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Enhanced Deep Learning Architectures for Spectrum Sensing in Cellular Networks

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Abstract:
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Abstract:
The expansion of 5G technologies and the Internet of Things (IoT) increases the demand for spectrum efficiency. In future smart city and Industrial IoT (IIoT) applications, the number of wireless users and IoT devices will be excessive. The effect will be spectrum congestion. Moreover, the existing wireless technology has security flaws and inadequate service quality. Cognitive Radio (CR) technology intends to enhance the functioning of the existing system and meet the growing bandwidth needs of users. Spectrum awareness with identification of various signal patterns, is crucial in a cellular system environment. In this work, two deep neural network architectures are presented to distinguish 5G NR (new Rradio) signals from Long-Term Evolution (LTE) signals. This paper presents AlexNet and SqueezeNet architectures for the classification of NR signal with LTE signal. The analysis is conducted by training the classifiers with three distinct optimizers, including RMSprop (root mean squared propagation), ADAM (adaptive moment estimation) and SGDM (stochastic gradient descent with momentum), In addition, performance study is conducted at three distinct training frequencies to assess the classifiers' superiority.

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Contents

I. Introduction

5G wireless technology offers to significantly advance the information, computing, and communications sectors by enabling the development of myriad new services with varying requirements. Emerging technologies are capable of managing large volumes of data. Machine learning (ML) is required for 5G wireless networks to manage data volumes at near-light speed. Specifically, 5G must employ deep learning to cut power usage and enhance performance. 5G, in contrast to earlier generations of wireless technology, utilises high-bandwidth frequencies to deliver services, routing communications based on the required service speed. This finally enables for previously unimaginable improvements and whole new services. Combining new approaches is required to make this all work. Among these are disruptive technologies, the millimeter-wave (mmW) frequencies, device-centric architecture, machine-to-machine (M2M) communication, smarter devices for vehicle-to-vehicle (V2V) and Massive MIMO (MMIMO) communication [1].

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Figures

References

Keywords

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