Proposal for

“Classification of Radio Astronomy Observations through Machine Learning”

Submitted to:

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Machine learning is a rapidly evolving technology that revolves around analyzing data. Algorithms used in machine learning use large quantities of data to calculate a prediction that then gets compared with an expected value. Based on the accuracy of the prediction, the algorithms change the weight of each input to closer match the expected value over time. The more data the machine is trained on, the more accurate the prediction. By applying this principle to data collected over radio observations, the data can be rapidly processed on an optimized algorithm to assist with the classification along with assisting with the isolation of anomalous data. This can serve as a benefit for new data but can also assist with the review of existing data. Minor inconsistencies in data that may be missed or decided as negligible could have a correlation with other minor anomalies.

Machine learning for the classification of astronomical observations was chosen since there are not many applications being developed under machine learning for aerospace applications. By demonstrating the effectiveness of machine learning with radio observations, results from the project could be used as the basis for further investigation into other aerospace applications of machine learning. Based off the general structure of any machine learning project, it should take 6 months between gathering training and testing data, designing the model, training the model, and analyzing the data.

For this project, a desktop with one or more powerful graphics cards will be needed to perform the volume of calculations needed. Access to radio data will also be needed to serve as both training and testing data. A high speed external storage device will be needed to hold the amount of data as well while the model trains. All hardware needs are already met by my personal machine learning setup, and data can be retrieved from various observatories. One prime location for radio data is the Community of European Solar Radio Astronomers.

I feel confident in my ability to execute this project successfully as I am Software Lead for the ongoing Dependable Multiprocessor project at Morehead State University, have experience testing and troubleshooting software from a 400-hour internship at NASA Marshall Space Flight Center, and have also contributed multiple projects to open source. My direct background in machine learning has come from working on image classifiers through convolutional networks and assisting with a fellow NASA intern’s deep learning project that focused on detecting tank pressure anomalies in SLS simulations. Machine learning is also a personal hobby so my interest in this project is high. I will also be using Dr. Conner as a mentor for the software side of the project and Dr. Grupe for the astronomy portion of the project.