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Predicting GICs from L1 solar wind data using recurrent neural networks

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We describe the application of long short-term memory (LSTM) recurrent neural networks in the prediction of geomagnetically induced currents (GICs) in power grids from solar wind measurements at the L1 point (e.g. ACE or DSCOVR satellites). Recurrent neural networks process sequences of information and past input can affect the output at any point. This form of dynamic temporal behaviour is important when attempting to predict changes in the geomagnetic field as the geomagnetic response to solar wind interaction depends on the current state of the field and prior events. An LSTM trained on solar wind data (including speed, density, magnetic field z-component and local time variables) to predict the root-mean-square GIC values shows promising results. Different sets of data are compared for their usefulness in the prediction of space weather effects on terrestrial infrastructure.