Holistic Flare Prediction using Aggregated Solar Cycle 23-24 Magnetograms and Intensitygrams

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This project aggregates Michelson Doppler Imager (MDI) and Solar Dynamics Observatory's Helioseismic and Magnetic Imager (HMI) magnetograms and intensitygrams for solar cycles 23 and 24 in a Java computer analysis to improve daily solar flare prediction accuracy. A framework for solar flare prediction was generated by comparing the intensity and magnetic properties of sunspots to daily solar events observed by the National Weather Service's Geostationary Operational Environmental Satellite (GOES). The analysis then dynamically adjusted the prediction framework according to each sunspot variable by intelligently categorizing the historical data. The final framework of cumulative associations between solar parameters and flare classifications since 1996 was then applied to predicting solar flares during January through April 2016. Predictions in solar flares using this holistic method was compared to publicly accessible Solar Physics Group (FPS) and NOAA Space Weather Prediction Center (SWPC) flare predictions. Although the holistic method outperformed existing methods in predicting C-class flares only 36.41% of the time, the holistic method more accurately predicted M- and X-class flares 60.19% and 57.28% of the time respectively of the prediction period. Considering all classes of flares, the holistic method outperformed existing methods 61.17% of the time.

Awards Won:
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