission Charge

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.

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- 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.

IEEE PES BOSTON CHAPTER COURSE: Wind Energy

The Boston Chapter of the IEEE Power and Energy Society is conducting an 8-hour course on Wind Energy.

This course will be conducted virtually through Microsoft Teams.

This course offers 0.8 CEUs or 8 PDH credits.

Session	Date & time	Topic	Speaker(s)
1	Wed, Jan. 24, 2024 6-8pm	Introduction to Onshore and Offshore Wind Energy	Scott Secrest, *RES* Georgia Beyersdorfer, *Black & Veatch*
2	Wed, Jan. 31, 2024 6-8pm	Wind Turbine Technology	Timothy Gaston, *RES*
3	Wed, Feb. 7, 2024 6-8pm	Transmission Considerations	Gaye Angela Ohanesian, *gopower inc.*
4	Wed, Feb. 21, 2024 6-8pm	Energy Policy and Regulatory Considerations for Developers	Danielle Jensen, *Shell*

Cost:

For on-line registration please use the link below:

https://www.eventbrite.com/e/ieee-pes-boston-chapter-course-on-wind-energy-tickets-780890453367

PES Members: $160 + online registration fee

PES Members (requesting CEUs†): $165 + online registration fee

Non-PES Members: $190 + online registration fee

Non-PES Members (requesting CEUs†): $195 + online registration fee

Full-time college students*: $50 + online registration fee

Full-time college students (requesting CEUs†): $55 + online registration fee

*** Students who have four tickets to redeem should not register using the link. They should contact Ami Vyas (details given below). Also, student registration is for full time students ONLY. Evidence of full time status must be sent to the below contact before attending course.**

† Participants requesting CEUs for this course need to pay the additional $5 fee as IEEE will be charging PES Boston Chapter $5/certificate for certificates awarding CEUs or PDHs.

Participants can also register by mailing checks to IEEE PES Boston Chapter. For instructions on check registration, please contact Ami Vyas at ami.vyas@shell.com

Advanced Digital Design:
Implementing Deep Machine Learning on FPGA

Last Notice, Please Register Now!!!!

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

Hosted by

MITRE | SOLVING PROBLEMS FOR A SAFER WORLD

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 reprogrammed 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 toolchains
- 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 (>> 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 are availabe 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

Last Notice, Please Register Now!!!!

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

Speaker: **Greg Gerstenzang, and John Spangenberger, 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 might makes a patent essential for a 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 my 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
  - Anticipation
  - Obviousness
  - Written description/enablement
  - 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 Spangenberger:
https://www.lalaw.com/people/john-t-spangenberger/

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

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!

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

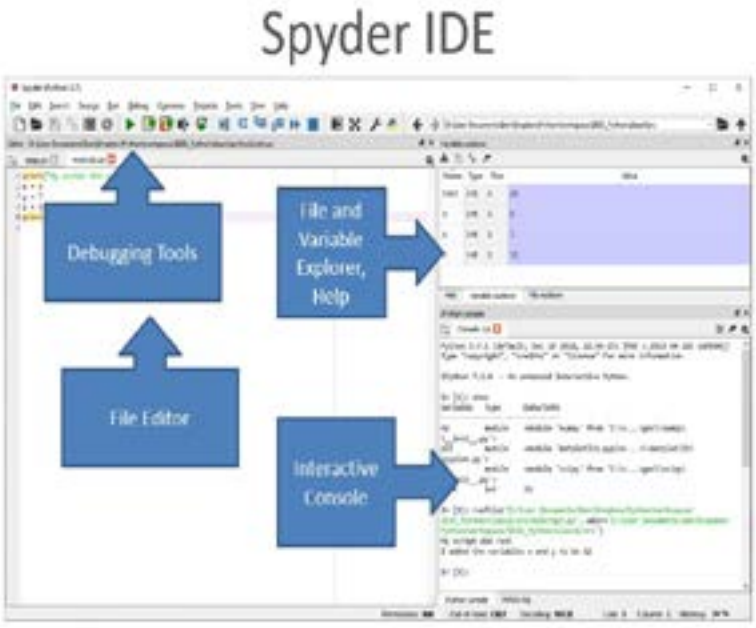
Speaker's Bio: Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing 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.

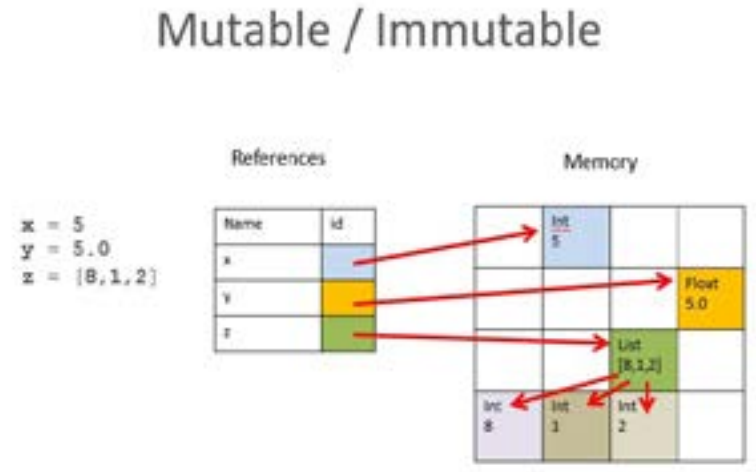
For more background information, please view Dan's Linked-In page (https://www.linkedin.com/in/dan-boschen/)

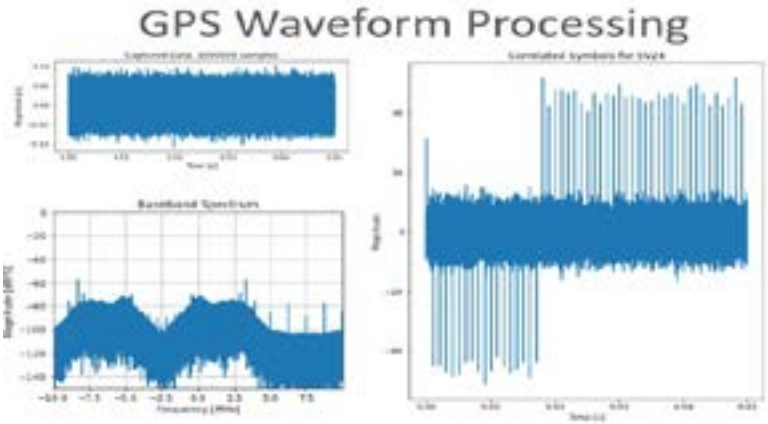
Registration is open through the last live workshop date. Live workshops are recorded for later use.

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







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