Customer and Network Prediction and Anomaly Detection

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TUPL

ELECTRICAL & COMPUTER ENGINEERING

Motivation

As telecommunication companies seek to improve network coverage and maintain customer satisfaction, they need to constantly monitor customer complaints and the status of their networks.

This project, in collaboration with Tupl Inc. seeks to reduce the latency between the time a network coverage area experiences issues and when the network operator notices these issues. Deep learning models process several types of telecom data to predict which data are anomalies.

- Call detail records (CDR) data from customer complaints determines if customers have recurrent cellular issues.
- Key performance indicators (KPI) data determines which base stations are down at a given time.
- Twitter tweets identify customers' dissatisfaction on social media that isn't directly reported to the company.

Technology & Workflow

KPI raw data (5,855,201 rows)

CDR raw data (9,232,275 rows)

Twitter API (44,989 tweets)

Keras

Keras: Open-source neural network library. The deep learning engine to train the model.

Google AI

Bert: Pre-training language model. The embedding layer.

VaderSentiment **Sentiment analysis algorithm for social media content.** The sentiment analysis tool.

python

Docker: A tool for building and running distributed applications. Application deployment an environment version control.

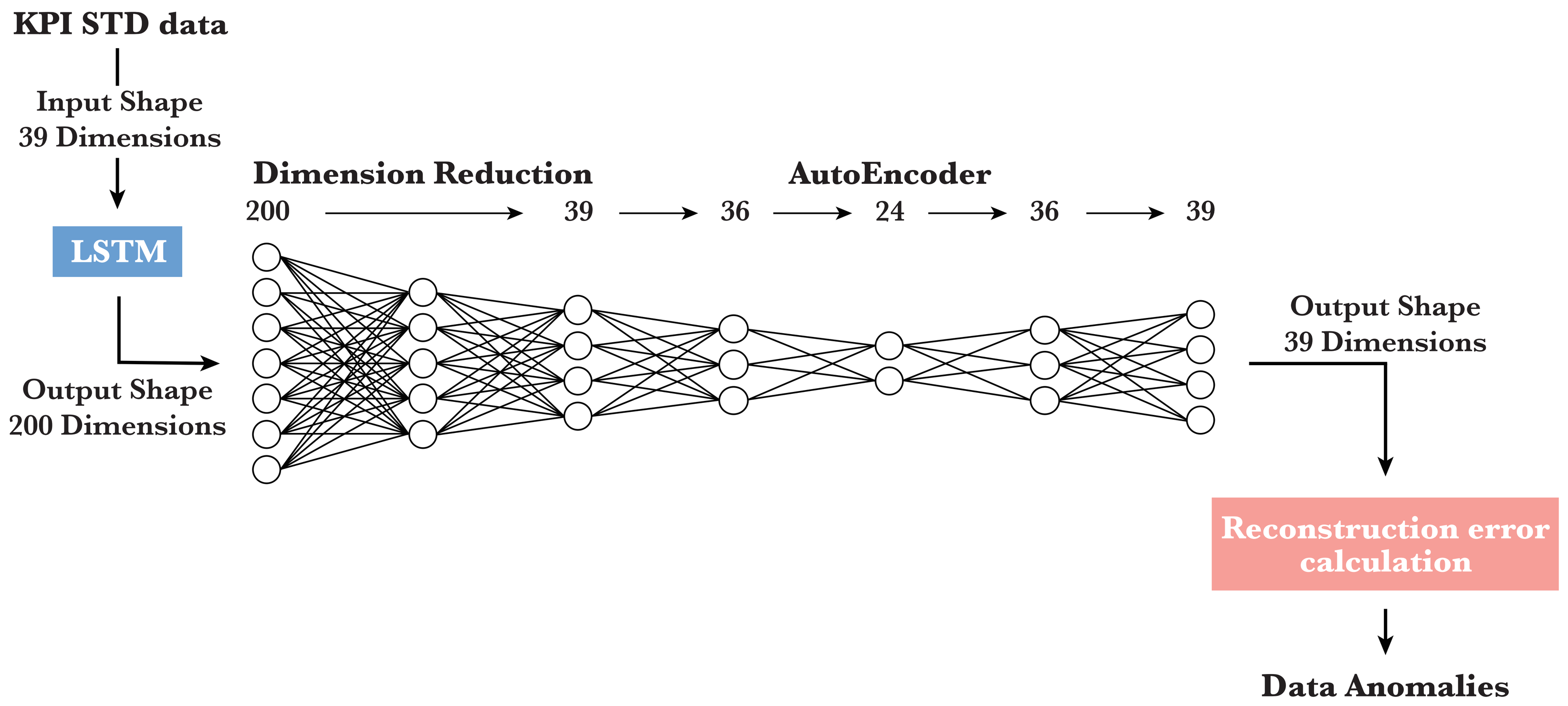
docker

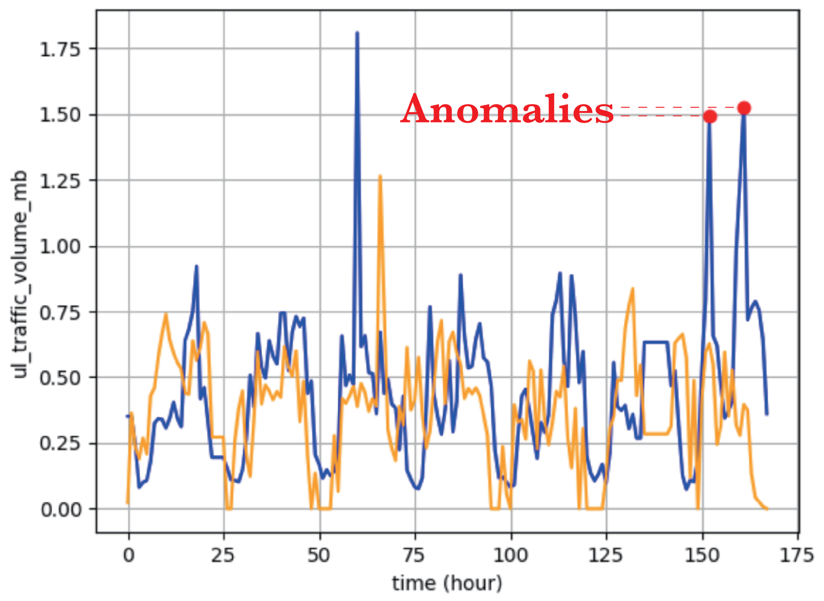
PostgreSQL: Open-source relational database management system. Storing data in psql table.

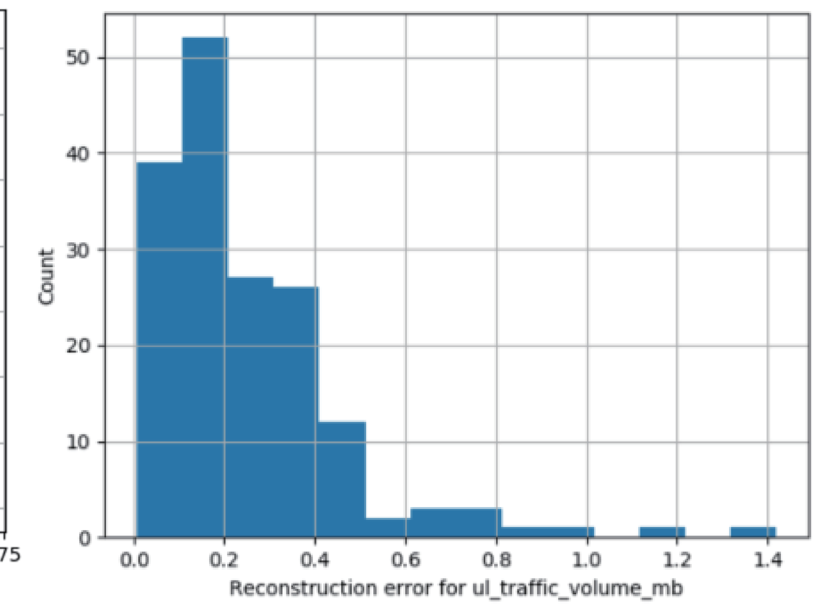
Grafana: Open source metric analytics & visualization suite. Visualize the anomaly results and twitter sentiment analysis result.

Grafana

Anomaly Detection - KPI



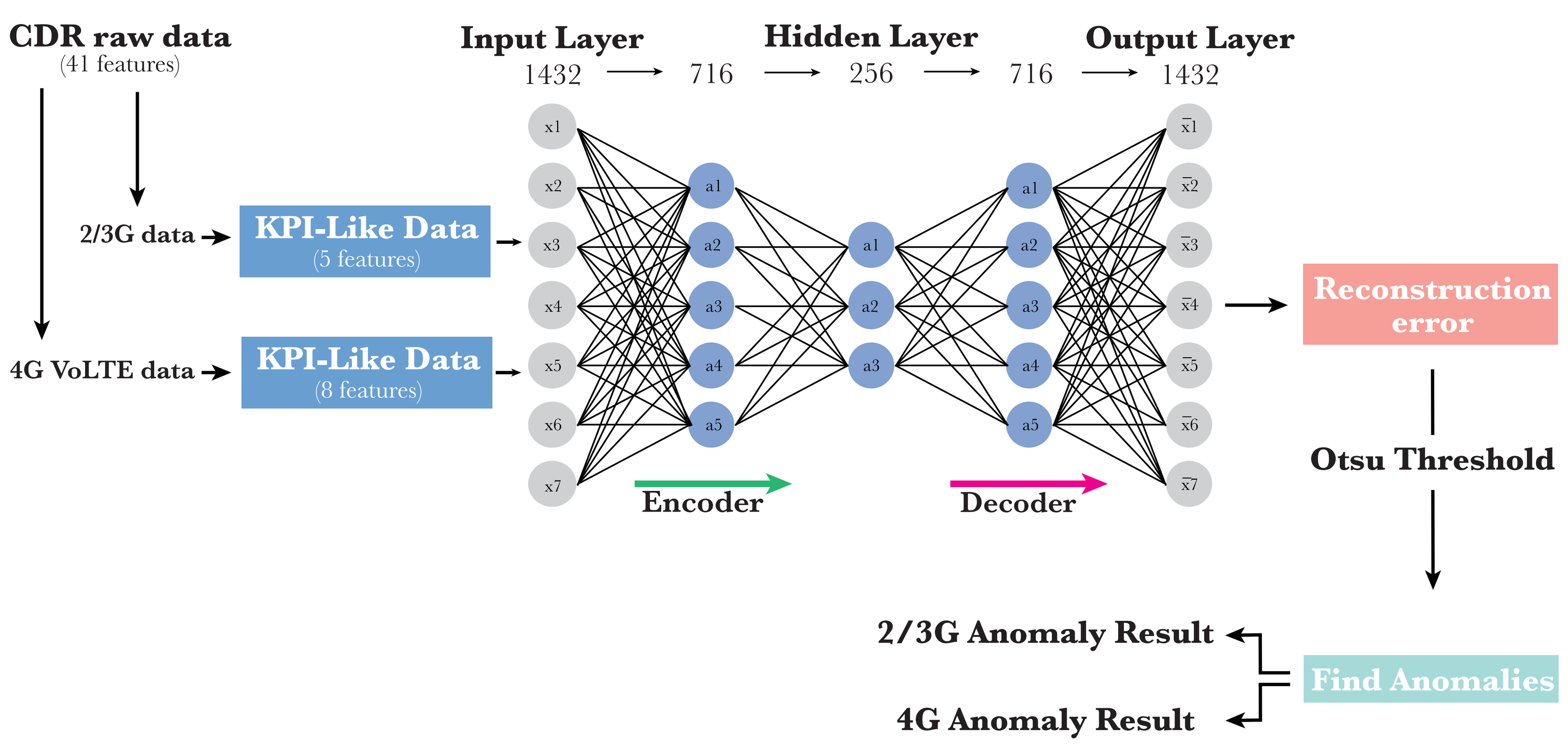


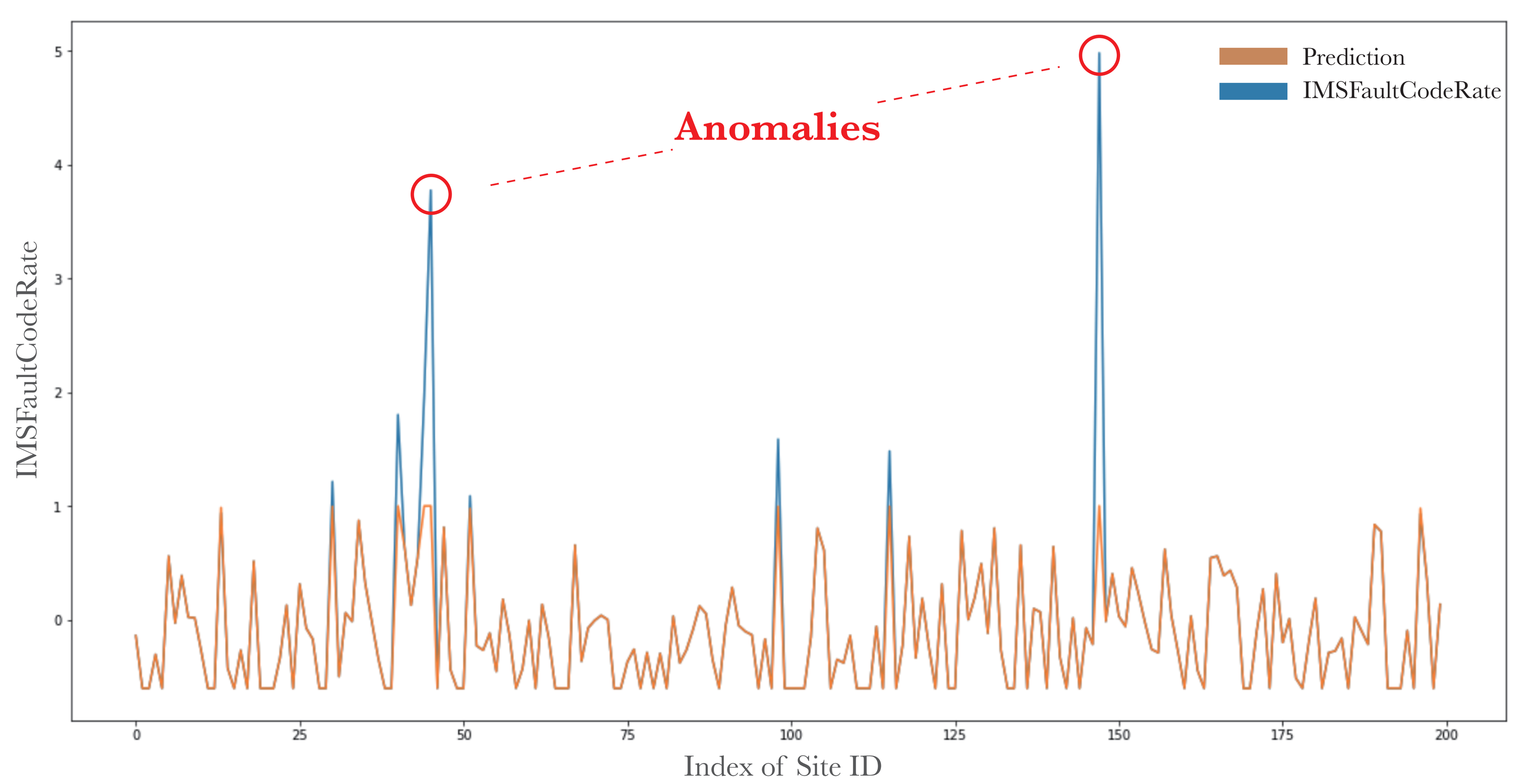


Comparing the Upload Traffic Volume, we plotted the input data in blue vs. the prediction data from our model in orange.

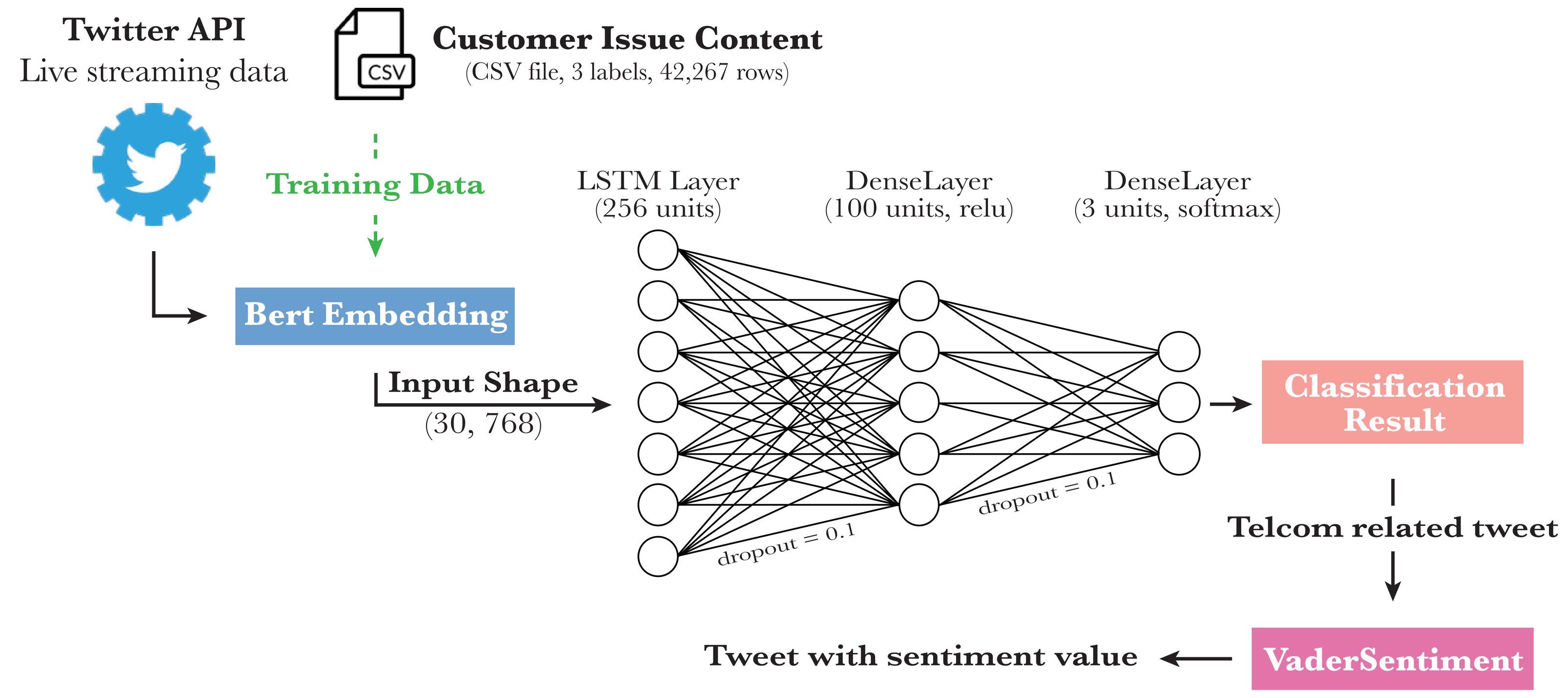
We calculated the reconstruction error between the two datasets and determined the anomaly threshold for this feature to identify the anomalies.

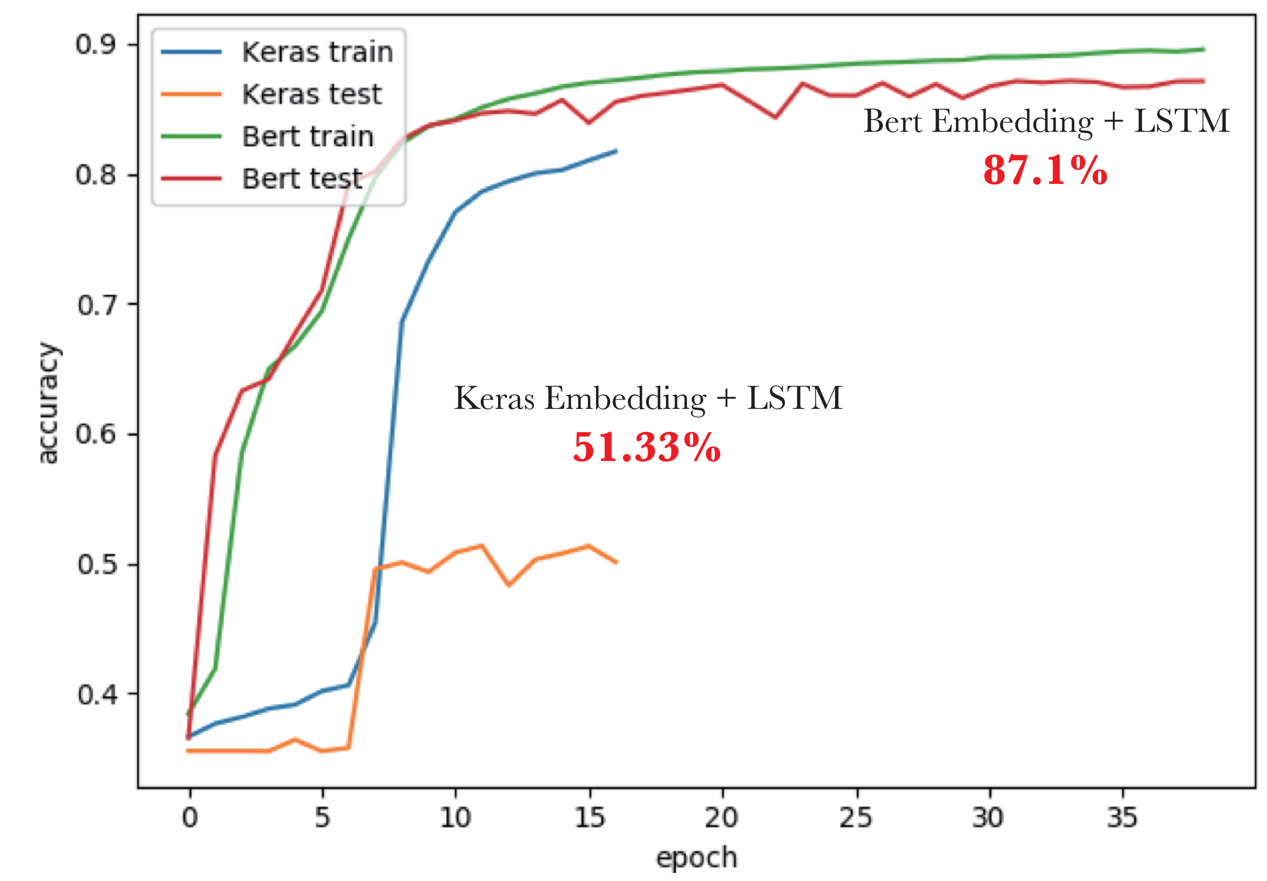
Anomaly Detection - CDR





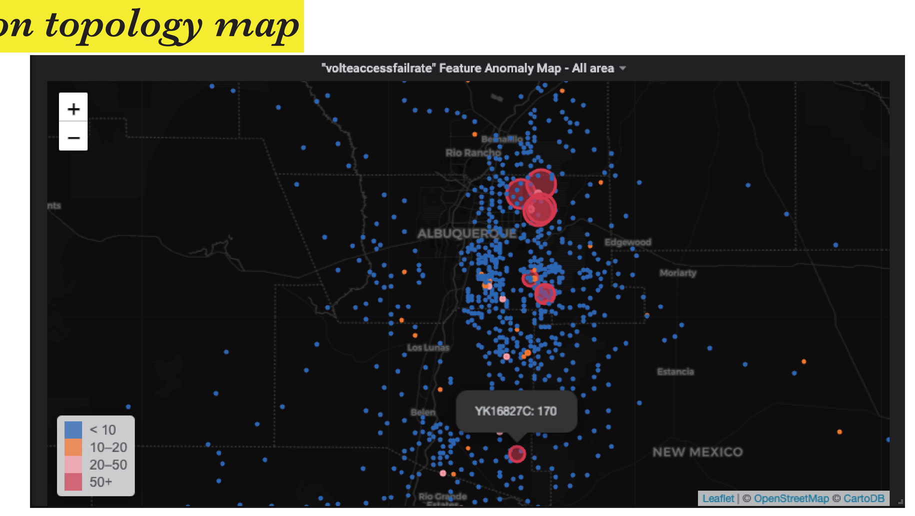
Twitter Sentiment Analysis



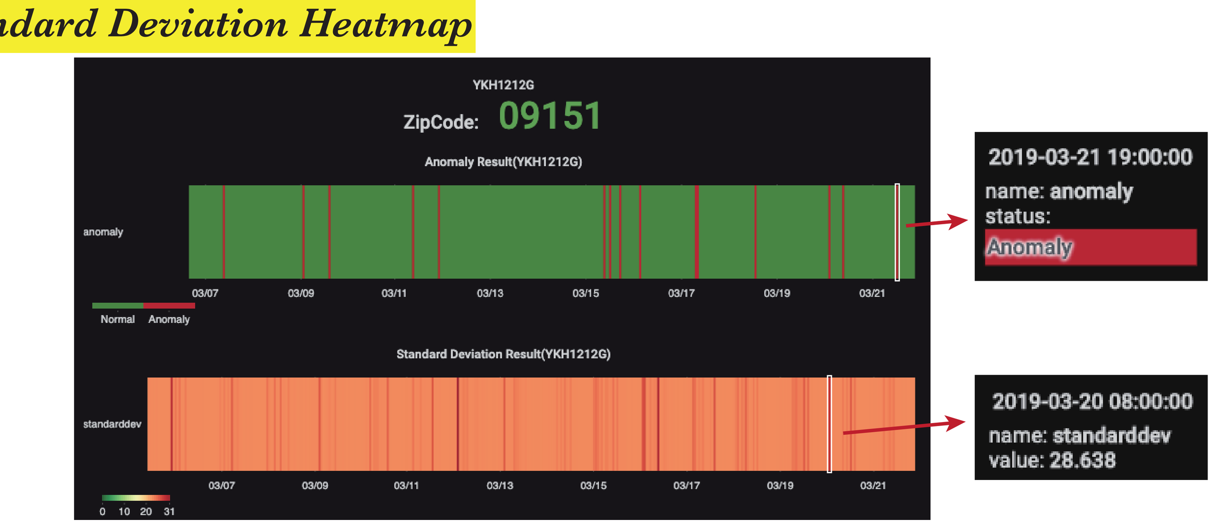


Visualization Dashboard

Anomaly station on topology map



Anomaly & Standard Deviation Heatmap



Twitter Sentiment Analysis