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## IEEE Technology Roadmaps Grow

Interest in technology roadmaps is growing. A number of IEEE organizational units are participating in the development of new technology roadmaps or continuing the work of established roadmaps. The start of some recent IEEE roadmap activity began as an effort to continue the work of the International Technology Roadmap for Semiconductors 2.0 (ITRS). The [Heterogeneous Integration Roadmap \(HIR\)](#), sponsored by IEEE Electronics Packaging Society (EPS), SEMI, IEEE Electron Devices Society (EDS), IEEE Photonics Society, and the ASME Electronic & Photonic Packaging Division (EPPD), published the first chapters of its 2019 edition in October, with additional chapters being released on a rolling basis. Another recently published technology roadmap, the [International Technology Roadmap on Wide Bandgap Semiconductors \(ITRW\)](#), has made the first edition of its roadmap free to members of the sponsoring society, IEEE Power Electronics Society (PELS). A third technology roadmap, which began in the IEEE Standards Association Industry Connections program and has found a home in the IEEE Rebooting Computing Initiative, [IEEE International Roadmap for Devices and Systems™ \(IRDS\)](#), published its second edition this year.

In order to support IEEE's technology roadmap activities, the IEEE Roadmaps Strategy and Governance (IRSG) Ad Hoc Committee was formed in May 2018. The committee, led by Chair Rakesh Kumar, consists of a steering committee and a user group. The user group serves as a forum for communication between the representatives of various published and developing IEEE roadmaps, as well as a resource for capturing best practices and guidelines.

As part of its efforts to bring more visibility to IEEE roadmaps, IRSG has created a new website: [roadmaps.ieee.org](http://roadmaps.ieee.org). This site features news items such as press releases announcing the launch of new IEEE roadmaps, information on IRSG, and links to each of the existing IEEE sponsored roadmaps. The site will serve as a central portal to access the roadmap publications and resources to support volunteers working on roadmaps.

Overseen by the IEEE Technical Activities Board (TAB) and supported by IEEE Future Directions, IRSG is working to provide guidance and infrastructure to support technology roadmap activities across the IEEE. IRSG is currently pursuing its transition to the IEEE Roadmaps Committee (IRC), a standing committee of IEEE Future Directions Committee.

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## IEEE Future Directions at IEEE GLOBECOM 2019

Join IEEE Future Directions at the [2019 IEEE Global Communications Conference \(GLOBECOM\)](#) in Waikoloa, Hawaii, USA, from 9-13 December 2019. Explore how the various emerging technologies that are being nurtured through IEEE Future Directions will revolutionize the communications field.

Special events include two industry panels on [Roadmapping Communications Technologies](#) on Tuesday, 10 December, moderated by Bill Tonti, IEEE Future Directions, and Peter Winzer, Nokia Bell Labs. The panels will bring together leading industry visionaries and roadmapping experts across various disciplines to address the applications driving communication network needs as well as the technology drivers and communications networks solutions supporting new applications.

The week will end with a workshop on [Blockchain in Telecommunications: Emerging Technologies for the Next Decade and Beyond](#) on Friday, 13 December. This workshop, organized by the IEEE Blockchain Initiative, features two sessions that will introduce the basic concepts of blockchain applied to telecommunications (including 5G, IoT, Networking, Cloud, and more) and will discuss emerging trends and challenges ahead. It will also provide a forward-looking perspective on the emerging technologies and key applications in this new field.

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## IEEE Future Directions Technical Communities

In IEEE Future Directions, we're committed to bringing you the best knowledge, resources, and opportunities in emerging technologies within IEEE. As we evolve and expand our offerings, subscription to our current Future Directions Technical Communities for IEEE Society members will be free as a Society member benefit. IEEE Members and non-members will pay a fee. These communities include: Blockchain, Brain, Digital Reality, Future Networks, and Rebooting Computing. Details of this change, including IEEE member and IEEE Student member rates, can be reviewed as you [renew your memberships for 2020](#).

As a participant of our Technical Communities, you will receive access to our growing suite of content, including online courses, webinars, white papers, videos, and more at discounted rates.

Thank you for being a part of our Technical Communities. We value your involvement and look forward to your continued participation in IEEE Future Directions.

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## Technology Policy and Ethics

IEEE Future Directions considers the reflection of technology through the lens of social implications a key tenet of our work as we incubate and promote technologies. We are currently seeking submissions of original content for 2019, articles of 800-1200 words on the social implications of technology, including but not limited to policy and ethics topics. If interested, please email [FDPolicyEthics@ieee.org](mailto:FDPolicyEthics@ieee.org). Learn more about submitting an article through the [author guidelines](#).

Blockchain Based Connected Vehicles for Smart Green City

## Environment

By Prateeti Mukherjee, *ReSENSE Lab Intern, Department of Computer Science, Institute of Engineering and Management, India*, and Dhananjay Singh, *ReSENSE Lab Director, Department of Electronics Engineering, Hankuk University of Foreign Studies, Korea*

Air pollution is perceived as a modern-day curse, a fatal by-product of increasing urbanization and rapid industrialization. The phenomenon has a plethora of negative impacts, including human health issues, damage to ecosystems, decreasing quality of food crops, and abatement of environmental standards. Passenger vehicles are a major contributor to air pollution, producing significant amounts of nitrogen oxides and carbon monoxide, among other pollutants. It is therefore necessary to enforce greener practices among citizens and introduce a reliable mechanism that encourages responsible behavior to support the environmental cause. The proposed work aims to circumvent the aforementioned problem with an IoT-enabled solution powered by blockchain technology to foster environment friendly practices in registered vehicle owners. The real essence of this project is to leverage technological innovations to solve pollution issues that befoul the urban atmosphere. We seek to achieve this goal with a financial reward-penalty scheme that drives the urban populace to practice green living, while monitoring pollution levels using an IoT device. The ability of blockchain networks to provide a verifiable record of actions and violations [1], coupled with the capabilities of Internet of Things (IoT) paradigms to detect pollution levels present in vehicular exhaust, is exploited in this project.

[Read More](#)

## Clinical Decision Support Systems – Part 2

By Tahir Hameed, *Girard School of Business, Merrimack College*

[Part one](#) of this article published in July 2019 focused on two major application areas of Machine Learning (ML) in Clinical Decision Support Systems (CDSS) i.e., 1) Computer Aided Diagnosis (CAD) and prognosis (progression) and 2) Risk stratification and preventive healthcare. In this second part of the article, we continue to discuss more cutting-edge ML applications in CDSS including clinical pathways optimization, diagnosis and personalized medicine development based on genomics and related data.

[Read More](#)

## Towards Zero-Trust Database Security – Part 2

By Walid Rjaibi, *Department of Computing and Mathematics, Manchester Metropolitan University and the IBM Canada Lab*, and Mohammad Hammoudeh, *Department of Computing and Mathematics, Manchester Metropolitan University*

In [Part One](#) of this article, we have explored the direct and indirect means through which the same data in a database system can be accessed and the challenges they pose to adhering to the basic tenets of zero-trust security. Here, we outline the solutions that are most suitable to address these challenges and enable enterprises to implement zero-trust database security without negatively impacting core database tenets such as query performance.

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## Current Activities in our Technical Communities



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On 29 January 2020, IEEE Blockchain will host the [IEEE Global Blockchain Virtual Summit on Healthcare](#), a new and innovative event experience that infuses short papers of educational value coupled with presentations from experts. Papers and their associated presentations are invited on all related topics, especially: Blockchain Healthcare Applications, Internet of Things (IoT), 5G, Artificial Intelligence (AI), Platform Technology, Quantum, Digital Assets, Clinical Research, Medical Devices, Pharma, Quality Assurance, Frameworks, Risk Management, Data Privacy, Identity Management, and Cybersecurity.

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The IEEE Brain Initiative has announced the launch of two new resources: the [Neuroethics Framework](#) and a [white paper on next generation closed-loop neural control systems](#). The IEEE Brain Neuroethics Subcommittee created the Neuroethics Framework as part of an effort to develop guidelines to address ethical, legal, and social concerns for the research and use of neurotechnologies. The next generation closed-loop systems is a technology roadmap white paper, serving as the first step in the creation of new technology roadmap. For more information or to provide your feedback on these materials, visit the IEEE Brain Initiative.

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The [IEEE Transactions on Cloud Computing](#) is a scholarly journal dedicated to the multidisciplinary field of cloud computing. It publishes peer-reviewed articles that present innovative research ideas and application results of cloud computing, focusing on key technical issues related to theory, algorithms, systems, applications, and performance.

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The 2019 IEEE Secure Development Conference (SecDev) was held 25-27 September in McLean, VA. The event



served as a venue for presenting ideas, research, and experience related to the development of secure systems. View the [Proceedings of SecDev 2019](#).

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On 9-11 December 2019, the IEEE Computer Society will be hosting their [2nd International Conference on Artificial Intelligence & Virtual Reality \(AIVR 2019\)](#). This unique event addresses researchers and industries from all areas of AI, as well as Virtual, Augmented, and Mixed Reality. It provides an international forum for the exchange between these fields to present advances in the state of the art, identify emerging research topics, and together define the future of these exciting research domains.

In addition, keep up to date on the digital transformation by checking out the recently published [IEEE Symbiotic Autonomous Systems White Paper III](#).

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The November issue of the [IEEE Future Networks Tech Focus](#) technical newsletter was recently published, including the following articles:

[Seamless Networks for Beyond 5G](#)

[Overcoming 5G Millimeter Wave Black Holes](#)

[Photonic Payloads for Next Generation 5G Satellite Networks](#)

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The [2020 IEEE 6th World Forum on Internet of Things \(WF-IoT 2020\)](#) is the premier IEEE conference on IoT and will be held in New Orleans, Louisiana, USA on 5-9 April 2020. It brings together leaders from industry, the public sector, and the research community with the purpose of fostering and advancing the adoption and deployment of IoT solutions for the benefit of society. The theme for the conference is "The Internet of Intelligent Things." For more information and to register, please visit the [conference website](#).

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Mobile technology has come a long way since the days when devices were produced unchecked, had a small

number of capabilities and were of questionable quality. Such current and future devices are expected to revolutionize health care as we know it not just enabling patients in remote places to get the health care they need, but also enabling everyone to get some treatments at home without visiting the physician's office. An upcoming special issue of the [IEEE Life Sciences Technical Community Newsletter](#) will feature articles describing and discussing the promise and the challenges of this emerging field.

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The IEEE Quantum Initiative invites you to [IEEE Quantum Week 2020](#), the inaugural IEEE International Conference on Quantum Computing and Engineering (QCE), to be held 12-16 October 2020 in Denver, Colorado, USA. IEEE Quantum Week aims to be a leading, highly multidisciplinary venue for advancing quantum computing, engineering, and technology. Visit the [conference website](#) for details on paper and contribution submissions, important dates, and a list of topics.

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IEEE Rebooting Computing Week 2019, held last month in San Mateo, California, USA, was a great success with wide participation, insightful discussions, presentations, and panels on various topics relating to the future of computing, machine learning, quantum computing, and more. The week kicked off with the Industry Summit on the Future of Computing, followed by the IRDS™ Winter Meeting, IEEE Quantum Initiative Workshops, and the 4th International Conference on Rebooting Computing (ICRC). Read a summary of the highlights and view the ICRC keynote talk "Developing Our Quantum Future" by Dr. Krysta Svore (Microsoft) on the [ICRC website](#).

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IEEE Smart Cities Standard Working Group P2784 - Webinar Series: Each month a webinar will be held based upon the proposed IEEE P2784 Smart City Planning and Technology Guide. Join us for the following upcoming webinar:

[IoT & Smart Lighting by Martin Mercier](#) - 17 December 2019

Past webinars will be available in the [IEEE Smart Cities Resource Center](#).

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Don't miss the [IEEE Smart Grid Cybersecurity Workshop](#) in Atlanta, Georgia, 12-13 December! This 1½ day workshop will focus on providing an industry update of the key challenges and latest industry developments. In addition, for the first time, this year's event will include The Smart Grid Cybersecurity Village, a combination vendor exhibition, and Red Team/Blue Team Exercise. [Register here.](#)

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IEEE SDN now offers a collection of online courses in the field of Software Defined Networking, Network Function Virtualization, and related technologies. Learn from industry experts about topics that include the fundamentals of SDN and NFV, security and management challenges, the latest SDN open source platforms, and more. Participants also have the opportunity to earn Continuing Education Units (CEUs) and Professional Development Hours (PDHs) with each course. [Access the courses.](#)

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Charles Despins, an IEEE Senior member and Co-Chair of the IEEE Sustainable ICT Initiative, provided his thoughts about "Making Information and Communications Technology More Sustainable" in a Q&A article. Read more at [IEEE Transmitter™](#).

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## IEEE Future Directions Events

[Workshop on Blockchain in Telecommunications: Emerging Technologies for the Next Decade and Beyond](#) at IEEE Globecom, 9-13 December 2019, Waikoloa, Hawaii, USA

[2019 IEEE Smart Grid Cybersecurity Workshop](#), 12-13 December 2019, Atlanta, Georgia, USA

[2020 IEEE World Forum on Internet of Things \(WF-IoT\)](#), 5-9 April 2020, New Orleans, Louisiana, USA

[2020 IEEE Transportation Electrification Conference & Expo \(ITEC\)](#), 24-26 June 2020, Chicago, Illinois, USA

[2020 6th IEEE International Conference on Network Softwarization \(NetSoft\)](#), 29 June - 3 July 2020, Ghent, Belgium

[2020 3rd IEEE 5G World Forum \(5GWF'20\)](#), 10-12 September 2020, Bangalore, India

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