[SE-09] Application of Support Vector Machine to Space Weather Prediction: Geo-effectiveness of CMEs

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Support vector machine is a powerful machine learning method in classification and regression. Generally machine learning has been greatly applied in image processing, data classification, and data mining. It is very helpful to automatically produce models from data which are not clearly understood. Very recently, researchers started to apply it to space weather forecast. In this study, we apply it to the forecast of geo-effective CMEs using 488 CME-Dst pairs that Kim et al. (2008) used. Here we assume that the occurrence of a geomagnetic storm is governed by CME speed, longitude, and earthward direction parameter. We made a model by training 348 front-side halo CMEs from 1997 to 2001, and predicted geo-effectiveness of 140 CMEs from 2001 to 2003. Finally we could achieve 72.1% accuracy in prediction by using SVM. In the future, we will apply machine learning technology to various space weather predictions to achieve more accurate predictions.

[SE-10] Statistical comparison of interplanetary conditions causing intense geomagnetic storms

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The southward IMF Bz field and convective electric field Ey component are well known interplanetary parameters which control the occurrence of intense geomagnetic storms (Dst $\leq$ -100 nT). In this study we have made a statistical comparison of interplanetary conditions of these parameters causing intense geomagnetic storms. By investigating the conditions of 82 intense geomagnetic storms from 1998 to 2006, we considered 8 different criteria of interplanetary conditions for the occurrence of gemagnetic storms including what Gonzalez and Tsurutani (1987) suggested - Bz $<$ -10 nT or Ey $>$ 5 mV/m for interval $>$ 3h. Then we applied these criteria to whole interplanetary data during the same period. As a result, we present contingency tables between prediction and observation, and obtain their statistical parameters for forecast evaluation such as probability of detection yes (PODy), false alarm ratio (FAR), Bias and critical success index (CSI). A comparison of these statistical parameters for 8 criteria shows that the best criteria for intense geomagnetic storms is Bz $\leq$ -8 nT or Ey $\geq$ 5 mV/m for 2h. In this case, the PODy, FAR, Bias and CSI are estimated to be 0.85 0.41 1.45 0.53, respectively.