

Generating Swarm Satellite Data using LSTM and GAN for the Detection of Seismic Precursors

Authors : Yaxin Bi

Abstract : Accurate prediction and understanding of the evolution mechanisms of earthquakes remain challenging in the fields of geology, geophysics, and seismology. This study leverages Long Short-Term Memory (LSTM) networks and Generative Adversarial Networks (GANs), a generative model tailored to time-series data, for generating synthetic time series data based on Swarm satellite data, which will be used for detecting seismic anomalies. LSTMs demonstrated commendable predictive performance in generating synthetic data across multiple countries. In contrast, the GAN models struggled to generate synthetic data, often producing non-informative values, although they were able to capture the data distribution of the time series. These findings highlight both the promise and challenges associated with applying deep learning techniques to generate synthetic data, underscoring the potential of deep learning in generating synthetic electromagnetic satellite data.

Keywords : LSTM, GAN, earthquake, synthetic data, generative AI, seismic precursors

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