Distributed Deep Learning Network to Predict Location of Google Street View Data

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Abstract/Motivation

- Create a neural network that can predict the latitude and longitude values of a location based on 3 different images of separate directions at the given position.
- Seeked to create a model to broadly identify any location in the United States
- Using this technology, one could predict the location where a given event took place, such as a crime or a major historical occurrence based on the features within the images.

Introduction

- We sought out to improve on past work by using a regression model whereas others use classification.
- Scraped images from Google Street View API of different segments of the US with apache spark and saved metadata such as location and heading..
- Trained a Deep Convolutional Recurrent Network to roughly predict the location of the images with regression.
- Qualitatively analyzed the predictions produced by the trained network.

Results

- Trained the model for 250 epochs with an adaptive learning rate scheduler.
- Used Mean Squared Error as the loss function and ended training with **a final training loss of 135.93.**
- The average validation distance error between prediction and actual was **884.15 miles.**
- Improved on average distance error from past work that used classification of location grids rather than using regression.
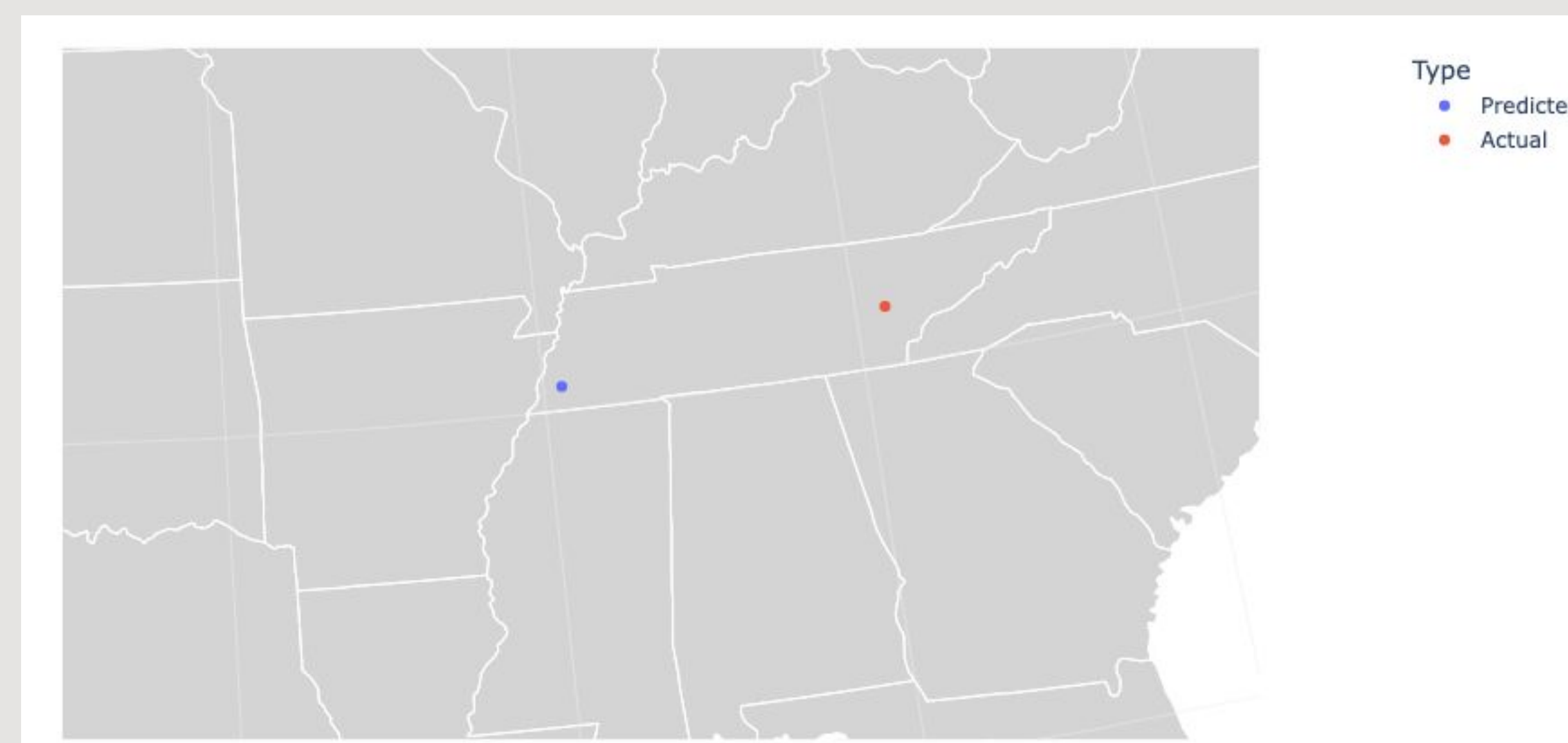
Conclusion

- Satisfied with the outcome of the model with the given restraints of the dataset and computational resources.
- Improved upon past results by a large margin.
- Concluded that in order to improve the model, a custom loss function must be created.

Future Work

- Integrate geospatial distance metrics into loss function such as haversine distance.
- Collect more global data to better improve the model.
- Train a larger model for longer.

Sample Data

Example Prediction

Average Distance Error

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