Chapter 2
Use of CAL-AI in Future Wireless Communication Systems

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ABSTRACT

Communication systems have changed dramatically during the last few decades. Wireless communication is one of the few industries that has been able to maintain exponential growth and visionary characteristics for many years. Computer assisted learning- artificial intelligence [CAL-AI] can process vast amounts of data produced by communication systems on a regular basis to give optimal QoS based on insight. CAL-AI is a method for creating "intelligent machines." It is a promising method that has the potential to make significant advancements in the technological area. The authors present a general summary of this groundbreaking method in the realm of wireless communication systems in this chapter, as well as its future implications. The progress of the information and communication technology industry will be largely attributed to CAL-AI.

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INTRODUCTION

Rapid advancements in mobile internet tend to generate massive volumes of network traffic, which necessitates more bandwidth in order to experience it at a higher quality. Wireless networks are evolving towards a diverse paradigm to meet the high demand for data traffic. Artificial Intelligence (AI) can easily process the massive amounts of traffic generated.

CAL-AI is a strategy for creating "intelligent machines," which replicate the functioning of a human mind and learn from their surroundings on a continual basis. Their learning is defined as Machine Learning (ML), and they use it to create a database that categorizes information to assist them in solving problems and providing "intelligent outcomes" similar to human beings depending on the insights gained, increasing the likelihood of success. Intelligent mobile networks are operated more efficiently and autonomously with improved performance thanks to AI. It has the potential to handle unstructured problems by interpreting large volumes of data and compartmentalizing it so that it can be dealt with during the design and optimization phase (Wang et al., 2020).

The Architecture of Artificial Intelligence

Without being expressly programmed, an Artificial Intelligence can assess massive volumes of data generated by several sources such as camera images, various sensors, drones, and surveillance recordings and operate accordingly. These are then combined to build a detailed operating map and database of the network's vast number of devices. It can be used to optimize many functions across wireless networks of varied sizes, such as fault monitoring and usage tracking. By learning the operations of the wireless environment and the network's users in real-time, AI Resource management techniques can run completely autonomously. AI is used to ensure that these management mechanisms grow over time and always function at their best, maintaining network dependability and adaptability by making real-time decisions based on predictions and interpretations of user behavior.

End-to-end optimization is provided by AI, which handles the design complexity of Radio Frequency (RF) communication systems by using robust machine learning techniques to optimize RF characteristics including channel bandwidth, antenna sensitivity, and spectrum monitoring. Physical and signal