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Applying LSTM and GAN to build a deep learning model (TGAN-TEC) for global ionospheric TEC

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TEC is very important ionospheric parameter, which is commonly used observation for studying various ionospheric physical mechanism and other technological related to ionosphere (i.e. Global Positioning). However, the variation of global TEC is very dynamic, and its spatiotemporal variation is extremely complicated. So in this paper, we try to build a novel global ionospheric TEC (total electron content) predicting model based on two deep learning algorithms: generative adversarial network (GAN) and long short-term memory (LSTM). Training data is from 10-year IGS TEC data, which provide plenty of data for the GAN and LSTM algorithm to obtain the spatial and temporal variation of TEC respectively. The prediction accuracy of this model have been calculated under different levels of geomagnetic activity. The statistic result suggest that the proposed ionospheric model can be used as an efficient tool for ionospheric TEC short-time prediction.