REVIEW

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Scope of machine learning applications for addressing the challenges in next-generation wireless networks

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Abstract

The convenience of availing quality services at affordable costs anytime and anywhere makes mobile technology very popular among users. Due to this popularity, there has been a huge rise in mobile data volume, applications, types of services, and number of customers. Furthermore, due to the COVID-19 pandemic, the worldwide lockdown has added fuel to this increase as most of our professional and commercial activities are being done online from home. This massive increase in demand for multi-class services has posed numerous challenges to wireless network frameworks. The services offered through wireless networks are required to support this huge volume of data and multiple types of traffic, such as real-time live streaming of videos, audios, text, images etc., at a very high bit rate with a negligible delay in transmission and permissible vehicular speed of the customers. Next-generation wireless networks (NGWNs, i.e. 5G networks and beyond) are being developed to accommodate the service qualities mentioned above and many more. However, achieving all the desired service qualities to be incorporated into the design of the 5G network infrastructure imposes large challenges for designers and engineers. It requires the analysis of a huge volume of network data (structured and unstructured) received or collected from heterogeneous devices, applications, services, and customers and the effective and dynamic management of network parameters based on this analysis in real time. In the ever-increasing network heterogeneity and complexity, machine learning (ML) techniques may become an efficient tool for effectively managing these issues. In recent days, the progress of artificial intelligence and ML techniques has grown interest in their application in the networking domain. This study discusses current wireless network research, brief discussions on ML methods that can be effectively applied to the wireless networking domain, some tools available to support and customise efficient mobile system design, and some unresolved issues for future research directions.

KEYWORDS

machine learning, network control, next-generation wireless networks

1 | INTRODUCTION

Currently, mobile phones and devices have become parts and parcels of our daily life. Our professional and commercial activities are mostly done by availing the online network services provided through mobile applications. Because of the enhancement of technologies, the number of mobile devices connected to the Internet, the number of services available through networks, the bit rate of data transfer, and the speed of connected mobile devices have increased by many fold. All these improvements have enhanced the comfort and convenience of mobile customers for availing network services,