Conference Theme Session: Realizing the 6G Vision-Societal Needs

19 July 2024

6G and the Needs of a Growing Global Ageing Population

by

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HEALTHCARE & LIFE SCIENCES

6G and the Needs of a Growing Global Ageing Population

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ADVANCING TECHNOLOGY FOR HUMANITY

ABOUT IEEE

Inspiring a global community of innovation

Where forward-thinking professional collaborate

Discover what's next in tech innovation

Build technical communities

Shape and share research

Create global standards

Engage in Humanitarian activities

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IEEE BY THE NUMBERS

450K+
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1900+
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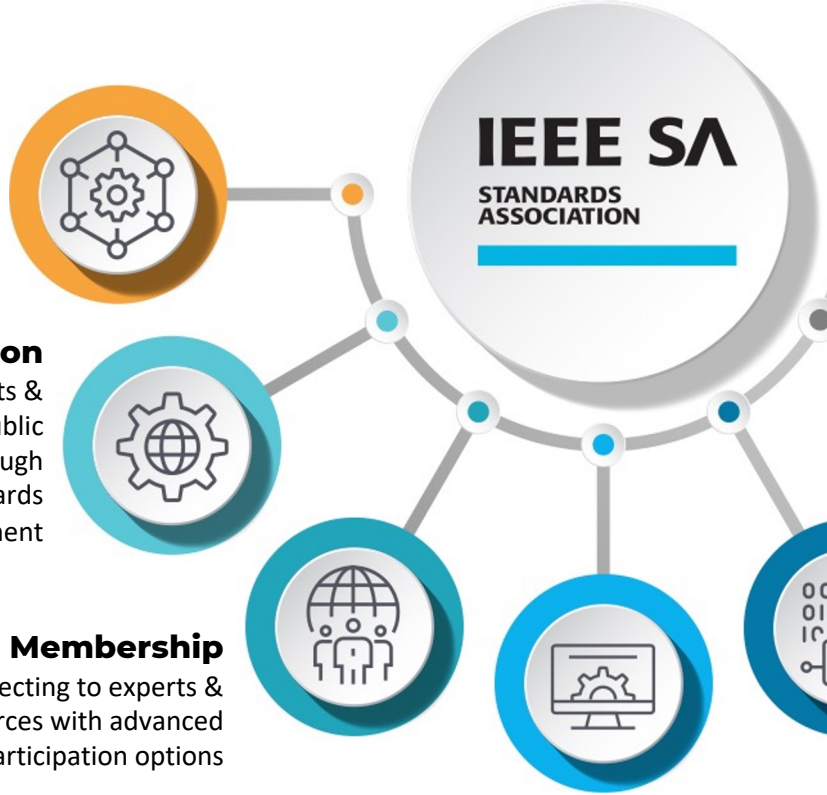

Industry Connections
Exploring & incubating new tech & its use

Standardization
Creating markets & protecting public safety through standards development

Membership
Connecting to experts & resources with advanced participation options

Conformity Assessment
Providing confidence & assurance & accelerating market adoption

Registries
Providing unique identifiers to support global compatibility & interoperability

Alliance Management
Providing support to alliances & trade associations

Open Source
Providing a community-powered platform to support open source projects

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IEEE SA BY THE NUMBERS

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380+
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7500+
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34,000+
GLOBAL PARTICIPANTS

180+
GLOBAL AGREEMENTS

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#IEEEHLS

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To improve the global standard quality of life at every step through affordable healthcare and access to medicines; support innovation to improve overall wellness and improve societal outcomes; and to enable innovation through open and standardized means.

Three Major Branches of Focus

1. Pharma/Biotech
2. Clinical Health
3. Global Wellness

https://ieeesa.io/hls

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IEEE SA Centers of Competence

Health & Life Sciences
- Bio/Pharma
- Clinical Health
- Global Wellness

Foundational Technologies
- Consumer & Industrial IOT
- Building Trust – TIPPSS and Cybersecurity
- Infrastructure for Emerging Tech

Mobility
- Safe autonomous driving
- Zero emissions
- Mobility as a Service (MaaS)

Connectivity & Telecommunications
- Rural connectivity
- Next generation telecom
- Wired and hybrid communications

Energy
- Smart energy
- Energy efficiency
- Energy infrastructure

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CONNECTIVITY & TELECOM

CONNECTIVITY AND TELECOM PRACTICE

Vision: To realize a robust, responsible and affordable connectivity to meet the ever-increasing data, innovation and economic aims across different domains and regions of the world.

Workstreams

Rural Communications

Consumer Communications

Industrial Communications

Initiatives

6G

5G Framework

Quantum Computing

Open RAN

Cybersecurity

Telecom Standardization in India

Telehealth

Sustainability

Data Quality Standards

Rural Connectivity

Activities

- Regulations/Policies
- Pilot Projects/ Demos/Test Beds
- Thought Leadership/Blogs/ White Papers
- Practice and its related activities Promotion
- Events/conferences/Webinars/Outreach
- Training

Strategic Collaborators

(Partial List)

IEEE 802 · IEEE ComSoc IEEE Communications Society · IEEE COMPUTER SOCIETY · IEEE Future NETWORKS Enabling 5G and Beyond

https://standards.ieee.org/practices/connectivity-telecom/

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IMPROVING PERSONAL HEALTH DEVICE COMMUNICATIONS THROUGH CONSENSUS BUILDING

RAISING THE WORLD'S STANDARDS

GLUCOSE METER
IEEE P11073-10417™>

INSULIN PUMP
IEEE 11073-10419™>

CONTINUOUS GLUCOSE MONITORING
IEEE 11073-10425™>

SLEEP APNEA BREATHING THERAPY EQUIPMENT
IEEE 11073-10424™>

CONNECTIVITY TRANSPORTS

IEEE 802.11™>
(Often referred to as WiFi®)

IEEE 802.15.4™>
(Often referred to as Zigbee®)

IEEE 11073-30300™>
(Often referred to as Infrared Communications)

IEEE 11073-30400™>
Near Field Communications

IEEE 802.3™>
(Often referred to as Ethernet)

IEEE P2721™>
Wireless Diabetes Device Security Assurance

CLOUD
IEEE 2301™>
IEEE 2302™>

PULSE OXIMETER
IEEE 11073-10404™>

ELECTROCARDIOGRAPH (ECG)
IEEE P11073-10406™>

BLOOD PRESSURE MONITOR
IEEE 11073-10407™>

BODY COMPOSITION ANALYZER
IEEE 11073-10420™>

CARDIOVASCULAR FITNESS & ACTIVITY MONITOR
IEEE 11073-10441™>

WEIGH SCALE
IEEE 11073-10415™>

PHYSIOTHERAPY
IEEE P2788™>

ACCESSIBILITY
IEEE P2049™ Series>
IEEE P2843™>

HUMAN AUGMENTATION
IEEE P2049™ Series>

CUFFLESS BLOOD PRESSURE
IEEE 1708™>

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Meet the NEW Rising Billions

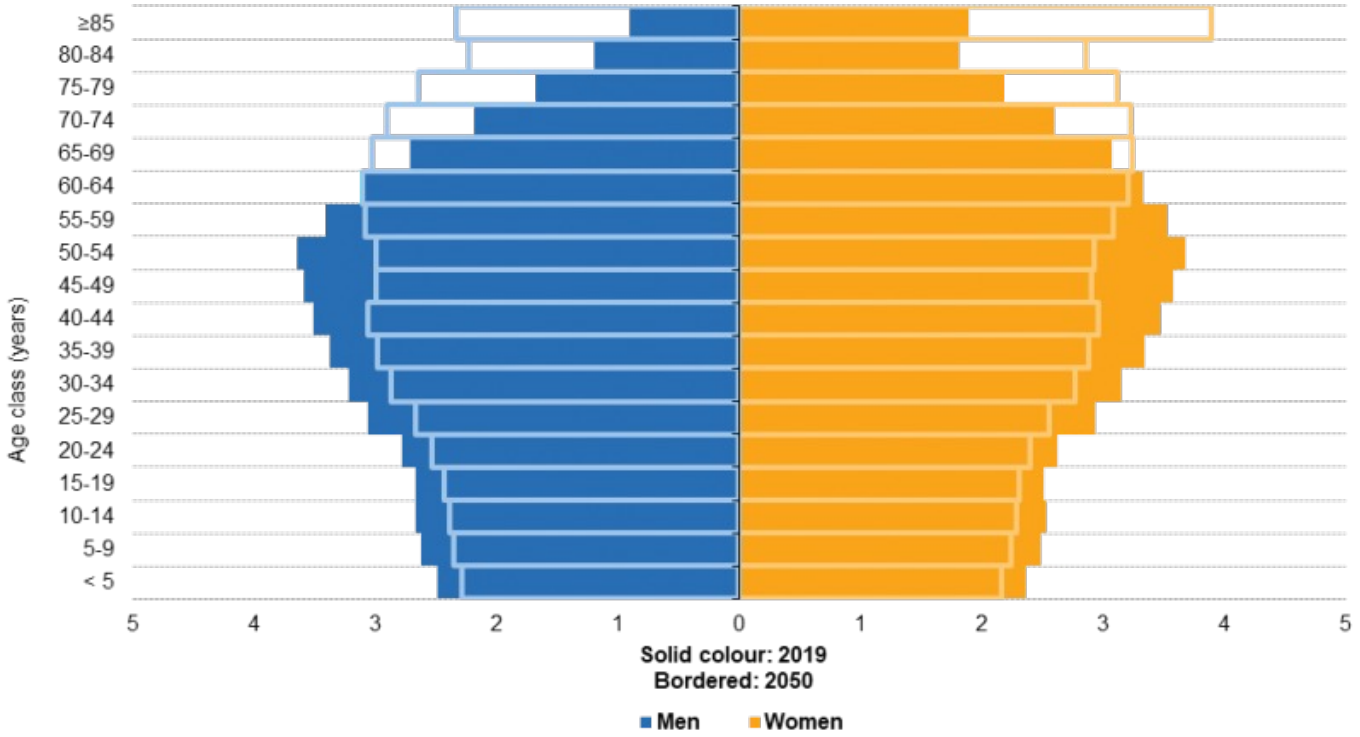
The number of people **aged 60 and older in the world is expected to increase from 1 billion in 2019 to 1.4 billion by 2030 and 2.1 billion by 2050.** This is an irreversible global trend

Age 55+ are less likely to have connected devices than others.

Based on a survey conducted in 2022. Statista.com

Population pyramids, EU-27, 2019 and 2050

(% share of total population)



Note: all data as of 1 January. 2019: estimates and provisional. 2050: population according to the 2019 projections, baseline variant (EUROPOP2019).

Source: Eurostat (online data codes: demo_pjangroup and proj_19np)

eurostat

Key Numbers & Concepts– Ageing and Health

BY 2050

- 1 in 6 people in the world will be over age 65 (16%), up from 1 in 11 in 2019 (9%).
- 1 in 4 persons living in Europe and Northern America could be aged 65+
- The number of persons aged 80 years + is projected to triple, from 143 million (2019) to 426 million(2050)

In 2018, for the first time in history, persons aged 65+ outnumbered children under 5 years of age globally."

United Nations (UN) World Population Prospects: the 2019 Revision, https://www.un.org/en/global-issues/ageing

In 2023, estimated that 92K centenarians (100 years+) are living in Japan with consistent expected growth rate (Statista.com)

- There is no typical older person
- Only a small portion are dependent on others for care
- Older people with the greatest healthcare needs have the least economic and social resources
- Intrinsic capacity (mental and physical health) is a better predictor of wellbeing versus the absence of disease
- Families alone cannot meet the needs of older people.
- Long term care= basic needs + preserving their rights (incl health), fundamental freedoms and human DIGNITY

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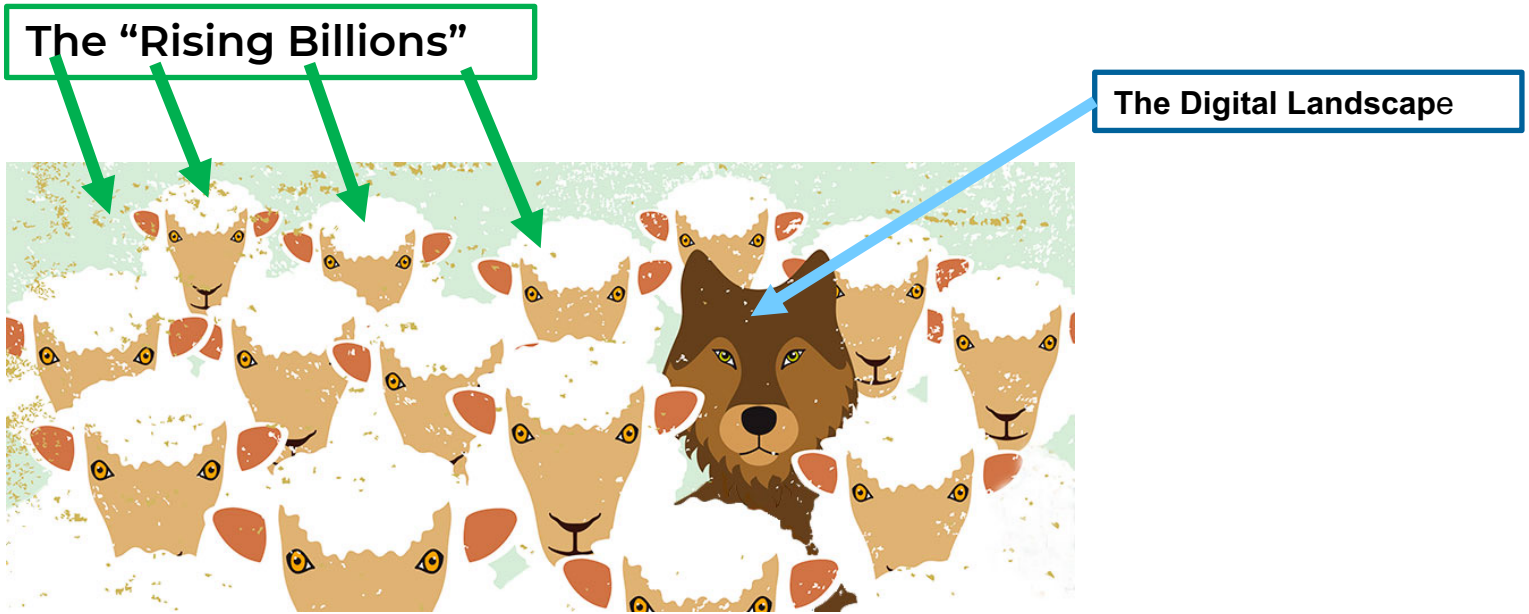
Ethical Considerations of Onboarding the “New Rising Billions into” Digital Communities



Growing Reliance Remote Digital Health/Assistive Technologies

Digital Health Technologies wearables, extended reality, robotics, sensors)

Digital Therapeutics (DTx) use of a smartphone app to either treat (i.e. digital mental healthcare), remind (i.e. patient adherence), or monitor

Connected Medical Devices (supporting the transition to hospital at home)

Virtual Autonomous Clinical Support Assistants (ie. supporting patient requests)

DYNAMICS IN PLAY

RAPIDLY GROWING AGEING POPULATION ACROSS THE GLOBE

AGETECH MARKET SLATED TO DOUBLE FROM $1 TO $2 TRILLION*

Did you know? Growing use of commercial virtual assistants such as Google Home, Apple Home, Alexa, etc) are being utilized to helping the aging although that was not their intended use case!

*Longevity Technology, 28 October 2019 https://www.longevity.technology/agetech-market-slated-to-double-from-1-to-2-trillion/

AH/AAL: Uses, Tools and Where We Need Technology to Be

Tools and technology to support data sharing that preserve human dignity, empower patients' rights to not/consent, ethics in development of applications and data governance

USES
Needed Areas of Support

- Companionship
- Personal safety
- Medical support
  - Frailty
  - Minor memory loss

TOOLS
Support + Data Generation

- Sensors and cameras (wearables, etc)
- Virtual assistance
- Smart/mobile applications
- Automatic pill dispensers
- Virtual /extended reality
- Robotics

TECHNOLOGY
Data Decision Making; Data Sharing

- AI at the Edge
- SWARM AI
- Federated Machine Learning

What can 6G do Better than 5G for Remote Assistive Technologies

- Speed
  - Could provide speeds up to 100 times faster than 5G enable faster and more accurate diagnoses, as well as real-time medical consultations and remote diagnostics.
- Low latency
  - Allow for the quick and efficient transmission of large amounts of data, such as medical images, beneficial for telemedicine and remote monitoring.
- Holographic communications
  - Could introduce holographic communications for telemedical appointments, allowing surgeons to perform procedures remotely using holographic representations of patients.
- Wireless communication
  - Enable wireless communication between medical devices.
- Real-time monitoring
  - Continuous real-time monitoring for benefit patients with chronic illnesses or those who need it
  - Integrated edge computing supporting AI/ML based decision systems embedded in devices

Challenges with 6G versus 5G – Impacting Remote Health

5G Challenges

- **Network security and privacy**
- **Ecosystem Availability**
- **Skills and Education Gap**
- **Impact on healthcare (environmental)**
- **Battery life on devices**
- **Creating a further digital divide**

6G Challenges

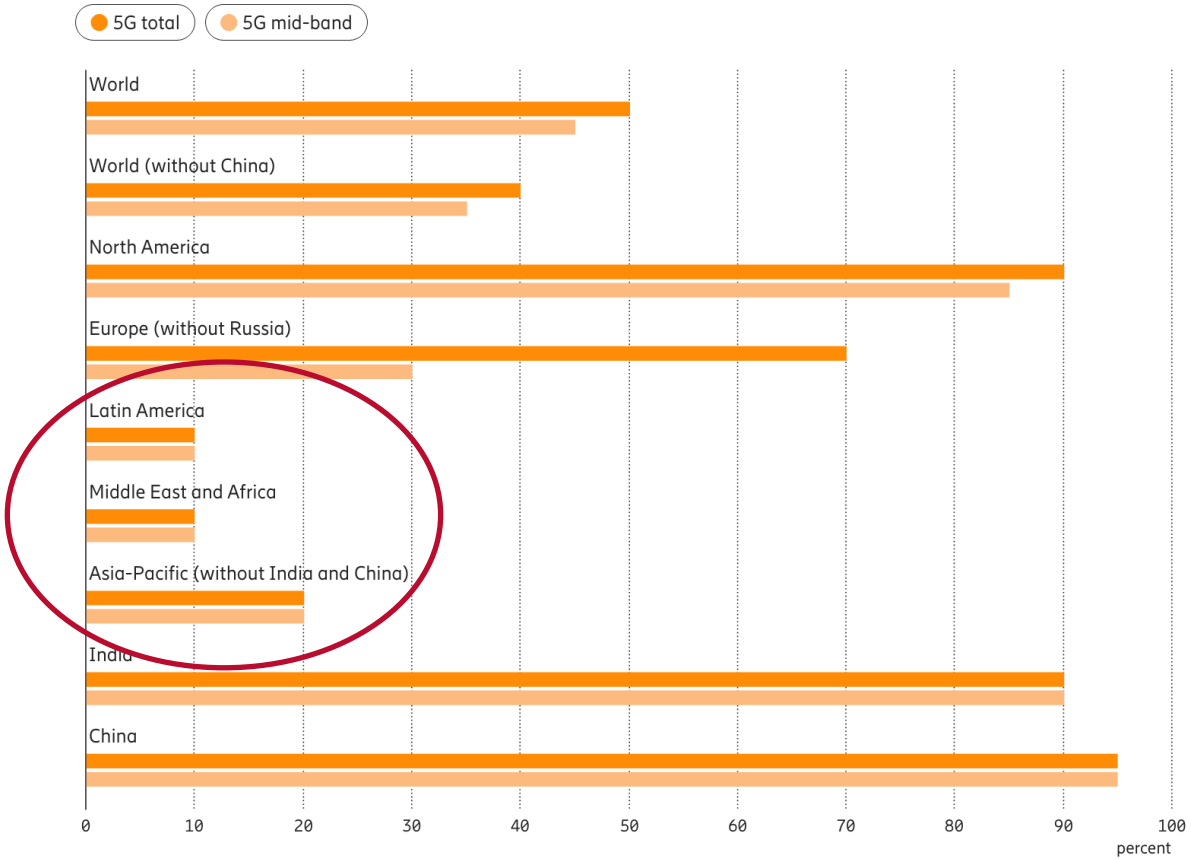
- Data privacy and integrity
- Network vulnerabilities
- Advanced persistent threats (APTs)
- Identity theft and fraud.
- Encryption and anonymization
- AI and machine learning for security
- Comprehensive security frameworks
- User awareness and education (digital literacy)

Who has 5G now and what is expected by 2029?

By 2029…estimated 5G population coverage would be at 80% of all subscriptions excluding mainland China!

Figure and data source: Ericsson 5G Mobility Report, 1 Feb 2024
https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/network-coverage#:~:text=5G%20coverage%20is%20growing%20but,about%2080%20percent%20in%202029

Figure 20: World population and mid-band coverage split by region at the end of 2023



Note: The figures in these graphs are rounded and refer to coverage of each technology. The ability to utilize the technology is subject to factors such as access to devices and subscriptions.

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Key Questions Regarding 6G Deployment in 2030 (est)

#1: How do we prevent the further divide between ”the Have” and ”the Have Nots”?

- Who will have access to it?
- What would be the cost of accessing devices that can leverage the strength of the 6G Network?
- What are the backup solutions if 6G network and those “upgraded’ devices and networks are not available; what can be modified to be usable with 5G network, etc?
- More….

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Pre & Active Standards Groups

IEEE

Standards for Technology for the Aging

- IEEE Life Members conference (April 2024) identified standards for technology for aging populations (age-tech) as an area of interest
- Potential technical areas might include computers/software, consumer electronics, medicine, assistive robotics, etc.
- Standards could address usability/human factors, design guidelines, terminology, metrics/test methods
- LM group is developing an IEEE SA Industry Connections Program proposal for a study group and 2025 workshop on Age-Tech standards with one or more draft PARs as a likely deliverable
- Also, have been invited to propose a mini-symposium on “Assistive Technologies for the Aging” at EMBS annual conference in Denmark, July 2025.
- We are looking for volunteers interested in these activities: contact **George Arnold (garnold@ieee.org) or Maria Palombini (m.palombini@ieee.org)**

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IEEE Initiative on Assistive Technology for the Aging

1. Bring together IEEE volunteer and additional external experts (i.e. a “advisory of experts”)
2. Identify work and opportunities in progress that can be nurtured through the various SA platforms (IC, standards, Open Source, etc)
3. Hold virtual/in-person workshops to address opportunities and gaps in this area
4. Establish a position as the leading platform to nurture these opportunities in a way that supports FAIR data usage, dignity, accessibility, feasibility and adaptability
5. Identify and nurture frameworks for standards, conformity assessment, or other sustainable practices that will support patient trust and responsible adoption for these technologies.

IEEE PRE-STANDARDS INCUBATOR PROGRAMS: AI + HEALTH

TRANSFORMING THE TELEHEALTH PARADIGM: SUSTAINABLE CONNECTIVITY, ACCESSIBILITY, PRIVACY, AND SECURITY FOR ALL

This program provides a platform for the global community to openly develop technical solutions to challenges impeding trust and validation, security, interoperability, accessibility, feasibility and integration telehealth systems. https://ieeesa.io/telehealthic

CLINICAL TRIALS TECHNOLOGY MODERNIZATION NETWORK

Prioritize the areas DCT using DHT standards can accelerate adoption, mitigate risks, and optimize efficiencies with sponsors, regulators, sites, technologists, service providers, patient advocacy organizations, and other relevant stakeholders. https://ieeesa.io/rct

ZERO TRUST CYBERSECURITY FOR HEALTH TECHNOLOGY TOOLS, SERVICES, AND DEVICES

Develop a roadmap to a suite of new zero-trust network access (ZTNA) standards that integrate commercial and open-source products to showcase robust security features of Zero Trust Architecture (ZTA) when applied to enterprise IT use cases. https://ieeesa.io/zerotrusthealth

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INCUBATOR PROGRAMS – HEALTHCARE & LIFE SCIENCES

- Transforming the Telehealth Paradigm
- Neuro Tech for Brain-Machine Interfacing
- Ethical Assurance of Data-Driven Technologies for Mental Healthcare
- Zero Trust for Cybersecurity of Healthcare Devices and Technologies
- Clinical Trials Technology Modernization Network
- The IEEE Global Artificial Intelligence Systems (AIS) Well-being Initiative
- Synthetic Data
- Open Data
- Digital Inclusion, Identity Trust and Agency (DIITA)
- Surveillance AI Systems for Governance for Cities
- Enabling A Smart And Equitable Agriculture Ecosystem

https://standards.ieee.org/industry-connections/activities.html

IEEE STANDARDS PROJECTS relative to topic

- IEEE 11073 Suite –Health Informatics - Personal Health Device Communication - Device Specialization
- *P1752.2 – Standard for Mobile Health Data: Representation of Cardiovascular, Respiratory, and Metabolic Measures*
- P2550 - Standard for Remote Monitoring of a Neonate and the Mother Post-Partum in a Non-Clinical Healthcare Setting
- P2650 - Standard For Enabling Mobile Device Platforms To Be Used As Pre-Screening Audiometric Systems
- P2144.1 - Standard for Framework of Blockchain-based Internet of Things (IoT) Data Management
- P2144.2 - Standard for Functional Requirements in Blockchain-based Internet of Things (IoT) Data Management
- P2144.3 - Standard for Assessment of Blockchain-based Internet of Things (IoT) Data Management
- P2418.1 - Standard for the Framework of Blockchain Use in Internet of Things (IoT)
- P1451-99 - Standard for Harmonization of Internet of Things (IoT) Devices and Systems

IEEE STANDARDS PROJECTS relative to topic

- P1528.7 - Guide to Assess the Electromagnetic Fields (EMF) Exposure of Internet of Things (IoT) Technologies/Solutions
- P2802 - Standard for the Performance and Safety Evaluation of Artificial Intelligence Based Medical Device: Terminology
- IEEE 2933 – 2024 Standard for Clinical Internet of Things (IoT) Data and Device Interoperability with TIPPSS (Trust, Identity, Privacy, Protection, Safety, Security)
- IEEE 2791-2020 - IEEE Standard for Bioinformatics Analyses Generated by High-Throughput Sequencing (HTS) to Facilitate Communication
- P2968.1 - Trial Use Recommended Practice For Decentralized Clinical Trials Patient Safety
- P2968.2 - Trial Use Recommended Practice for Decentralized Clinical Trials Threat Modeling, Cybersecurity, and Data Privacy

Learn more at standards.ieee.org

IEEE STANDARDS PROJECTS relative to topic

- IEEE 11073 Suite –Health Informatics - Personal Health Device Communication - Device Specialization
- IEEE 1752.1 -2021 - IEEE Standard for Open Mobile Health Data--Representation of Metadata, Sleep, and Physical Activity Measures
- IEEE 2621.3-2022 - IEEE Recommended Practice for Wireless Diabetes Device Security: Use of Mobile Devices in Diabetes Control Contexts
- *P1752.2 – Standard for Mobile Health Data: Representation of Cardiovascular, Respiratory, and Metabolic Measures*
- P2550 - Standard for Remote Monitoring of a Neonate and the Mother Post-Partum in a Non-Clinical Healthcare Setting
- P2650 - Standard For Enabling Mobile Device Platforms To Be Used As Pre-Screening Audiometric Systems
- *P1508 – Standard for Wireless Blood Pressure Monitoring*

IEEE STANDARDS PROJECTS relative to topic

- P1528.7 - Guide to Assess the Electromagnetic Fields (EMF) Exposure of Internet of Things (IoT) Technologies/Solutions
- P2802 - Standard for the Performance and Safety Evaluation of Artificial Intelligence Based Medical Device: Terminology
- P2418.6 - Standard for the Framework of Distributed Ledger Technology (DLT) Use in Healthcare and the Life and Social Sciences
- P2933 -Standard for Clinical Internet of Things (IoT) Data and Device Interoperability with TIPPSS (Trust, Identity, Privacy, Protection, Safety, Security)
- IEEE 2791-2020 - IEEE Standard for Bioinformatics Analyses Generated by High-Throughput Sequencing (HTS) to Facilitate Communication
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GLOBAL PRACTICE EVENTS & ACTIVITIES

IEEE

IEEE Regulating AI in Digital Mental Health Forum *Asia*

2 October 2024 - Singapore

ieeesa.io/DMHAsia

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Technical Partner

EMB IEEE Engineering in Medicine and Biology Society

IEEE

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JOIN YOUR PEERS

Telehealth Start-up Global Community

- TAP TECH MENTORS
- EARN DEMO OPP & CREDITS
- CREATE PARTNERSHIPS
- BECOME A CHANGE AGENT

LEARN MORE

ieeesa.io/telehealth-startup

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How we collaborate?

- Think tank for identifying challenges and potential solutions in telehealth innovation
- Supporting start-ups with industry knowledge, tools and resources
- Creating an environment to form partnerships and knowledge sharing
- Hosting of the annual Global IEEE Telehealth Tech Pitch Competition
  - 2024 Winner was just announced

Sign up at ieeesa.io/telehealth-startup

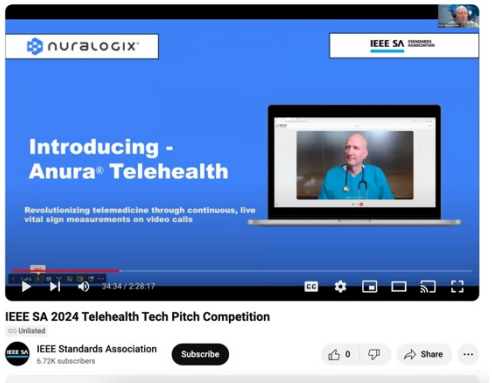
IEEE

2025.

Congratulations to 1st Place Finish

Anura Telehealth

Anura Telehealth is an AI/ML software which can either be a standalone telemedicine system or integration to existing telemedicine platforms; and allows for real time assessments of patient health risks.



Live Pitch Presented by:
Dr. Keith Thompson, Chief Medical Officer, Nuralogix

3RD ANNUAL IEEE SA TELEHEALTH PITCH COMPETITION

Digital Health Innovation Challenge

ieeesa.io/telehealth-pitch

Concluded: 12 June 2024

INDUSTRY IOT CYBERSECURITY VIRTUAL WORKSHOP SERIES

GLOBAL CONNECTED HEALTHCARE CYBERSECURITY VIRTUAL WORKSHOP SERIES

IEEE CYBERSECURITY TIPPSS FOR INDUSTRY

TIPPSS FOR IoTs CLINICAL RESEARCH
ON-DEMAND (18 June 2024)

TIPPSS FOR CONNECTED VEHICLES
24 SEP 2024 | 11 AM – 1 PM ET

TIPPSS FOR PRECISION AGRICULTURE
9 OCT 2024 | 11 AM – 1 PM ET

TIPPSS FOR TRANSACTIVE ENERGY
12 NOV 2024 | 11 AM – 1 PM ET

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ieeesa.io/tippss-workshops

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The [IEEE Re-Think Health Podcast Series] is an interview-style podcast where global healthcare stakeholders– technologists, researchers, clinicians, patient advocates, regulators, and more– re-think the approach to healthcare, from therapeutic discovery through bedside practice, utilizing new technologies and applications. Episode topics feature experts addressing:

- Aging
- Telehealth
- AI for Good Medicine
- Health Robotics
- Wearables/Sensors
- ...more

TUNE IN STITCHER

IEEEReThinkHealth.podbean.com

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THANK YOU

GET INVOLVED:
Write about it, talk about it, develop solutions…make an impact.

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http://ieeesa.io/hls