

Predicting Real-time Solar X-ray Data using U-nets

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Solar flares are bursts of electromagnetic radiation emitted from the sun that have major impacts on space weather and Earth systems. The events are a threat to modern technological infrastructure because accompanying geomagnetic storms can cause radio blackouts, power outages, and deorbiting of spacecraft. To improve near-real-time space weather forecasting, a U-Net machine-learning model that incorporates satellite imagery to predict solar flare events was developed. The model is trained on six extreme ultraviolet (EUV) datasets from the Atmospheric Imaging assembly (AIA) on the Solar Dynamics Observatory (SDO), and are used to predict X-ray data from the Hinode X-ray telescope. Although X-rays are the better indicator for geomagnetic storms, the data for X-rays are either not collected with sufficient frequency for near-real-time space forecasting or are not spatially oriented. EUV datasets on the AIA are taken every ten to twelve seconds, and contain spatial information. Therefore, bridging the gap between these two telescopes would provide a more accurate near-real-time forecast.