Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

Modeling the Variability of the Sun's Total Solar Irradiance through Supervised Machine Learning Techniques[1] ASHLEY LIEBER, University of Arkansas; Laboratory for Atmospheric and Space Physics, LAURA SANDOVAL, JOSHUA ELLIOTT, WENDY CARANDE, Laboratory for Atmospheric and Space Physics — With the Sun being Earth's main source of energy and heat, it is critical to understand how and why it varies. The primary objective of this project was to create a machine learning regression model that predicts the total solar irradiance (TSI) and to analyze the contributions of solar features in driving change of the Sun's TSI. This improves upon the previous model by incorporating machine learning techniques on a wider array of data. We utilized the technique of multiple linear regression to have the model predict an irradiance value for a given day based on given solar features. The features we initially considered were the sunspot area and seventeen space weather parameters. These features were visible in intensitygrams and line-of-sight magnetograms from the HMI instrument aboard SDO and include information on active regions (AR) on the Sun's surface and space weather parameters. We then used the TSI Composite Data to compare the model's predicted TSI values with the actual TSI values. Due to the number of features, a correlation matrix was used to eliminate unnecessary features. Preliminary results show that training the model on these features yields a root mean squared error of 0.052 showing that the model is performing as expected in this early stage.

[1]This research was supported by the National Science Foundation REU Program, award 1659878.

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Date submitted: 09 Jan 2022 Electronic form version 1.4