

Review of Project 8: Classification of Cross-Ambiguity Function (CAF) Surfaces Using Convolutional Neural Networks (CNN) for Coherent and Non-Coherent Signals in Digital Communications: (100/100)

Summary: (25/25)

This project claims that deep learning methods can be used to process Frequency Shift Keying signals sent through Cross Ambiguity Functions to determine if the signals are coherent or non-coherent. Coherent signals are described as carrying meaningful data while non-coherent signals represent idle periods, often 1s and 0s. It is proposed that a Convolutional Neural Network can be used to process the output of the Cross Ambiguity Function to classify these signals. It claims that this should reduce the computational complexity and load on real time applications, allowing for more efficient signal monitoring.

Given this project's direct use of deep learning through the use of a CNN, this project is directly relevant to the main theme of CS5814. CNNs are covered in this course, so this project is an application of that section.

Reflection: (40/40)

After reading through the project proposal, I find it to be very comprehensive. It conveyed the background, motivation, proposed process, and evaluation very well. These include but are not limited to: the thorough explanation of Frequency Shift Keying, Cross Ambiguity Functions, coherent/non-coherent signals, previous research, hyper-parameter selection, and post training evaluation. This project also manages to define itself as unique from other existing projects. Similar use of machine learning is defined for other radar and signal processing fields but not in the context of using CNNs for coherent and non-coherent signal classification. Finally, the proposal does follow the project submission guidelines and rubric through its formatting and content.

The proposal does seem technically sound as well. While I do not have a lot of experience in signal processing, it does seem to be a viable area for applying deep learning. I inferred this mainly from the thorough analysis of signal identification and the similar research covered in the proposal. This leads me to conclude that, including the well put together evaluation plan, that the treatment of this problem seems very complete. I can't find any missing elements I could add.

Pros/Cons: (20/20)

This project has a very well put together problem statement. The classification of coherent and non-coherent signals using a CNN is very easy to grasp and justify its applicability. This project's relative straight forwardness, in terms of the application of deep learning, is a big strength of the project. Additionally, it is very applicable to real life scenarios. I've failed to identify any glaring weaknesses of the project. If anything, it would be that it doesn't advance deep learning as it is just an application of deep learning methodologies.

Finally, while minimal, this paper does cite and use appropriate references for its tasks, models, datasets, and evaluation.

Presentation Quality: (15/15)

The quality of the presentation was very satisfactory. It was well written and no typos or grammar issues were identified.