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PROSPECTS AND DEVELOPMENT OF 5G TECHNOLOGIES

The first generation (1G) of cellular networks was deployed in the 1980s, and used analogue radio signals at 150 MHz. Primarily designed for voice calls, it employed Frequency-Division Multiple Access (FDMA) for channel allocation. However, limitations in reliability and security led to the introduction of Advanced Mobile Phone System (AMPS) and Total Access Communication System (TACS) that offered data rates up to 2.4 kbps [4].

The next generation (2G) made it possible to use clearer calls and the Short Message Service (SMS), Multimedia Messaging Service (MMS), and digital signal transmission [3]. The next 2.5G standard bridged the gap between voice and data services. General Packet Radio Service (GPRS) enabled internet access at speeds of up to 64 kbps. In addition to this, Enhanced Data Rates for GSM Evolution (EDGE) provided faster data transmission capabilities.

The third generation (3G) was introduced in 2000 and significantly increased data transfer rates to a minimum of 2 Mbps. Using CDMA and EDGE technologies, 3G offered data speeds that reach 100-300 Mbps [3]. This eased web browsing, audio and video streaming.

The following generation (4G), focused on enhanced multimedia, video streaming, global networks, and portable device. The new generation of communications has provided data transfer rates up to 100 Mbps. This generation made a revolution in mobile internet access, enabling advancements like online gaming, high-definition video services, and high-quality video conferencing.

Finally, 5G represents the newest wireless mobile broadband technology. It has significantly higher speeds, lower latency, the ability to support a multitude of devices simultaneously, and improved energy efficiency. 5G operates at frequencies between 30 GHz and 300 GHz and provides high-speed data transmission over short distances, which exceeds 1 Gbps [4].

Higher data transfer speeds, lower latency, increased capacity and advanced security features, which provide new 5G communication standards, allow progress in the implementation of the main directions of the Internet of Things (IoT) such as smart cities, in which urban infrastructure is optimized for efficient resource management and public safety, Industrial IoT that provides real-time monitoring and control, healthcare advancements and smart grids [2]. Apart from this, 5G technology is designed to service to industrial applications and emerging trends like machine learning, which will be used in innovative developments such as self-powered mobile devices, real-time video applications, augmented reality and virtual reality services, autonomous vehicles and advanced educational tools [5].

During its initial implementation, 5G met significant public resistance due to concerns about safety of technology. In the period from 2018 to 2020, a series of studies were published exposing both 5G in particular and short-wave radio communications in general, and claiming the undoubted harm of these technologies to health. However, the meta-analysis found that most of these publications were created by interested parties funded by certain industries [1]. The studies themselves were of fairly low quality, and the original data were questionable. Subsequently, when the technology gained great popularity, independent researches were published, the results of which cannot confirm any impact of mobile telephony technologies on human health. So, the harm of 5G remains unproven to this day.

Thus, we are on the verge of a revolution in wireless communications associated with 5G technologies. The latest communication technologies will be widely implemented in various infrastructures, the IoT, and will also be closely related to machine learning.

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