Tweeting About Disaster

Using Neural Networks and NLP to Detect Tweets About Real Crises

Flatiron School // Data Science // Project 4 // Zaid Shoorbajee

Business Case

A news outlet, *The Flatiron Post*, wants to report on stories of natural disasters and other kinetic events as they happen.

- Plane crashes, earthquakes, hurricanes, wildfires, terrorist attacks, etc.
- Such events can happen without warning
- Twitter can help monitor for events, but there's too much noise for humans to parse through
- Can we use Machine Learning to predict if a tweet is about a disaster or not?

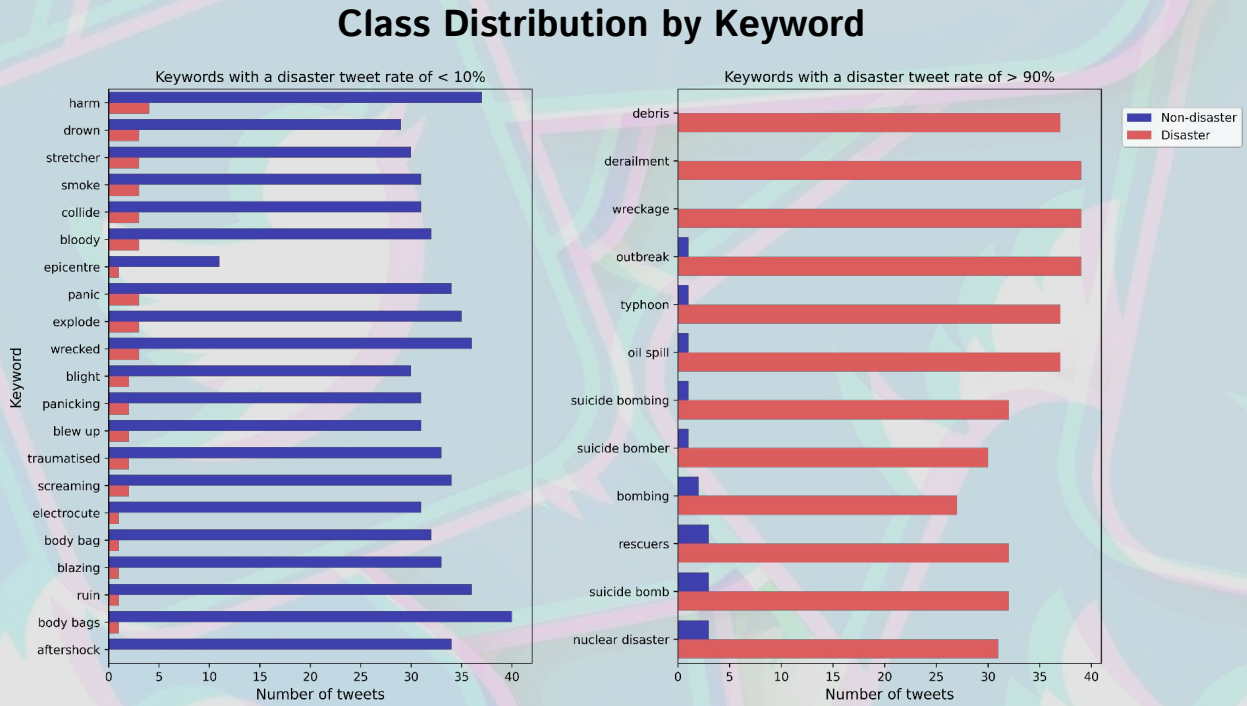
Data Understanding: Dataset

Kaggle's Disaster Tweets dataset

7,163 tweets

Keyword	Search term used to search for tweets
Location	User-generated location on the account
Text	Actual text of tweet
Target	Binary label 1: Disaster // 0: Non-disaster

Data Understanding: Dataset



Data Understanding: NLP

Natural Language Processing

- Language is messy
  - Easy for humans to understand; not for machines
- Unstructured data
- Must be heavily processed

Data Understanding: NLP

🌟 Original Tweet 🌟

A sandstorm in Jordan has coated the Middle East□Ûªs largest refugee camp in a layer of grit http://t.co/hVJmuuaLXV http://t.co/T8Nz6h9Zz4

Cleaned and tokenized

[a, sandstorm, in, jordan, has, coated, the, middle, east, largest, refugee, camp, in, a, layer, of, grit]

Lemmatized

[a, sandstorm, in, jordan, have, coat, the, middle, east, large, refugee, camp, in, a, layer, of, grit]

Lemmatized & Removed Stop Words

[sandstorm, jordan, coat, middle, east, large, refugee, camp, layer, grit]

Part-of-Speech

[DET, NOUN, ADP, PROPN, AUX, VERB, DET, PROPN, PROPN, ADJ, NOUN, NOUN, ADP, DET, NOUN, ADP, NOUN]

Named-Entity Recognition

a sandstorm in jordan GPE has coated the middle east LOC largest refugee camp in a layer of grit

TF-IDF Vectorized

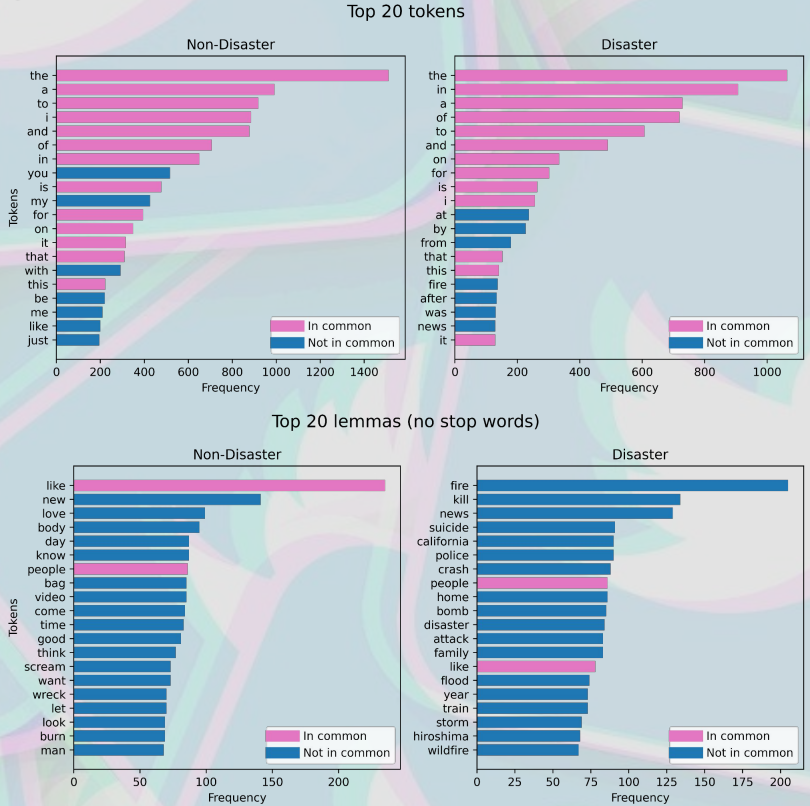
camp	0.281543
coat	0.349224
east	0.296542
grit	0.378373
jordan	0.349224
large	0.277535
layer	0.378373
middle	0.299659
refugee	0.261779
sandstorm	0.259229

+ values of “0” for all other words in the dataset

Data Understanding: NLP

Effects of Lemmatization & Removing Stop words

This version has fewer words in common between disaster and non-disaster tweets



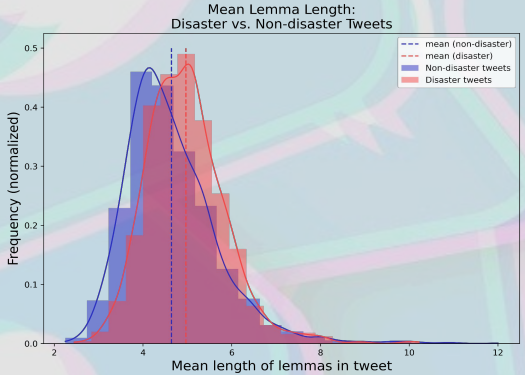
Data Understanding: NLP

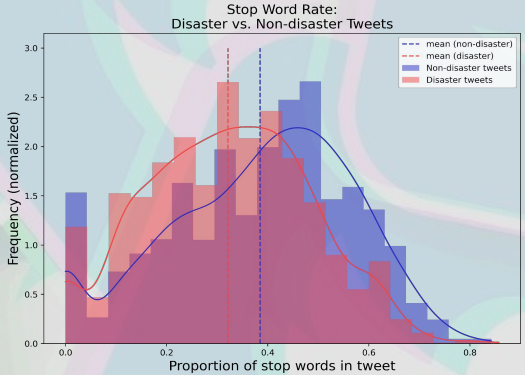
Meta-Features

Aside from linguistic features, we can extract seemingly arbitrary information about each tweet

- Character count
- Number of stop words
- Proportion of stop words
- Character count of non-stop words divided by total character count
- Number of tokens
- Average length of lemmas
- Number of unique lemmas
- Proportion of words that are hashtags (#)
- Proportion of words that are mentions (@)
- Has URL

Examples:

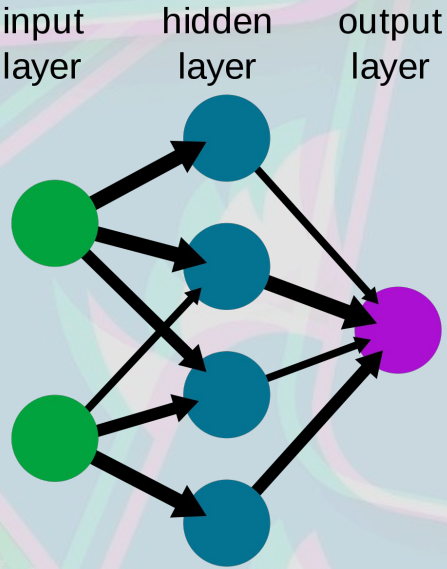




Modeling

Neural Networks:

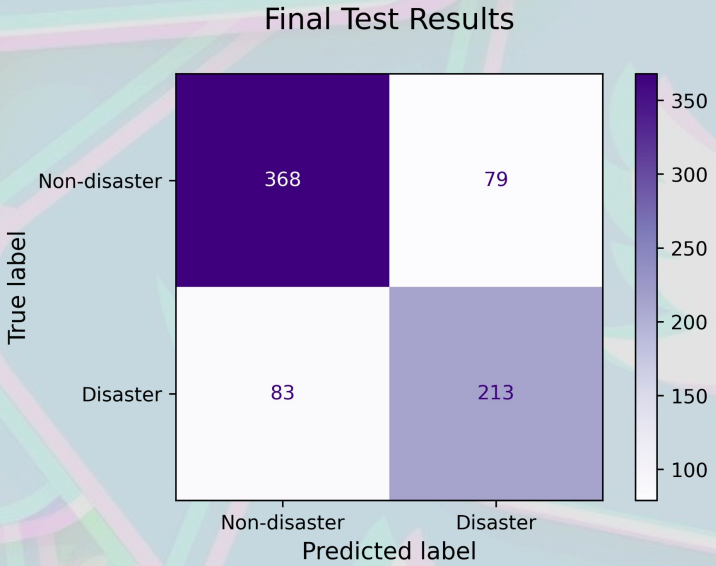
- Machine learning practice mimicking the neurons of a brain. They can be tuned:
  - Inputs, layers, nodes
  - Simple baseline model; five additional models
- Task: Binary classification
- Training, validation, and test datasets



Evaluation

The Flatiron Post is concerned with false negatives, i.e. neglected disaster tweets.

Accuracy	How many tweets does it get right?	78%
Recall	How many **disaster** tweets does it get right?	72%



Recommendations

- False negatives are still prominent, so don't completely filter out non-disaster predictions. Instead, run all tweets in a feed that also displays the model's predicted probability.
- Discard search terms that yield very few disaster tweets, like "harm," "bloody," "screaming," "ruin," etc.
- Narrow the criteria for what constitutes a "disaster." Focus on kinetic events and more immediate crises (bombings, earthquakes, crashes, etc.).
    - Requires relabeling or gathering new data

Example Feed with Probabilities

Watch This Airport Get Swallowed Up By A Sandstorm In Under A Minute http://t.co/H84R1TIh8J	97.85%
1.9 earthquake occurred 15km E of Anchorage Alaska at 00:11 UTC! #earthquake #Anchorage http://t.co/QFyy5aZIFx	96.99%
Two giant cranes holding a bridge collapse into nearby homes http://t.co/9asc1hhFNJ	94.70%
Slash-and-burn blamed for bush fires in western St Thomas - http://t.co/5dJ6cHjFZP	76.26%
Truck crash on 40w at US70 in Lebanon is a fatality. Very sad. Expect long delays through the morning.	68.47%
British bake off was great pretty hilarious moments #mudslide	40.98%
Super loud thunder woke me up from my very nice nap	27.90%
I PUT MY CHICKEN NUGGETS IN THE MICROWAVE FOR 5 MINUTES INTEAD OF 1 ON ACCIDENT AND THEY FUCKING BURNED	15.30%
On plus side LOOK AT THE SKY LAST NIGHT IT WAS ABLAZE http://t.co/qqsmshaJ3N	14.90%
screams internally	11.47%
I rate Hazard very highly but his fanboys are among the worst accounts on Twitter.	4.38%

Future Work

- Training this model was limited by the search terms used to obtain these tweets. Training on a less biased sample might yield better results.
- Missing feature: Does the tweet contain a photo or video?
- This model is just one piece of a larger application. Other pieces:
    - Tool that automatically requests tweets through Twitter API
    - User-friendly feed for journalists

Thank you

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