

# Clustering Learned CNN Features from Raw I/Q Data for Emitter Identification

Lauren Wong

Hume Center for National Security and Technology  
Virginia Polytechnic Institute and State University  
ljwong@vt.edu

## Abstract

Specific Emitter Identification (SEI) is the act of matching a received signal to an emitter using a database of radio frequency (RF) features belonging to known transmitters. SEI algorithms were developed for and continue to be used in military settings for emitter tracking. However, emitter identification has also become a powerful tool for use in cognitive radio applications such as dynamic spectrum management. This work develops an approach, shown in Figure 1, to perform SEI utilizing Convolutional Neural Networks (CNNs) to extract emitter-specific features and the clustering algorithm DBSCAN [1].

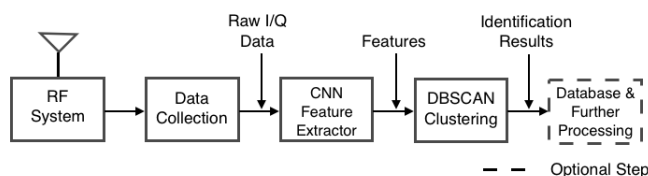


Figure 1: The developed CNN feature clustering SEI approach.

The output of the developed approach is shown in Figure 2. Extensive performance analysis demonstrates the effectiveness of the proposed approach in identifying emitters. Furthermore, results show the features extracted from the CNNs can be used to differentiate between devices unseen in training.

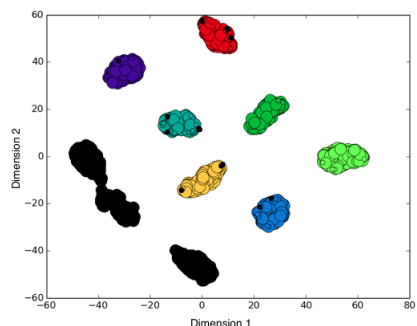


Figure 2: Output of the proposed approach.

## References

- [1] Martin Ester, Hans peter Kriegel, Jrg Sander, and Xiaowei Xu. A density-based algorithm for discovering clusters in large spatial databases with noise. pages 226–231. AAAI Press, 1996.