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J-BHI Special Issue on "Enabling Healthcare AI and Informatics by Energy-Efficient Network Design and Protocols for 5G"

In recent years, the healthcare sector has been revolutionized with modern communication technologies and wireless sensor networks such as the Internet of Medical Things (IoMT), Internet of Health-care Things (IoHT), Personalized Internet of Things (PHoT) 5G, and beyond for seamless health remotely monitoring of the patients, especially in pandemic situations. Smart healthcare devices can sense, process, and analyze the vast amount of healthcare data collected from a range of medical devices. That information needs to be transmitted immediately to the concerned medical practitioner for better decision-making, especially during an emergency. However, existing wireless and mobile communication networks are unlikely to address the expected requirements of the smart healthcare environment related to latency, capacity, end-to-end delay, bandwidth, QoS, channel estimation, energy efficiency, network traffic, and other attributes. Since the number of connected IoT devices is expected to grow at an unprecedented rate and with the ever-increasing speed of network traffic. There is an increasing demand for adopting next-generation communication 5G for healthcare applications for low latency, higher reliability, throughput, and flexibility. Adding the 5G network to the existing architecture will enhance the performance and ensure the high-speed data transmission of a large number of medical imageries like MRI results, which helps improve the quality of care.

Smart healthcare devices are characterized based on sensors or actuators, processing devices, and storage and network components. It is widely used in many cases, such as monitoring glucose level, ECG, blood pressure, oxygen saturation, AR or VR-based clinical care, and much more. Due to its resource-constrained nature, reducing energy consumption is crucial for real-time surgical or robotic surgical procedures. Since 5G is twice as energy-efficient as a 4G network, it is expected to offer energy-efficient methods to manage the network resources even with the increased volume of users. Distributed antennas like MIMO (Multiple Input Multiple Output), SWIPT, and small cells protocols are the critical enabling techniques to reduce energy consumption. Reducing the distance of the base station will significantly increase the network density and signal strength. The most critical design aspect of 5G is network slicing, a kind of virtual networking infrastructure that enables tailored connectivity and data processing in terms of data speed, quality, network configuration, and latency according to the specific use cases. It reduces the capital expenses while increasing the operational efficiency and time of the 5G network. Besides that, modern networks are rapidly changing towards software-based automation through Network Function Virtualization (NFV) and Software-defined control for better infrastructure scaling and lower computational redundancy, likely reducing energy consumption.

However, there are some significant challenges in 5G assisted healthcare services, such as lack of interoperability, standardization, device complexity, and security. As more IoT devices are run on the network, security remains critical in 5G enabled devices particularly, due to network bandwidth and unprotected IoT devices. This special issue focuses on innovative ways of designing novel network architecture with more emphasis on energy-efficient approaches for optimal performance of 5G-assisted healthcare applications. We welcome researchers and practitioners to present their novel contributions in this regard.

Topics of interest include, but are not limited to, the following:

- Energy efficiency and security in 5G applications of IoMT, IoHT and PHoT
- 5G and beyond for High-speed data transmission of medical imageries
- Nature-inspired smart energy-efficient hybrid systems for 5G and beyond healthcare.
- 5G and beyond enabled Hybrid energy efficient intelligent models in IoMT and IoHT
- Seamless remote patient monitoring through 5G applications.
- Importance of 5G cognitive computing for context-aware healthcare applications.
- Improving energy performance in 5G networks for IoMT and IoHT devices.
- Energy efficient meta-heuristic algorithms in 5G cellular and IoMT networks.
- 5G applications for advanced robotic surgery with AR and VR techniques
- Privacy and security challenges in 5G enabled healthcare applications.

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