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, and is often used in military settings for emitter tracking and in cognitive radio applications for dynamic spectrum management.

This work investigates the use of Convolutional Neural Networks (CNNs) to extract emitter-specific features and the clustering algorithm DBSCAN to perform SEI.

**Problem Statement and Goals**

**Approach**

- CNNs are used to extract emitter-specific features by training the network to perform emitter identification on raw I/Q data.
- The Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm is used to cluster the features extracted from the received signals by emitter.
- t-distributed Stochastic Neighbor Embedding (t-SNE) is used to reduce the dimensionality of the features, for visualization of the output only.

**Results**

- When all received signals have the same bandwidth, the extracted features can be used to differentiate between devices, even when those devices were not seen in training. Performance increases as the number of emitters the CNN was trained on increases, until a threshold point, showing the feature extractor can only describe a limited number of emitters.

- When the bandwidth of the received signals varies, extracted features cluster by both emitter and bandwidth. Therefore only two emitters can be identified. Future work will investigate methods to allow for emitter tracking across bandwidth changes.