Chapter 5
The Role of Artificial Intelligence in 6G Networks, Architecture, Protocol, Transmission, and Applications

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ABSTRACT

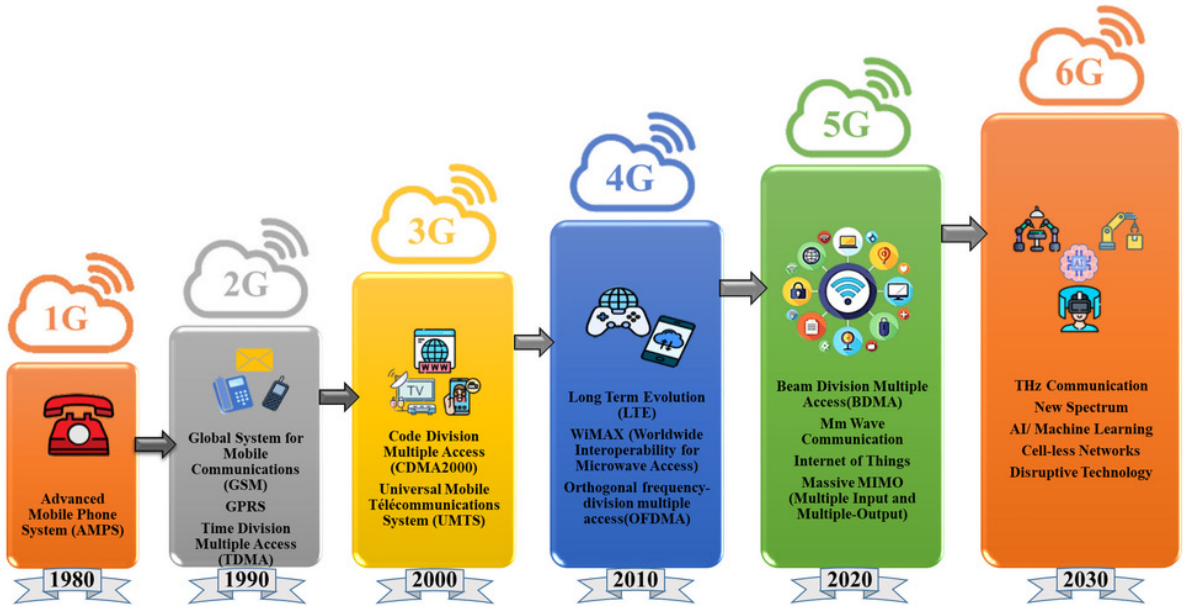
The 6G wireless communication technology is the successor to the 5G cellular-based technique. It is aimed at the increased bandwidth and higher dimensions of data transmission with the measurement of less than one microsecond of latency communication. Artificial Intelligence (AI) is pivotal in establishing computational and intelligence infrastructure, data storing, transmission, and decision-making. With the increased frequencies of 6G, sampling rates will surge beyond those achievable with 5G (Fifth Generation). Access points will gain the capacity to serve multiple clients through orthogonal frequency-division multiple access concurrently. The expected spectrum of communication using 6G is up to terahertz (THz). Artificial Intelligence (AI) guides Quality of Service (QoS) in 6G communication. This chapter covers a high-level overview of the role of AI in 6G, architecture, protocols, transmission technologies, and applications.

DOI: 10.4018/979-8-3693-8799-3.ch005

1.0 INTRODUCTION

Wireless communication refers to the transmission of data or information over a distance without the use of physical connections or wires. This type of communication utilizes electromagnetic waves, such as radio frequencies, microwaves, and infrared signals, to convey information between devices. Figure 1 shows the evolution of wireless communication.

Figure 1. Evolution of Wireless Communication



In the early 1980s wireless mobile technology was started with the first generation (1G). 1G was used for low data transfer, especially for voice/audio communication with a speed of 2.4Kbps.

In the early 1990s, the second generation (2G) wireless technology was introduced. Time Division Multiple Access (TDMA) is a cellular telecommunication technology that was developed to transmit high-quality audio and text communication with a transmission speed of 64Kbps.

In the early 2000s, the third generation (2G) wireless technology was introduced. Code Division Multiple Access (CDMA) is a cellular telecommunication technology that was developed to transmit high-quality audio and text communication with a transmission speed of 64Kbps.

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In the early 2010s, the fourth generation (4G) wireless technology was introduced. Orthogonal Frequency Division Multiple Access (OFMDA) is a cellular telecommunication technology that was developed to transmit high-quality audio and text communication with a transmission speed of 1Gbps.