Training and Deployment of Predictive Models for Space Weather Forecasting: An Application on Full-disk and Active Region-based Flare Prediction

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Abstract

Taking machine learning models from conceptualization to production is a complex and often time-consuming practice. Solar flare prediction is a central problem in space weather forecasting and has piqued the interest of many researchers in recent years. The prediction efforts have been catalyzed by the recent advancements in machine learning and deep learning methods and the experimental results show notable performance improvements. On the other hand, operationalizing these models and building well-documented, reliable cyberinfrastructure from them remains to be a challenging issue. We will present an example training and deployment scenario for a solar flare prediction system prototype with two different modes of prediction: full-disk and active region-based. We will demonstrate the challenges we faced during the development lifecycle including the data preprocessing and integration, model training and optimization, validation, and reporting. We will also show the results from our hybrid-mode flare prediction method and factors impacting the real-life performance of our cyberinfrastructure services.

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