Machine Learning Model Development for Space Weather Forecast

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Space Weather (SW):
- Varying conditions between the Sun and Earth
- Impacts the technologies (satellites, navigation, communications, power grids)

Objectives:
- ML for the SW in the Earth’s ionosphere
- Nonlinear functions of SW processes
- Corrections for navigation applications
- An early-warning system

Data:
- Inputs (at time t): solar activity (R, F10.7), solar wind speed (SW), magnetic field (Bz, AE, Kp,Dst), time (Hour of day and day of year DOY), VTEC (GIM CODE)
- Output (t+24h): Vertical Total Electron Content (VTEC) in the ionosphere at high-, mid- and low-latitudes
- Datasets (hourly): 1) original data, 2) 24-hour differences (diff.) to reduce trends (except time info)
- Time-series cross-validation: 2015-2016, Test: 2017

Algorithms: Decision Tree (DT), Random Forest (RF), AdaBoost (AB), XGBoost (XGB), Voting regressor (VR): RF, AB & XGB

Results: 24-hour forecast (test)

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