ABSTRACT

The task of determining the relevant parameters of a transmission scheme is known as modulation classification. Possible parameters of interest include carrier frequency, symbol time or modulation order. In this thesis we focus on modulation format (linear vs OFDM) and modulation order. This task has applications in signal intelligence receivers (SIG INT), and cognitive radios. One possible application is in military use, where friendly or non-friendly transmissions can be identified. Another possible application is in a cognitive radio network, where knowledge of primary users transmission scheme could be used as part of an underlay network scheme. A common approach for modulation classification is support vector machines (SVM) with high order cumulants as features, however the problem of classification of orthogonal frequency division multiplexing (OFDM) signals has not been fully explored. Furthermore, deep neural networks (DNN) have made tremendous advances in classification problems, and there has been no prior work done on using live captured data to test modulation classification using DNN. Therefore, four linear and OFDM modulations are captured live over a range of signal powers, and tested against with both SVM and DNN classifiers. The SVM classifier with high order cumulant features achieved a classification rate of 99% for OFDM modulations, but only achieved 93% accuracy for linear modulations. A convolutional neural network (CNN) achieved 99% classification for all 8 modulations. Additionally, the CNN generalizes better than the SVM classifier when trained over a range of SNR values. When trained in this manner, the convolutional network significantly outperforms the SVM classifier when the SNR value is not known at the receiver.