Solar Flare Prediction Studies Using Universal Time Series Predictor UFCORIN

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We have been studying space weather forecast using time-series prediction engine UFCORIN(Universal Forecast Constructor by Optimized Regression of INputs.) In our studies (Muranushi et al. 2015), we have compared 6'160 different prediction strategies that uses subset of wavelet features of SDO/HMI images as well as GOES past light curves.
Use of TSS (True Skill Statistics) as the indicator of flare forecast performance has been widespread since it is proposed by Bloomfield et. al(2012). However, we found that variation of bare TSS values over different cross-validation (CV) data sets is too large, so that we cannot measure significant difference between different forecast strategies. We found by using the z-value, or standard deviation of TSS, we can distinguish such strategies that show forecast performance consistently better than the average. We suggest the use of z-value as a method of finding good forecast strategies from thousands of candidates.
In our studies, the laregest TSS for X,M, and C class flare forecast, were 0.75 ± 0.07, 0.48 ± 0.02, and 0.56 ± 0.04, respectively.
Based on (Muranushi et al. 2015), we have been operating real-time flare forecast server since August 2015. The system have been making forecast every 12 minutes, except for some down times. We would also like to report on the latest state of this experience.

Keywords: Space Weather Forecast, Flare Forecast

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Realtime Solar X-ray Flux Forecast using Deep Learning

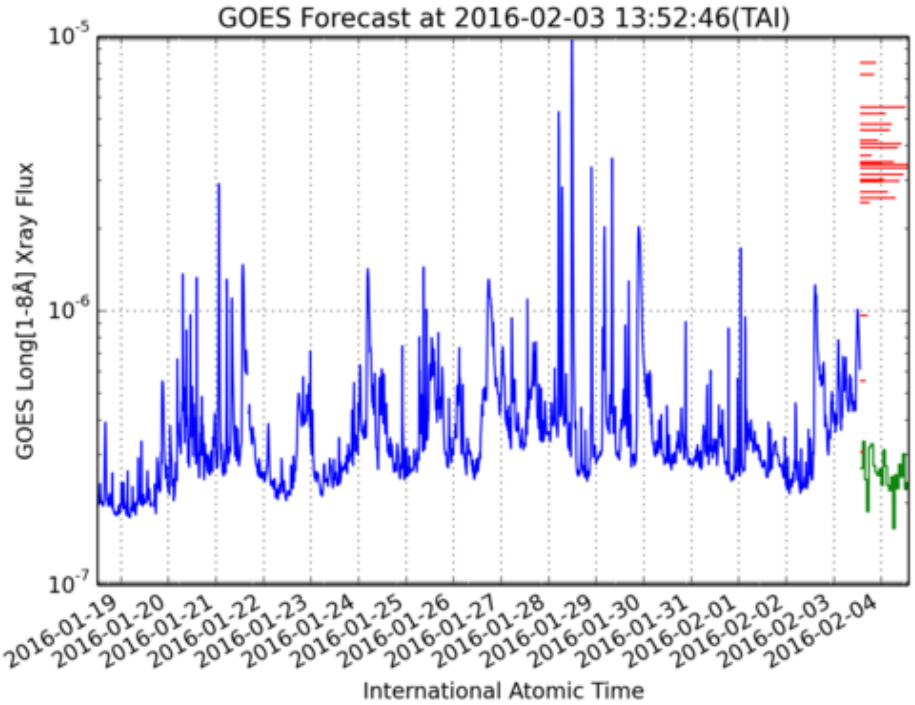
We present the 24-hour forecast of GOES X-ray flux, based on realtime GOES data and HMI-720s Near-Real-Time data.

The forecast is produced by regression of the time series using Long-Short Temporal Memory (LSTM) neural network.

The feature vector is produced from (1) GOES X-ray flux and (2) wavelet analyses of HMI images, as described in Muranushi et al (2015): http://arxiv.org/abs/1507.08011 .

The source code is available under MIT license at https://github.com/nushio3/UFCORIN/tree/master/script .

Largest flare in next 24 hours: 3.3e-06 W/m²
Flare category forecast: C Class



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