Modelling spectrum sensing using Deep Learning and Machine Learning for wireless networks in South Africa

Owing to the global exponential growth of wireless networks, the demand for wireless spectrum (frequency bands) have drastically increased in South Africa. The regulatory bodies must manage spectrum by granting each operator a license to operate in a specific frequency band. Nevertheless, the spectrum management by the regulatory bodies tend to be inflexible. Spectrum scarcity is a common issue in wireless networks due to all the frequency bands being assigned. The secondary users must vacate the spectrum when the primary user is utilizing the band. This implies that the secondary users must not collide with the primary users. Cognitive radio networks mitigate the scarcity of spectrum by sensing frequency bands. Spectrum sensing is the detection of the spectrum that is unoccupied by licensed users (primary users) so that it can be utilized by secondary users. This reduces the underutilization of frequency bands in wireless networks. Spectrum scarcity has accelerated the need to design efficient methods for spectrum optimization. There are currently several algorithms that have been put forward for spectrum sensing like the eigenvalue-based detection, energy detection, frequency-domain entropy detection, cyclostationary feature-based detection as well as the spectral density split cancellation method. However, these methods tend to fall short in low signal-to-noise ratio environments. Some algorithms are computationally complex as they require knowledge of the noise signal before sensing the spectrum. Hence this research aims to employ several Deep Learning and Machine learning algorithms for the optimization of spectrum sensing in wireless networks.