

Ethics in AI and Humanity's Sustainability: IEEE's Drive for a Better World

Tom Coughlin, 2025 IEEE Past President

January 14, 2025

ieee.org



The professional home for the engineering and technology community worldwide

Outline

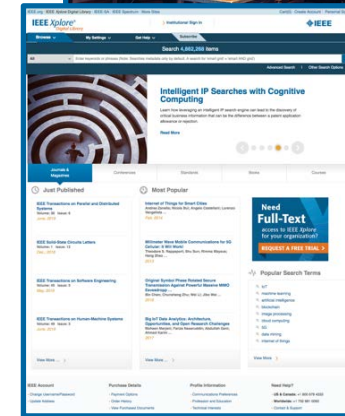
- ▶ The IEEE in 2024
- ▶ Retaining Younger IEEE Members
- ▶ Industry Engagement
- ▶ IEEE Climate Change, Sustainability and AI Ethics Activities
- ▶ Other IEEE Initiatives

The IEEE in 2024

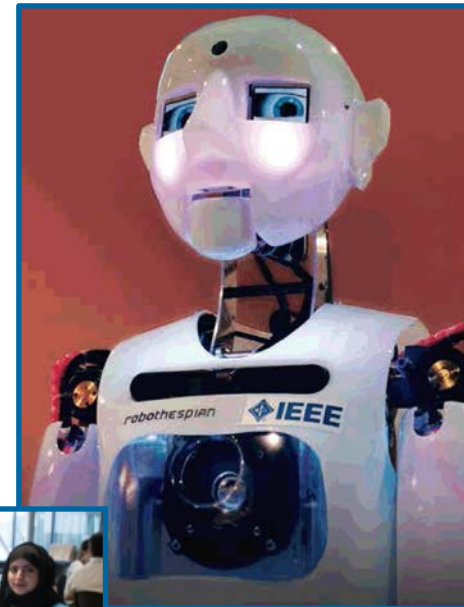
IEEE at a Glance

- ▶ **460,000+** members in more than **190** countries
 - More than **171,000** Student members
- ▶ **39** technical Societies and **eight** technical Councils representing the wide range of IEEE technical interests
- ▶ **6 million+** documents in the IEEE *Xplore*[®] digital library, with **24 million+** downloads each month
- ▶ **1,144** active standards and **1,000+** standards under development
- ▶ Publishes approximately **200** transactions, journals, and magazines
- ▶ Sponsors **2,000+** conferences in **190** countries a year
- ▶ Continuing Technology Education Resources
- ▶ Global public policy and professional ethics
- ▶ International Climate Change engagement

All figures as of February 2024



IEEE: Enabling Innovation and Technology Solutions



What we have been working on



- ▶ Increase our retention of younger members
- ▶ Increase our engagement with industry
- ▶ Increase our outreach to the broader public
- ▶ Make investments in new products and services
- ▶ Develop the future of education

Imagine the Future of IEEE

The painting depicts a lush, green valley with a winding river and rolling hills. In the sky, a large, glowing, circular structure resembling a satellite or a futuristic city is visible, surrounded by a network of lines and a bright, central light source. The overall scene is a blend of nature and advanced technology.

Painting by Rick Guidice, courtesy NASA.

IEEE is a public charity.

“The purpose of IEEE’s work is to engage exclusively in scientific and educational activities ... directed toward the advancement of the theory and practice of electrical, electronics, communications and computer engineering, as well as computer science, the allied branches of engineering and the related arts and sciences; means to these ends include, but are not limited to...for the benefit of the engineering community and the general public.”

- ▶ 7 Guiding Principles of the Revised Budget Process
 - ▶ Budget Redesign
 - ▶ Reassessing Public Imperative Activities
 - ▶ 2024 Social Impact Report



2025-2030 IEEE Strategic Plan Refresh

- ▶ We kicked off our Strategic Plan Refresh journey in January 2024
- ▶ Engagement has included cross organizational input, stakeholder interviews, focus groups, surveys, and more
- ▶ Our updated externally facing goals will help us tell the world what IEEE's strategic priorities are



IEEE 2025-2030 Strategic Goals

Goals are in service of the greater IEEE Mission for the benefit for humanity
Advance science and technology as a leading trusted source of information for research, development, standards, and public policy
Drive technological innovation while promoting scientific integrity and the ethical development and use of technology
Provide opportunities for technology-related interdisciplinary collaboration, research, and knowledge sharing across industry, academia, and government
Inspire intellectual curiosity and support discovery and invention to engage the next generation of technology innovators
Expand public awareness of the significant role that engineering, science, and technology play across the globe
Empower technology professionals in their careers through ongoing education, mentoring, networking, and lifelong engagement



Retaining Younger IEEE Members

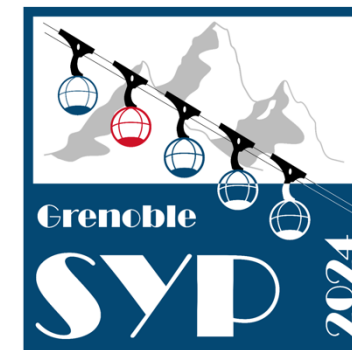
Retaining our Younger Members

- ▶ How can we retain our younger members and thus keep IEEE relevant and vital?
- ▶ I believe that an important element is creating a sense of community among IEEE members, particularly at the local section level and engaging our student and YP members.
- ▶ Many members would like to help, they are just waiting to be invited.
- ▶ IEEE can create resources to support talks to student branches and perhaps help with connections with industry with job fairs, etc.
- ▶ Most of our students work for industry, so greater engagement with industry could help with retention



Retaining Younger Members (cont)

- Rising Stars Conference participation
- Attended Region meetings to promoted 2024 priorities
- Inaugural IEEE Life Members Conference participation
- Participation in Young Professional and Women in Engineering events in Asia, US, and Europe
 - Region 8 Student and Young Professional Congress in Grenoble, France



Industry Engagement

Strengthening our Value to Industry and IEEE Members Working in Industry

- ▶ This will require work at the local level as well across IEEE Organizational Units.
- ▶ Get members from industry involved in your local section leadership.
- ▶ Work with your local companies.
- ▶ Local groups at companies
- ▶ Participate in local trade shows (exhibits, talks).
- ▶ Recognize local companies for their activities.
- ▶ Engaging with industry is an important element in retaining and attracting younger members.



My Engagement with Industry in 2024



- Met with Intel, Samsung, Openai, and others in SF Bay Area
- Viavi at MWC, ASML in the Netherlands, and OPPO in Shenzhen, China
- Helped Lincoln Labs connect with IEC for bulk IEEE memberships
- Several companies in Indonesia and attended Region 10 IEEE WIE Industry Forum in May
- IMEC, CERN, and SpinTec/CEA in Europe
- Athens, Greece related to developing standards for port electrification.
- Corporate partnership (small and large) opportunities: goal of 10 by end of 2024

Industry Engagement in Asia

AXELSPACE HITACHI

IBM LY MinebeaMitsumi
Passion to Create Value through Difference

MITSUBISHI ELECTRIC NARO NEC

Rapidus TMEiC
We drive industry

TOSHIBA

SEMICON TAIWAN



TMEiC Factory Visit



HITACHI Research Institute
Chairman Mr. Suzuki



IBM CTO Mr. Morimoto



IEEE Japan Office



Line Yahoo CTO Mr. Tajima



With MinebeaMitsumi's Corporate
Eight Characters



IEEE Corporate Partnership Program (IEEE CPP)

Companies can strengthen business intelligence, workforce development, and public visibility programs

Exclusive corporate partners with IEEE CPP can:



Leverage the full benefit of the global reach and technical expertise of IEEE



Foster innovation and keep their global workforce on top of the latest technology advances



Engage and develop their technical employees



Receive on-demand access to some the most essential plenary sessions at IEEE conferences



Influence technology development and help define standards



Celebrate leaders in the engineering profession, connect with innovators, and learn from visionaries

BUSINESS DEVELOPMENT

Networking
Business Intelligence
Emerging Market Development

PUBLIC VISIBILITY

Thought Leadership
Foundation Leadership
Branding

WORKFORCE DEVELOPMENT

Employee Membership
IEEE Social Good Activities
Professional Development
Retention & Recruitment

IEEE Engagement with Major AI Players

IEEE is systematically contacting major AI organizations to explore collaboration

Company	Contacts	Outcome	Next Steps
Company 1	Head, Data & Corp Dev Business Operations Mgr	Unable to align on satisfactory terms	Possible 6 month follow up
Company 2*	Global Lead, Strategic Partnerships	Positive response to outreach	Contact following up with tech team
Company 3	Product Partnerships Mgr Sr VP Product Partnerships	Planning limited content partnerships. Focus on healthcare, legal, STEM	Sign an NDA to allow additional discussion
Company 4*	Librarian	Limited license for reuse of older OA content.	Discuss license for non- library internal LLM
Company 5	President	Interested in IEEE content for technology dashboards, free to public	Awaiting detailed description of effort & content to be exposed

IEEE Climate Change, Sustainability and AI Ethics Activites

Immense breadth of IEEE Activity in Climate Change

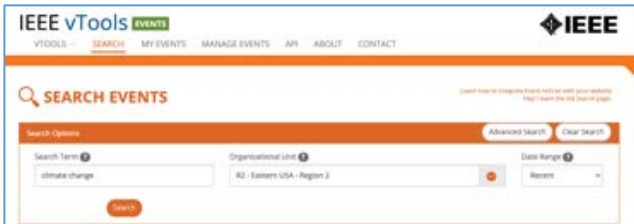
Some of activities in place



Examples of Industry Connections Programs

- Green Hydrogen
- Marine Carbon
- Dioxide Removal
- Sustainable Maritime
- Energy and Water Nexus

Webinars from IEEE TECHNOLOGY CENTER for Climate



More than 1300 events

IEEE Resource Center 500+ Resources

IEEE Technical Community for Climate Change

Exploring Sustainable Technology Challenges & Solutions to Climate Change

IEEE-ITU SYMPOSIUM on Achieving Climate Resilience

IEEE Technical Community for Climate Change



The IEEE Climate Change Collection

IEEE Xplore®

- Conference Papers (23,793)
- Journal Articles (3,276)
- Magazine Articles (555)
- Early Access Articles (82)
- NEW!! Climate Change taxonomy
- NEW!! IEEE Climate Magazine
- NEW!! IEEE PES Sustainability Magazine

Other Activity Examples:

- Tracking inventory of CC-related initiatives, including improvements to collection process
- IEEE Spectrum Influencers
- Much more!

Coming Soon!!

IEEE Experts in Climate Change

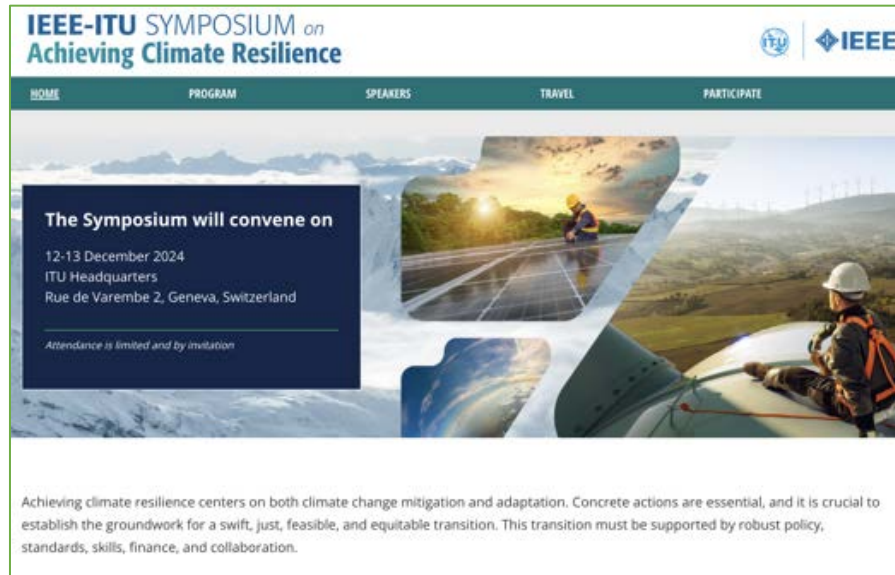
Beta launch in Q4 20224

IEEEDataPort 60+ Resources

Climate Change/Environmental

IEEE Activities in Collaboration with External Partners

Driving International Collaborations



IEEE-ITU SYMPOSIUM on Achieving Climate Resilience

HOME PROGRAM SPEAKERS TRAVEL PARTICIPATE

The Symposium will convene on
12-13 December 2024
ITU Headquarters
Rue de Varembe 2, Geneva, Switzerland

Attendance is limited and by invitation

Achieving climate resilience centers on both climate change mitigation and adaptation. Concrete actions are essential, and it is crucial to establish the groundwork for a swift, just, feasible, and equitable transition. This transition must be supported by robust policy, standards, skills, finance, and collaboration.



IEEE youngprofessionals

Member Benefits Volunteer Resources Contact Us

IEEE Member Group Insurance Program

Climate Week NYC | 23 September 2024 | 5 -7 PM EDT

A Multi-Stakeholder Dialogue on Climate Action:
Young Practitioners and Their Role in the Technology Transformation

Jay Conference, Bryant Park, 2nd Floor, Tokyo Room
109 West 39th Street, New York City, NY, United States of America

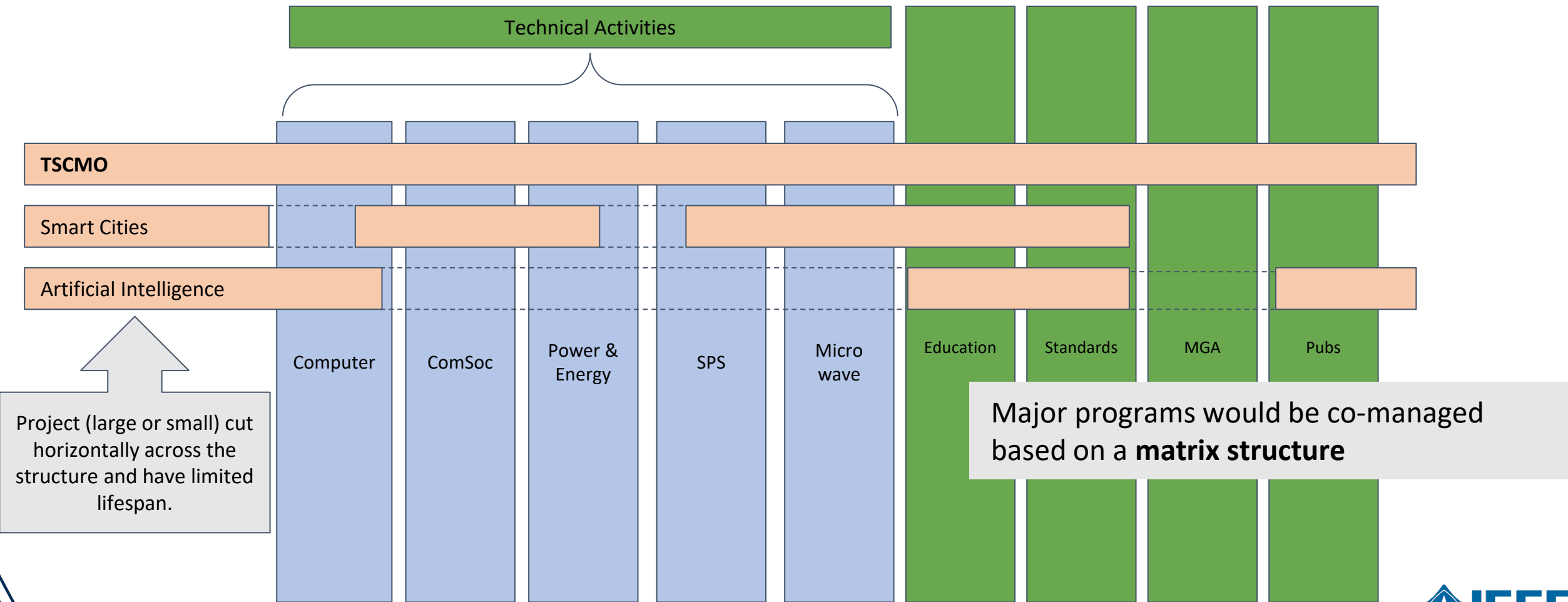
The Event Has Concluded

Thank you for seizing this opportunity to contribute to a vital conversation on climate action and sustainability. Your insights and participation were crucial in driving discussion that will shape a sustainable future.



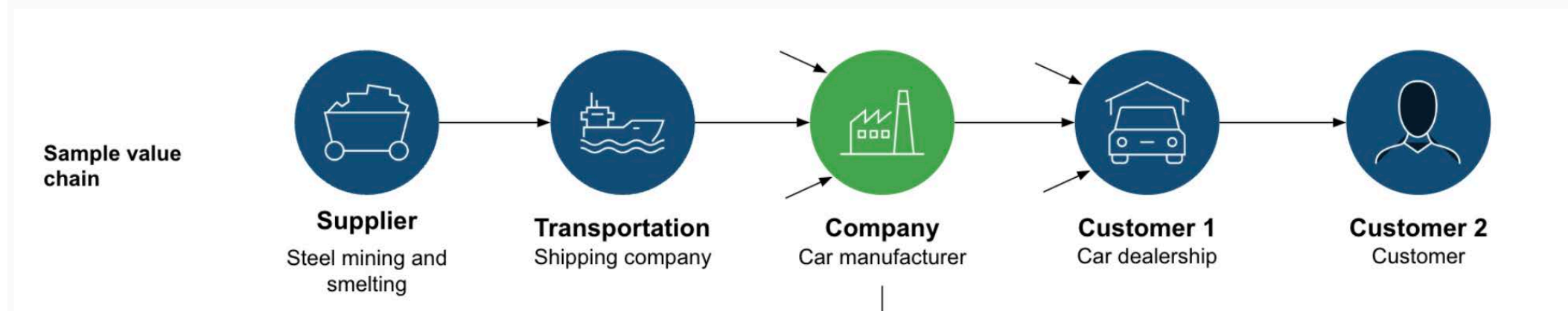
Matrix Structure Cuts Across IEEE Verticals

A new structure addresses a topic that doesn't belong to just one OU



Sustainability Leadership Opportunities for IEEE with E-Liability

- ▶ E - (Environmental) Liability is a key methodology to connect the Accounting / Financial community driving climate change regulation with IEEE and systems engineering design, policy, and leadership.
- ▶ An important tool for IEEE in terms of providing value to industry and thereby increasing our connection to industry.
- ▶ The concept of E-Liability allows for a way to do certifiable measurement of the carbon content of a supply chain. This is a very important approach that would be very valuable for companies and organizations in terms of their meeting their ESG requirements.



Sustainable Maritime

Standards for Smart & Sustainable Ports

- ▶ The shipping industry generate ~3% of global emissions
 - Global shipping industry emissions are growing substantially (ships, ports and related infrastructure)
 - The International Maritime Organization (IMO) have set targets for 70%+ reductions in emissions by 2040 (<https://www.imo.org/en>)
- ▶ Ship and port electrification are a major component towards achieving emissions reductions targets
- ▶ IEEE SA launched an Industry Connections program to build a community of interest on Sustainable Maritime to pursue standards and other initiatives in support of technologists addressing these maritime goals
 - Bringing together pockets of activity within IEEE, along with external stakeholders
- ▶ Collaboration is underway between volunteers in SA, the PES Maritime Standards committee, Transportation Electrification, EPPC and others to amplify existing and new IEEE contributions and programs in support of sustainable maritime



Some IEEE Standards for Sustainability

Standards play an integral role in data center sustainability by enhancing energy management, supporting renewable integration, promoting equipment efficiency, and optimizing power systems, standards such as:

- ▶ IEEE 1680-2009 Standard for Environmental Assessment of Electronic Products
- ▶ IEEE 1547-2018 Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces
- ▶ IEEE 1451.0-2024 Standard for a Smart Transducer Interface for Sensors and Actuators--Common Functions, Communication Protocols, and Transducer Electronic Data Sheet (TEDS) Formats
- ▶ IEEE 1680.3-2024 Standard for Environmental Assessment of Televisions
- ▶ IEEE 1680.2-2012 Standard for Environmental Assessment of Imaging Equipment
- ▶ IEEE 1680.1-2018 Standard for Environmental and Social Responsibility Assessment of Computers and Displays
- ▶ IEEE 3001.2-2017 Recommended Practice for Evaluating the Electrical Service Requirements of Industrial and Commercial Power Systems
- ▶ IEEE 802.3-2018 Standard for Ethernet
- ▶ IEEE 2416-2019 Standard for Power Modeling to Enable System-Level Analysis
- ▶ IEEE 2030-2011 Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), End-Use Applications, and Loads
- ▶ IEEE 1450.6.2 Standard for Memory Modeling in Core Test Language

A Circular Economy for (Storage) Devices

- ▶ A circular economy for storage prioritizes the longest first use, extending life through repair and health monitoring.
- ▶ After maximum use, components should be recycled



New IEEE media sanitization specification enables circular economy for storage, J.M. Hands and T. Coughlin, Computer Magazine, January 2023

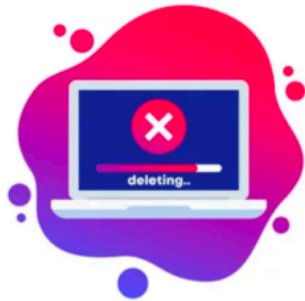


IEEE 2883-2022 Data Sanitization Standard

- ▶ In June 2022, the IEEE Standards organization (with a working group from the Storage Networking Industry Association (SNIA), released the IEEE P2883, IEEE Standard for Sanitizing Data.
- ▶ Data sanitization methods include data sanitization, storage sanitization and media sanitization
- ▶ The P2883 standard focuses on media sanitization
- ▶ **Sanitization of media enables reuse and at end of life, material recovery**



Data Sanitization Methods



Clear

Uses logical techniques to remove data on all addressable storage

Prevent against simple non-invasive data recovery

Format, deallocate



Purge

Uses logical or physical techniques to remove all data

Infeasible data recovery with state of the art techniques

Block erase, crypto erase, overwrite



Destruct

Infeasible data recovery with state of the art techniques

Leaves device in unusable state

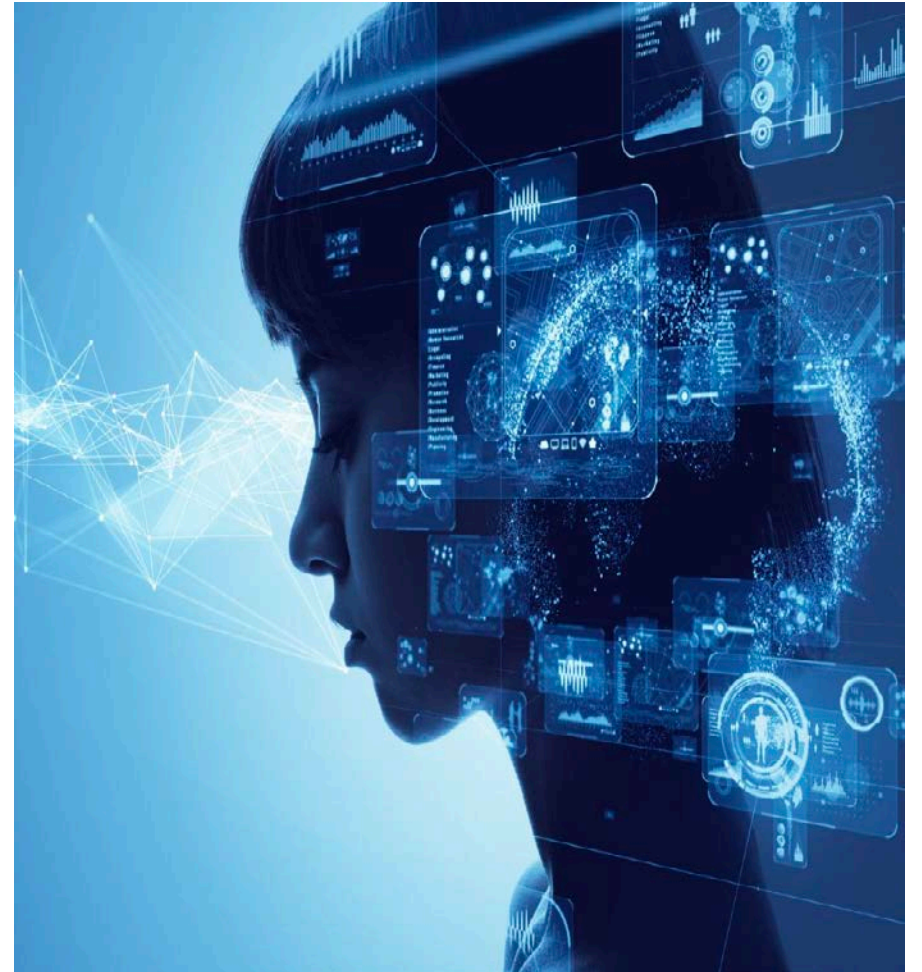
Disintegrate, incinerate, melt

Generative Artificial Intelligence

Over the past few years, IEEE, through the IEEE Standards Association, has been developing a wide range of standards and methods to address safety, biases, transparency, privacy, and corporate governance.

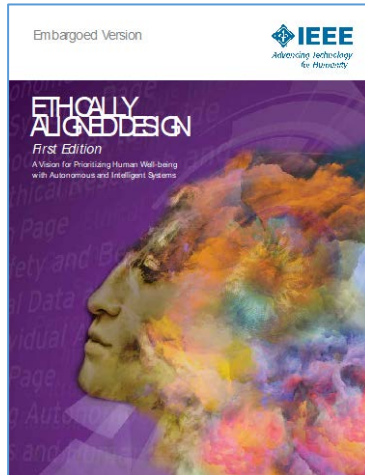
These tools could be used also to address many of the publicly debated issues of quality assurance of Large Language Models.

To prevent harmful outcomes, it is imperative for developers, users, and regulators to address ethical and societal concerns.



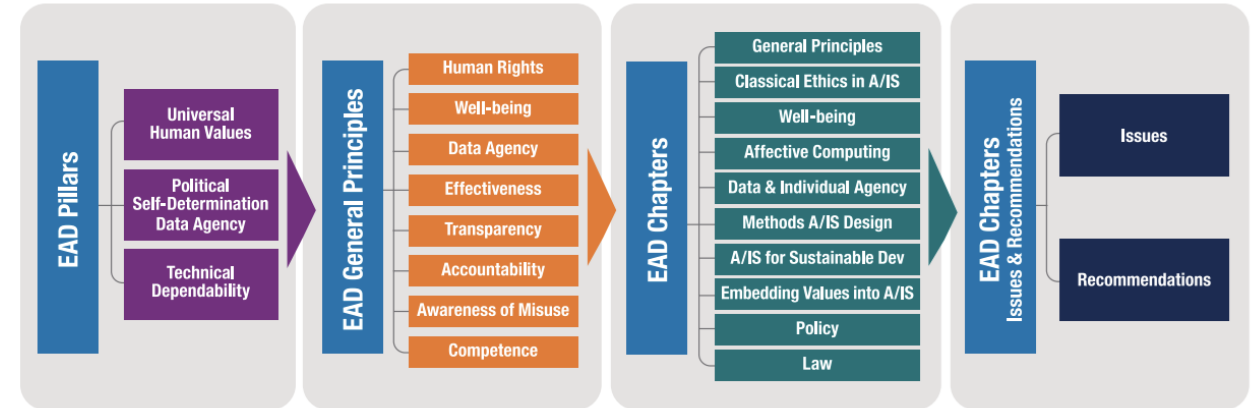
Ethically Aligned Design

AIS Ethics in Action Since 2015



- First version released in 2016.
- Latest version released March 2019.
- Received over 500 pages of feedback.
- Written by more than 700 global thought leaders.
- Over 300 pages long – not just a list of AI Principles.
- Features hundreds of evergreen, pragmatic recommendations.
- Inspired IEEE’s AIS Ethics Certification work.

Ethically Aligned Design Conceptual Framework—From Principles to Practice

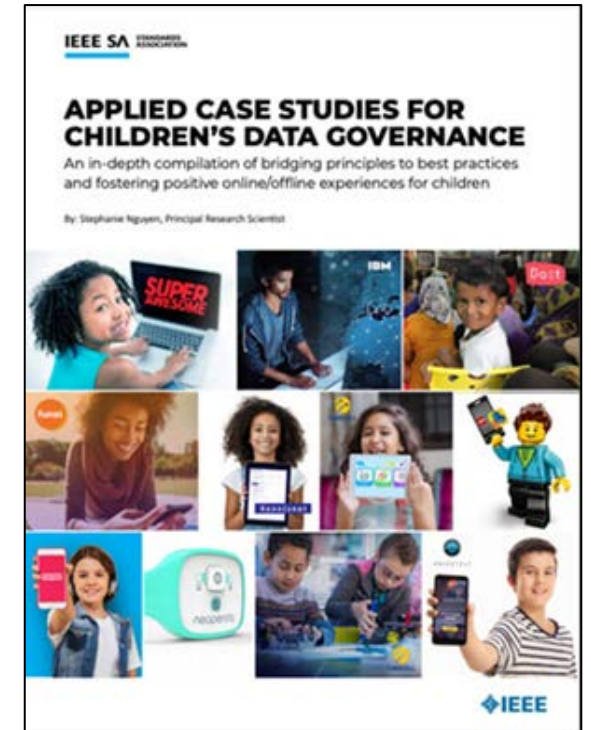


- EAD, v2 used by OECD for their AI principles.
- EAD, v2 used by IBM for “Everyday Ethics for AI.”
- EAD, v2 used by FLI for their AI Principles.
- EAD, v2 used by UNICEF for their Children’s Data principles.
- EAD, v2 used by UNESCO for their AI Principles.
- EAD in all versions mentioned in more than three dozen academic journals, AI Principles and media since 2016

Trustworthy & Inclusive Design for Children & Youth in a Connected World

IEEE SA supports the development of **standards & resources that can be implemented to support a trustworthy ecosystem for children**, including:

- **IEEE 2089-2021** - Standard for Age Appropriate Digital Services Framework - Based on the 5Rights Principles for Children
- **IEEE P2089.1** - Standard for Online Age Verification
- **IEEE P7004** - Standard for Child and Student Data Governance
- **IEEE 3527.1-2020** - IEEE Standard for Digital Intelligence (DQ) -- Framework for Digital Literacy, Skills and Readiness
- 2 Editions of the **IEEE SA Children's Data Governance Applied Case Study Report** (see image on the right)
- The **IEEE Trustworthy Implementations of Technology for Children's Online/Offline Experiences** program
- The **IEEE Dignity, Inclusion, Identity, Trust and Agency (DIITA)** program
- The **IEEE Digital Resilience** program, including **Human Digital Resilience Sub-Committee**

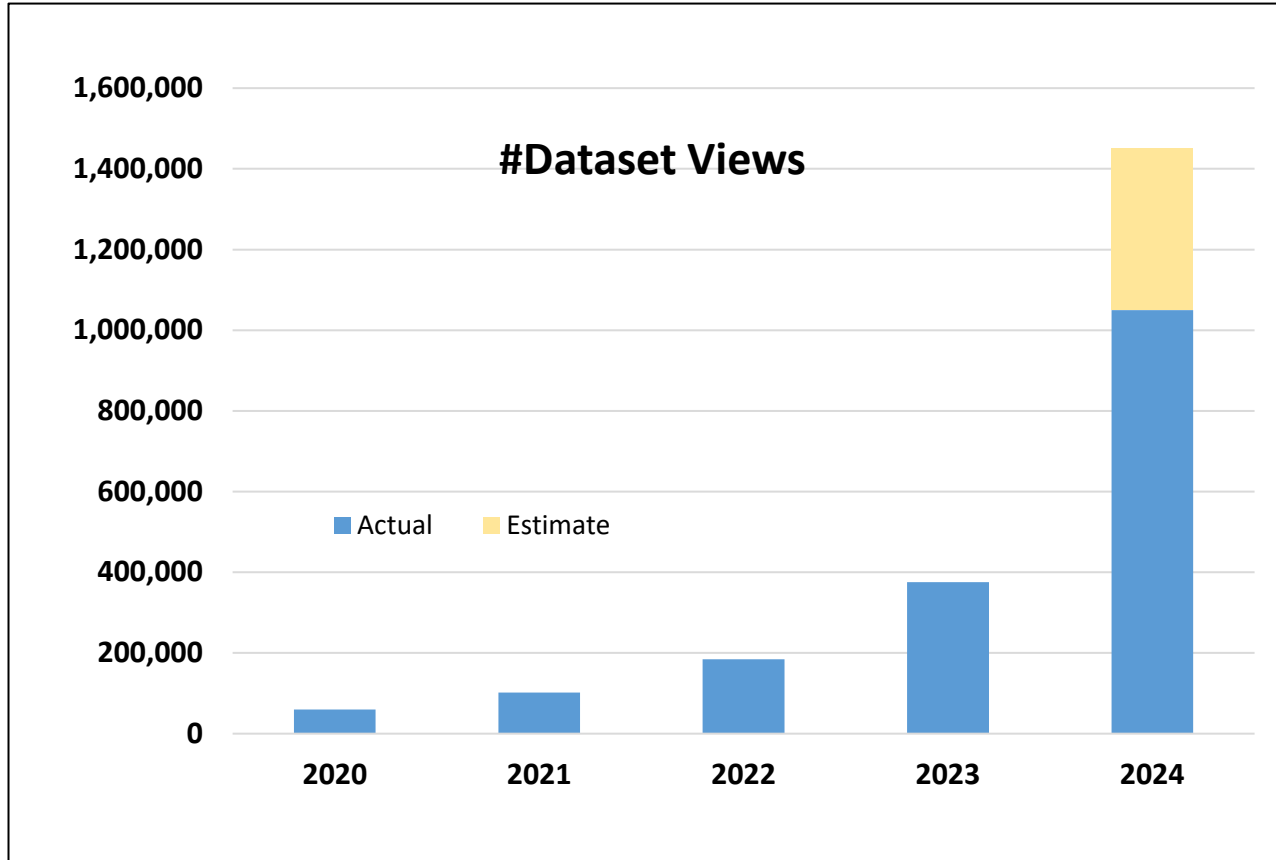




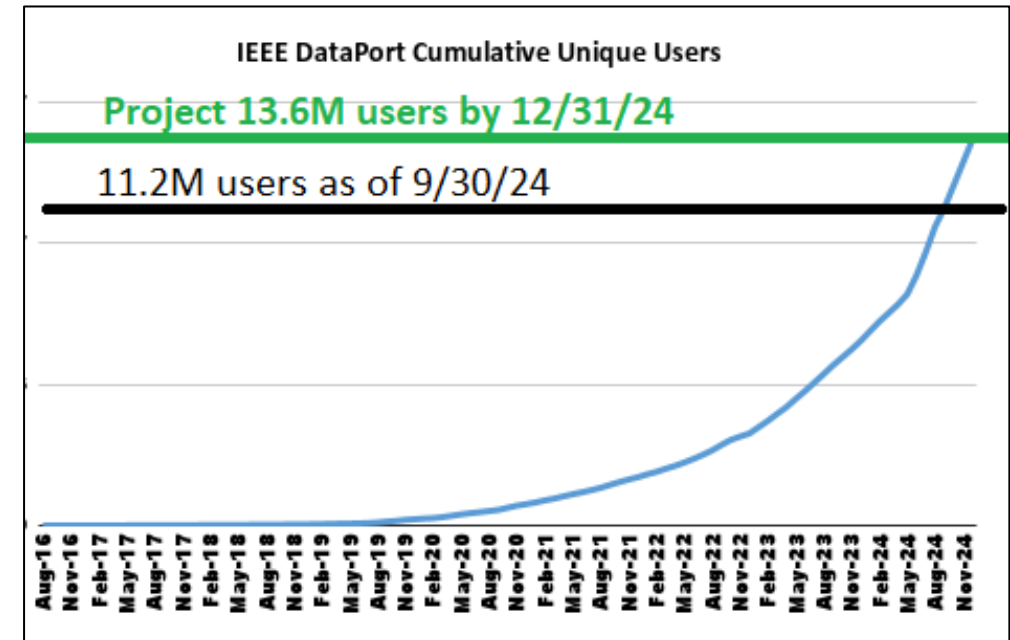
Other IEEE Initiatives

IEEE DataPort™

Usage is exploding as a result of the 2024 funding and volunteer and staff efforts = >13M users, >7.1K datasets



Goal is 25M users by 2025!



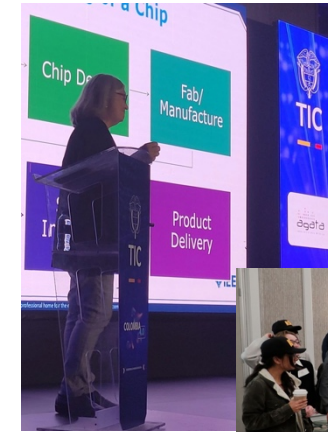
Our initial efforts since 2024 funding have Positioned DP for further growth in 2025!

2024 Achievements

- Supported Semiconductor Working Groups in R9 and R10 with Jen Castillo and Bernard Lim
- Supported [IEEE USA Packaging Summit](#) (industry, gov, academia) with Tim Lee
- Discussions across OUs with multiple countries on IEEE capabilities (e.g. Columbia, Dominican Republic, Panama, Hong Kong and more)
- IEEE Supported Tiny TapeOut event with > 70 tapeouts in one day
- Engagement with Major Semiconductor Groups (e.g. ICOS, OECD SIEN)
- Support of IEEE-USA's [Innovation, Workforce, and Research Conferences](#) (IWRC)
- Work Force Development Support through EA Microcredentials, Job Skills Catalog, OnSemi train the trainers

2025 Strategic Plans

- **Continue IEEE Global Semiconductors Initiative**
- International Collaboration - increasing reliance on partnerships in Latin America, Asia and Europe.
- Increased Company Engagements – Collaborative forums to address challenges in new resiliency models and international workforce development
- Support technical aspects of educational development, with deployment to international groups including IEEE WFD Microcredentials Summit
- Continued support for semiconductor related IEEE Roadmaps



KHayashi presenting Semiconductors in Bogota Columbia 4.0

Kathleen Kramer, Lynn Francis and Case Kirk (TryEngineering ONSEMI) in San Diego at large Tiny Tapeout Event



Global Semiconductors.

Global Impact.

semiconductors.ieee.org



Taken At PSDC. From the left, Dr. Bernard Lim, Dr. Hari Narayanan, Ms. Hazel Dieh Stoiber, and Ms. Lim Wei Chen

Sandra Watson, President and CEO Arizona Commerce Authority and Erik Heilman, Director of Government Relations, IEEE-USA

Participate in the Future of Technology

Discover technical communities that best match your interests

- ▶ IEEE Future Directions fosters IEEE's efforts to create new and emerging technology initiatives
- ▶ Technical Communities are focused on technology challenges or cutting-edge subject areas with direct impacts on industry



IEEE
FUTURE DIRECTIONS

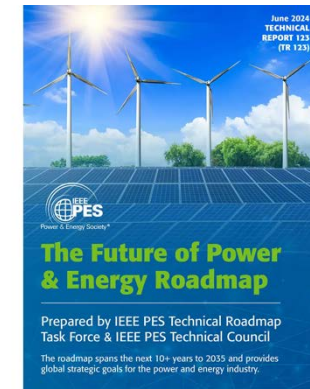


36 [Learn more: ieee.org/futuredirections](https://www.ieee.org/futuredirections)

IEEE Technical Roadmaps: *In numbers, there is strength!*

We began with 1...now there are 9!

- ▶ 4 new Roadmaps have been (*or are being*) added to the portfolio
 - Control Systems
 - Power and Energy
 - *Power Electronics Distributed Energy Resources*
 - *Reliability*



Informing the Broader Public about IEEE

- ▶ Did you know:
 - IEEE publications are cited 3x more than any other publisher in the top 50 patenting organizations worldwide.
 - IEEE members have won 21 Nobel Prizes so far.
 - IEEE members filed over 143,000 patents in 2022.
 - IEEE has over 1,300 active standards with more on the way that standardize the internet, the metaverse, blockchain, sustainable and ethical design, etc.
 - IEEE publishes 3 out of the top 5 publications on AI, Automation and Control Systems, and Computer Science HW and SW.
- ▶ We need to participate in opportunities to talk to non-IEEE groups about IEEE.



IEEE Public Policy

Helping society embrace innovation

- ▶ We help leaders make sense of technological change and put innovation to work for the public
- ▶ We are a global network of IEEE experts in more than 160 countries who understand technology policy because we create, improve, and use the technology every day
- ▶ IEEE does not represent any specific company, technology, or innovation
- ▶ Our expertise includes sustainable and reliable energy, cybersecurity, computer chips, STEM education, wireless communications technology, and every other type of technology



IEEE Humanitarian Activities

A lever for economic, social, and sustainable development

IEEE's range of Humanitarian Technical Activities:

- ▶ Leverages the strength and reach of the IEEE network to make a difference around the world
- ▶ Supports the Board-endorsed vision of IEEE members globally carrying out and/or supporting impactful humanitarian activities at the local level
- ▶ Focuses on building partnerships with local communities, entrepreneurs, and stakeholder groups
- ▶ To encourage the adaptation and implementation of appropriate technology
- ▶ To increase community capacity building to support local sustainability

ieee.org/doing-good



Humanitarian Activities
Committee



EPICS IN **IEEE**

IEEE SIGHT

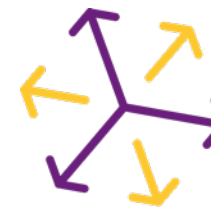
Special Interest Group on
Humanitarian Technology

MOVE COMMUNITY
OUTREACH
AN **IEEE★USA** INITIATIVE



IEEE Foundation

**Climate
Change**



IEEE **IEEE: Enabling Innovation and Technology Solutions**

REACH

Raising Engineering Awareness
through the Conduit of History

My Public Visibility Activities

- Participated in IEEE Panel at the 2024 CES
- Visited Mobile World Congress
- Talks at Designcon (Santa Clara), Cuba Conference, Harrisburg, PA conference, ZCG Conference in Beijing, WAIC in Shanghai
- Congressional Visits Day, Washington DC
- VICS and Honors invitations to other organizations
- IEEE Milestones in Santa Clara Valley, UK, and Australia
- Panel session, talk, student competition and information display at the World Science Fiction Convention in Glasgow
- Africa visit in October (Tunisia, Kenya and S. Africa)
- Monthly Forbes blogs with LinkedIn, Twitter, and Facebook posts on my IEEE travels and activities



Unique Engagement Opportunities

- ▶ Increasing our outreach to the broader public



Raising the Prestige of IEEE Awards

IEEE Medal *OF* Honor

- ▶ IEEE Medal of Honor prize increased from US \$50,000 to \$2 million
- ▶ 2025 IEEE Medal of Honor laureate will be announced at a dedicated press conference in New York City early next year
- ▶ Honors ceremony in Tokyo in April, 2025

IEEE Distinguished Young Professional Innovator and Laureate Forum before IEEE Honors Event

- ▶ **Background:** Recommendation from the 2024 IEEE Ad Hoc Committee on Raising the Prestige of IEEE Awards who were charged to develop a new program to enhance the engagement of early career professionals in IEEE
- ▶ **Overview:** The IEEE Distinguished Young Professional Innovator and Laureate Program/Forum will:
- ▶ **Occur as an annual event launching in 2027** and held before the IEEE Honors Ceremony.
- ▶ Recognize and celebrate exceptional achievements by young professionals, early-career technologists, innovators, and researchers from around the world.
- ▶ Aim to provide a platform for these individuals to network, be recognized for their work, connect with IEEE Medal of Honor Laureates, IEEE Medal Recipients, and industry and government leaders
- ▶ Ties to IEEE's core value of growth and nurturing and the IEEE goal to provide opportunities for career and professional development



IEEE is My Professional Home Videos

Membership & Public Engagement through Video Outreach

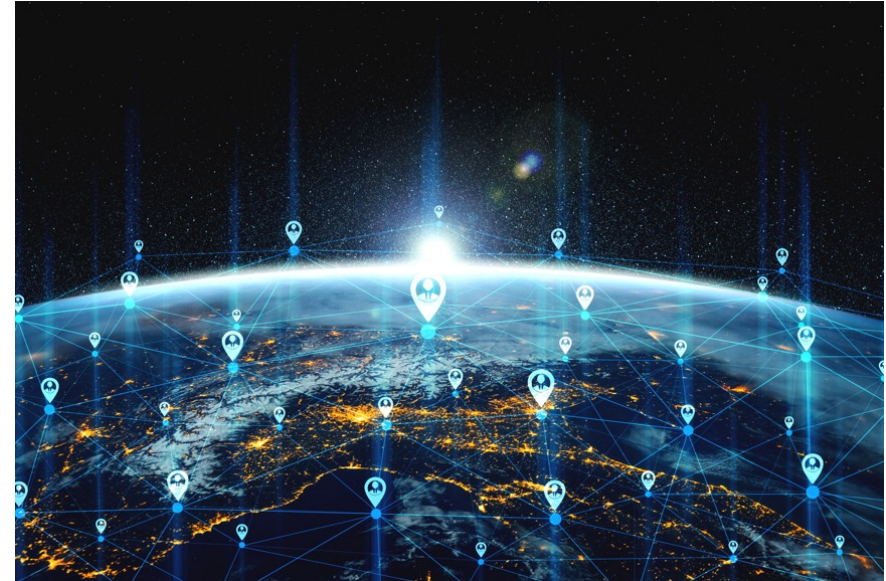
- ▶ Wrapped up filming in Japan and the UK with IEEE members
- ▶ Target audience is early career technology professionals, existing IEEE members, as well as the general public
- ▶ Expanding IEEE's video portfolio by producing new videos, tailoring the spots to a global audience so ads can be run outside the US and scheduling use in additional targeted media markets
- ▶ In addition to their use for a larger external advertising campaign, these videos will also be available for use by IEEE organizational units, regions, sections and members for their promotional efforts



The original IEEE is My Competitive Edge ads can be found here:
<https://bit.ly/ieeeusa-videos>

IEEE: A Resource For Technology Decisions

- ▶ Technology of all sorts drive the world's economy
- ▶ IEEE is the largest technical professional organization in the world
- ▶ IEEE members are involved in all aspects of technology creation and use
- ▶ IEEE research powers patents and IEEE creates world's technical standards
- ▶ IEEE fosters efforts in future directions, technical roadmaps and tracking megatrends
- ▶ IEEE can inform public policy and is a resource for technical discussions





IEEE

*Advancing Technology
for Humanity*

Connect with me on LinkedIn:

<https://www.linkedin.com/in/thomas-coughlin-41a65/>



Tom Coughlin

2024 IEEE President

tomcoughlin@ieee.org