Natural Disasters
Classifying natural disaster occurrences, types and urgency in realtime using twitter data

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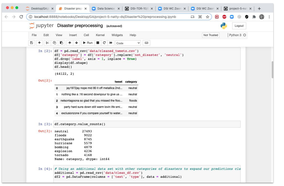
How we collected tweets in realtime using both twitter's API and web scrapers



100 accounts

Leveraged the most popular/followed twitter disaster news and/or relief accounts (Redcross, unicef, disaster update, etc)

Used **Tweepy** module with **Twitter** API credentials to pull the most recent tweets and **trending hashtags** from these accounts

70 keywords

Used the closest **Word2Vec** key word matches to our target natural disaster labels (earthquake, hurricane, etc)

Implemented **SNSscrape** module to query twitters front end for any posts mentioning our **70 relevant keywords** and **trending hashtags**

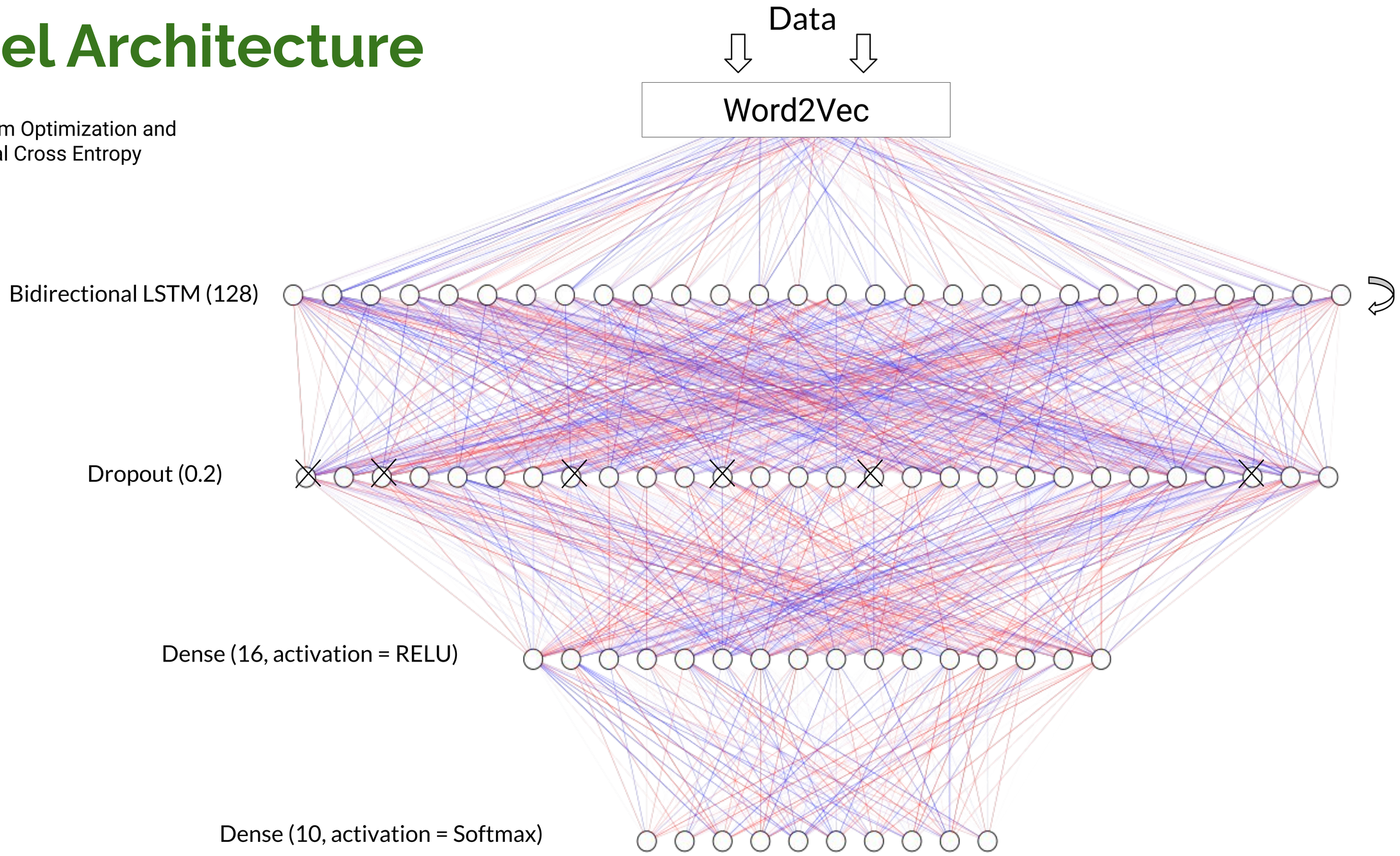
- Built our API calls, data processing, location gathering, model predictions and key insights into a single application
- New data is fed into the model every hour to be pre-processed, modelled and displayed
- End user sees the most relevant disasters types along with the location where they are occuring

Build a classification model to accurately predict disaster types from tweets in real time

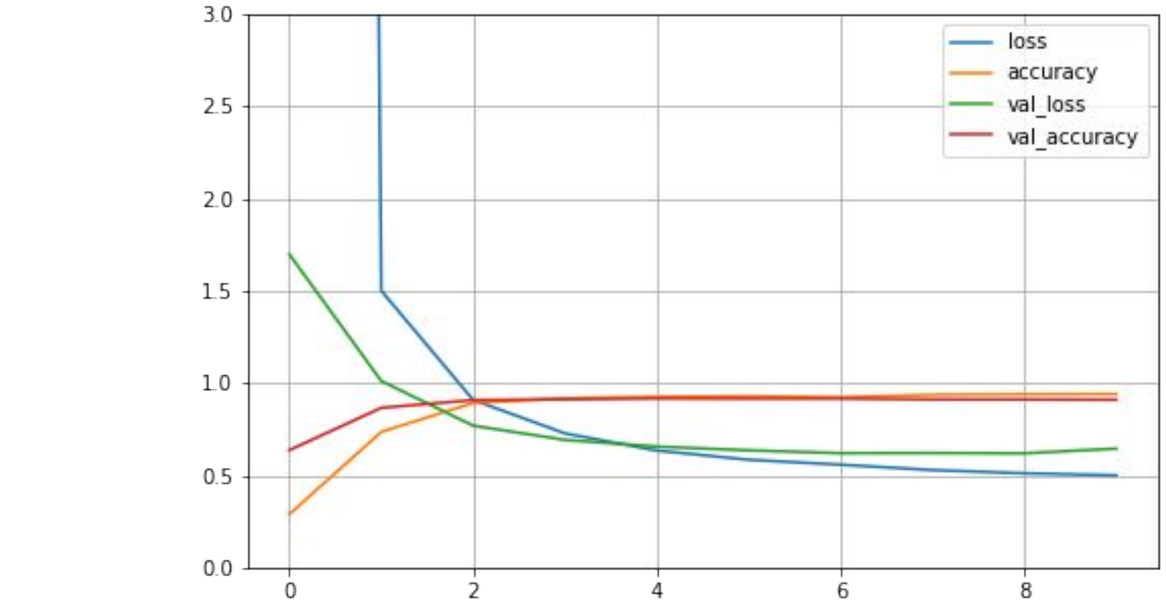
```
| Time: 19:37:12 | {'covid19': 48, 'earthquake': 17, 'resilient': 10, 'cities': 10, 'iati': 6} | MODEL PREDICTIONS:
| [['There are 675 mentions of hurricane'], ['There are 291 mentions of mudslide'], ['There are 226 mentions of ear
thquake'], ['There are 201 mentions of neutral'], ['There are 189 mentions of tornado'], ['There are 95 mentions of
bombing'], ['There are 64 mentions of noreaster'], ['There are 64 mentions of floods'], ['There are 29 mentions of
wildfire'], ['There are 28 mentions of explosion']],                                                    pred_label
location
bombing     No Location Available    29
            friendly                 1
            pace                     1
            page                     1
earthquake  No Location Available    201
                                     ...
wildfire    middle                   1
            mission                  1
            ontario                  1
            union                    1
            wall                     1
Length: 115, dtype: int64
```

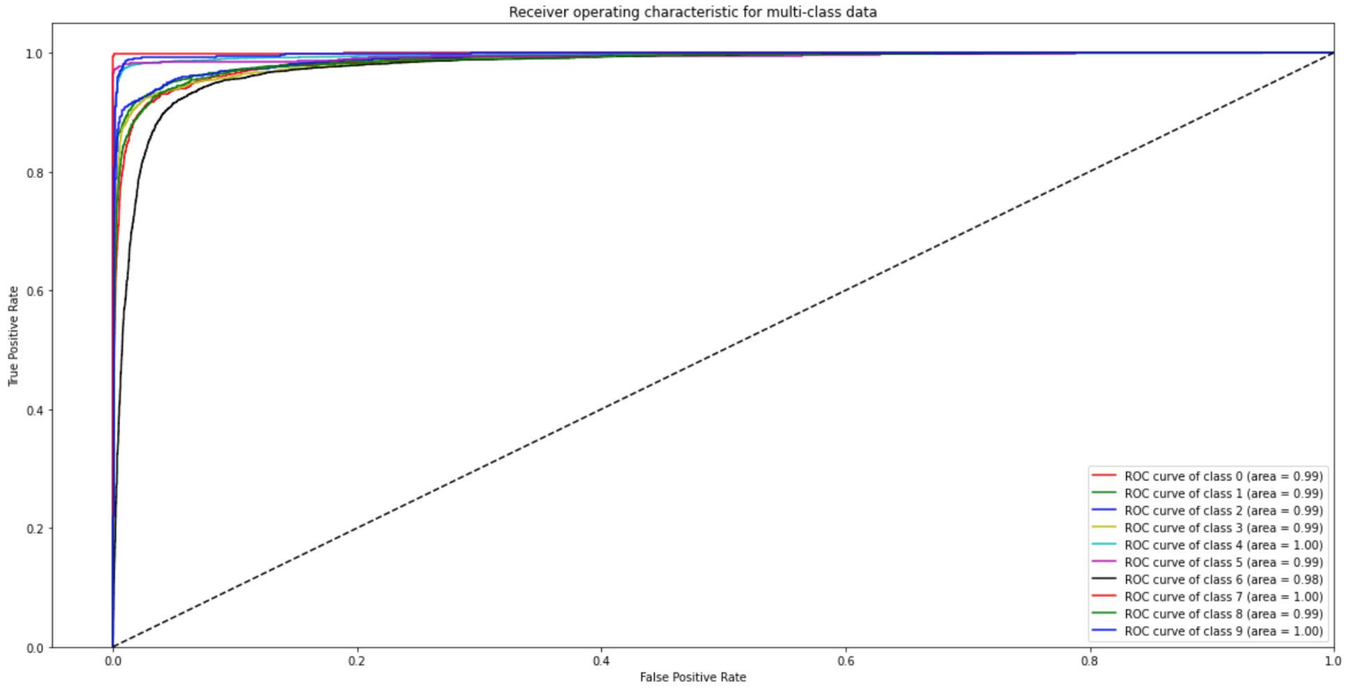
Model Architecture

Using Adam Optimization and
Categorical Cross Entropy



Model evaluation and performance





Methodology:

- Tokenized, lemmentized and preprocessed the text data.
- Leveraged the effectiveness of recurrent neural networks on textual data.
- Gradually increased model complexity, then implemented regularization and dropout layers to maximize bias.
- Monitored loss, accuracy, validation loss, and validation accuracy.

Final results:

Train Accuracy = 94%
Validation Accuracy = 91%

Mapping locations in tweets

```
location = []
array = [[]]

for tweet in df_dis['processed_tweets']:

    for word in tweet:
        try:
            city_names[word]
            location.append(tweet)
            location.append(word)
            array.append(location)
            location = []


        except:
            location.append(tweet)
            location.append('No Location Available')
            array.append(location)
            location = []
```

```
lat = []
long = []
latitude_list = []
longitude_list = []


for word in X['location']:
    try:
        coords_dict[word]
        lat.append(coords_dict[word][0])
        latitude_list.append(lat)
        long.append(coords_dict[word][1])
        longitude_list.append(long)
        lat = []
        long = []



    except:
        lat = []
        long =[]
```

Visualizing the natural disasters in real time...


```python
#Import important libraries
import gmplot
import numpy as np

# declare the center of the map, and how much we want the map zoomed in
gmap = gmplot.GoogleMapPlotter(0, 0, 2)
# plot heatmap
gmap.heatmap(flat_lat, flat_long)
gmap.scatter(flat_lat, flat_long, c='r', marker=True)
#Your Google_API_Key
gmap.apikey = "AIzaSyA5D2bG0Stl1zmF66yo84ZXg1sEufc-4RM"
# save it to html
gmap.draw("./maps/country_heatmap2.html")
```

Next steps and improvements

Given more resources and time the following next steps would be taken in order to improve the applications functionality and accuracy:

- Continue to gather all of our analyzed tweets in a database along with our predictions for post-mortem analysis on our models accuracy
    - With more resources, we could have a team work through our scrapped tweets to check labels and re-label and misclassified tweets
- Continue to fit and train our model on our growing database of tweets (leveraging other pre-labeled disaster tweet datasets wherever possible)
- Experiment with more model architectures (including pre-trained models) on our historical dataset to identify improvements to be made to our core prediction model
- Implement a flask GUI interface on top of our application giving the end user more control over the interface (location filtering, real-time map, email notifications etc) as well as a better user experience
- Leverage twitters paid API account to expand the scope of our daily api calls as well as the tweet parameters and metadata feeding into our application