



Ph.D. DISSERTATION DEFENSE

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Degree: Doctor of Philosophy
School/Department: School of Engineering and Science / Electrical and Computer Engineering
Date: Wednesday, April 12th, 2023
Time/Location: 10:00am/Zoom (<https://stevens.zoom.us/my/ydyao>)
Title: Spectrum Awareness in a Complex Radio Environment: A Deep Learning Approach

Chairperson: Dr. Yu-Dong Yao, Department of Electrical and Computer Engineering

Committee Members: Dr. Victor Lawrence, Department of Electrical and Computer Engineering, school of Engineering

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ABSTRACT

Wireless communications systems have become increasingly important, but the limited availability of spectrum has become a significant challenge to their growth. To address this challenge, efficient spectrum management techniques are needed to maximize the usage of available resources. Deep learning techniques, such as convolutional neural networks (CNN), have shown promise in a range of spectrum-related tasks, including modulation classification, medium access control protocol (MAC) classification, and spectrum sensing.

In this dissertation, we propose novel techniques for identifying coexistence interference in the industrial, scientific, and medical (ISM) radio bands. Specifically, we use a pre-trained CNN model to classify signals from these bands and compare the results of our approach, which uses only three basic types of signals for training, with those of another model that uses both basic types of ISM band signals and their possible combinations.

Additionally, we test a multimodal approach that combines visual and sensor data for superior object classification performance. By leveraging both visual and sensor data, we can achieve more accurate results compared to a visual-only approach.