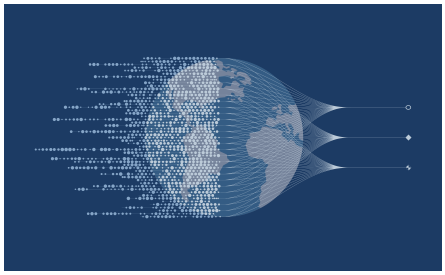

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Towards Predictive Maintenance Strategy Through Waveform Anomaly Detection using Unsupervised Learning

Tuesday 9 September 2025 18:00 (15 minutes)

Early stage identification of seismic station equipment problems can save unnecessary maintenance on healthy equipment, while prompting necessary maintenance on equipment at risk of failure. Performing maintenance before equipment fails can ensure data quality and avoid outages. In a previous study, we proposed an unsupervised deep autoencoder model to detect ambient data anomalies, indicating possible equipment failure. We tested this approach with the U.S. portion of the International Monitoring System (IMS) seismic arrays and successfully demonstrated its ability to detect anomalies on a monthly scale, which can prompt system maintenance before complete failure occurs. Application to other IMS arrays shows good agreement between the detection of anomalous data before unscheduled maintenance visits. This demonstrates that the model can effectively identify potential system failures at stations not included in the model training. Based on this, we are building a quality control tool that can determine if a station is behaving normally or may require maintenance. This can augment existing quality control methods to enhance the overall effectiveness of station sustainability. Here, we further extend the application of the data quality model to a worldwide network.

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