# Leveraging Social Media to Map Disasters

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# Two Facts:

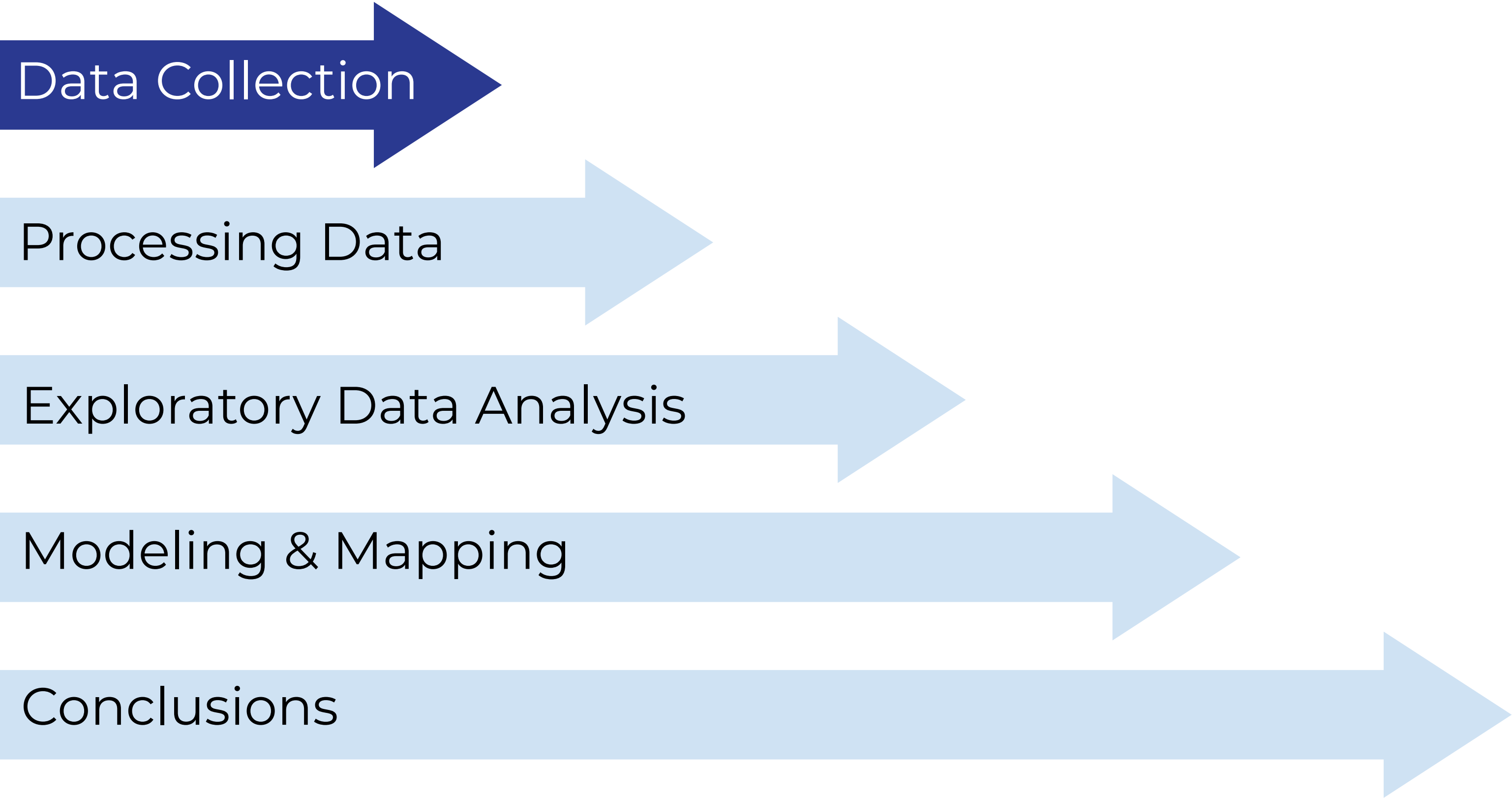
1. During a natural disaster it is essential for first responders to have access to victims' locations.

2. People often use social media to report their status.

# The Goal:

Leverage social media to locate people in need of emergency disaster relief.

# Process



Data Collection

Processing Data

Exploratory Data Analysis

Modeling & Mapping

Conclusions

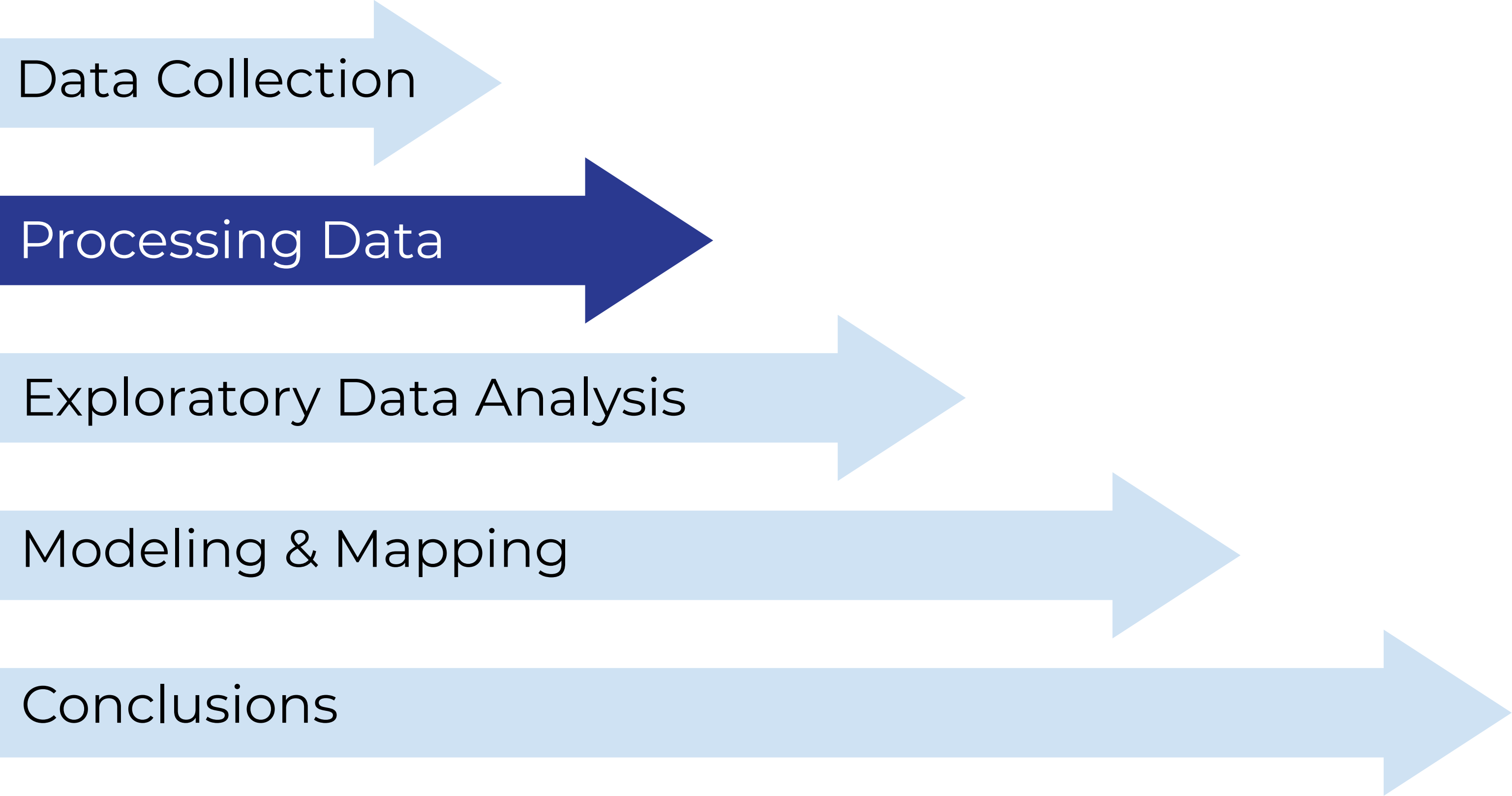
# Data Collection

- Multiple social media options: Twitter, Facebook, Instagram
- Twitter’s basic API is restrictive
- Third party package, Twitterscraper was used

# Disaster Sourcing

- To make a robust model, multiple disaster events were targeted
  - Hurricane Harvey (Aug-Sept 2017)
  - Montecito Mudslides (Jan 2018)
  - Southern Tornados (April 2019)
  - Noreaster (March 2018)
  - Floods (July 2019)
- Total tweets collected: 22,862

# Process



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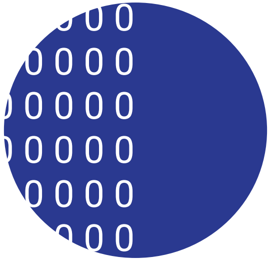
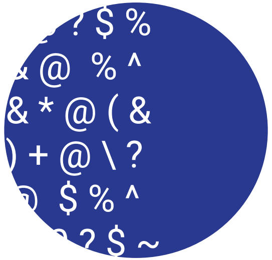
# NLP Preprocessing

**Drop Duplicates**



**Check for Nulls**



**Remove Unnecessary Punctuation**

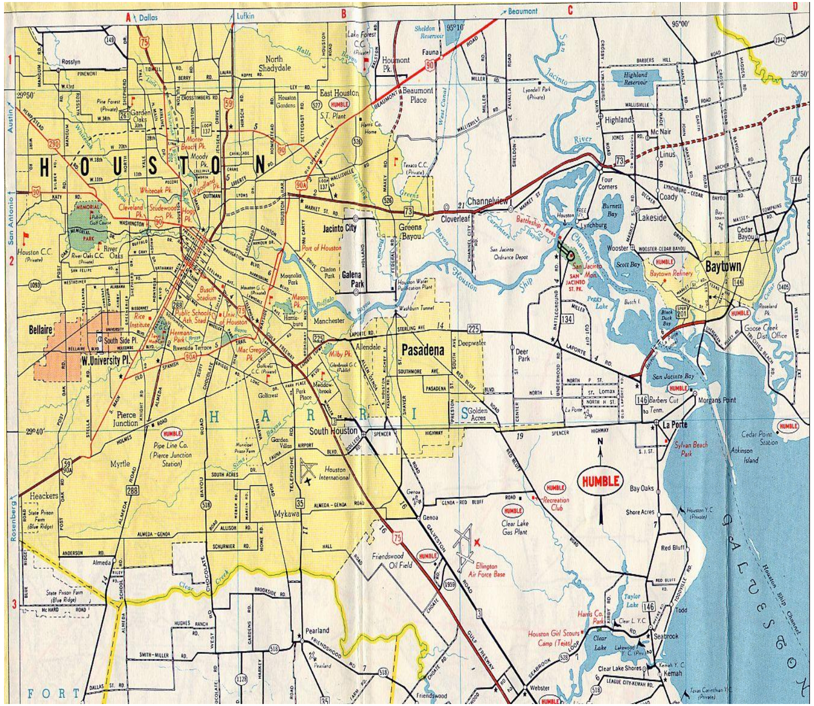
# Creating Target Variable

- Create critical bag of words

  E.g. medivac, sos, & save me

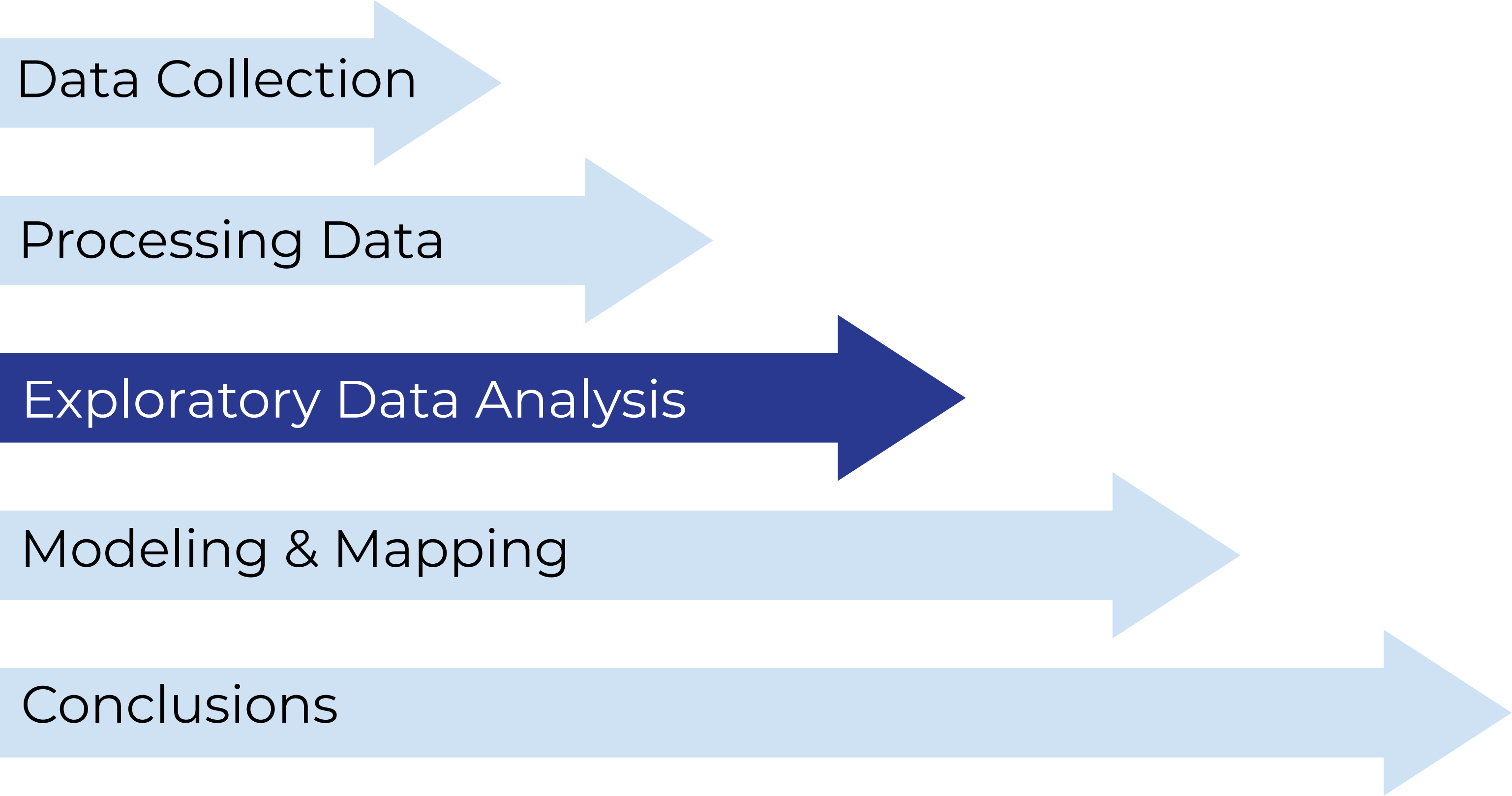
- Mapped to tweets

# Assigning Locational Data



- Geolocation was not available for our tweets
- Locations were randomly assigned to tweets
- Five areas were created to simulate concentrated areas

# Process



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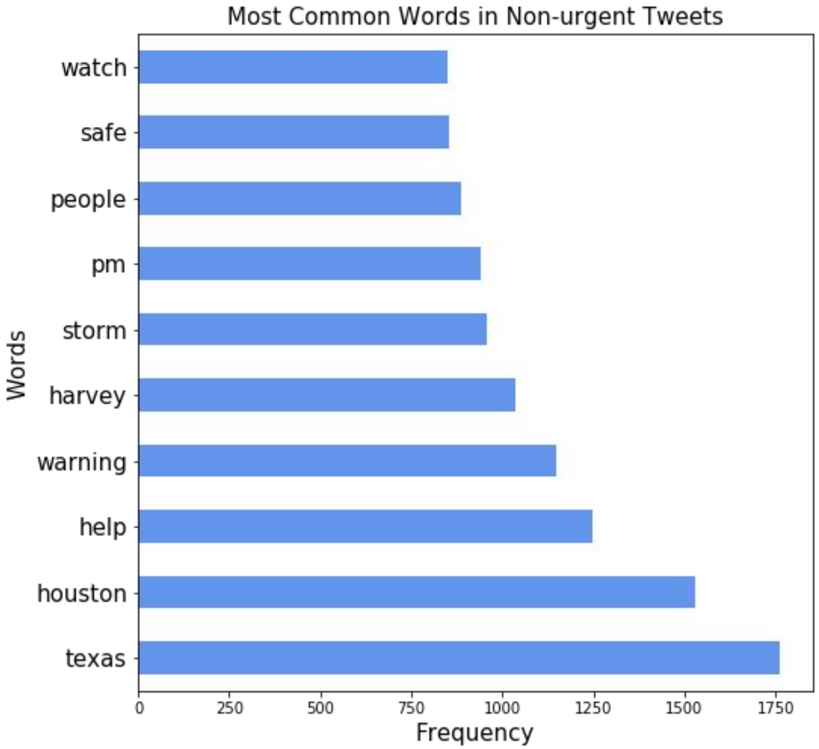
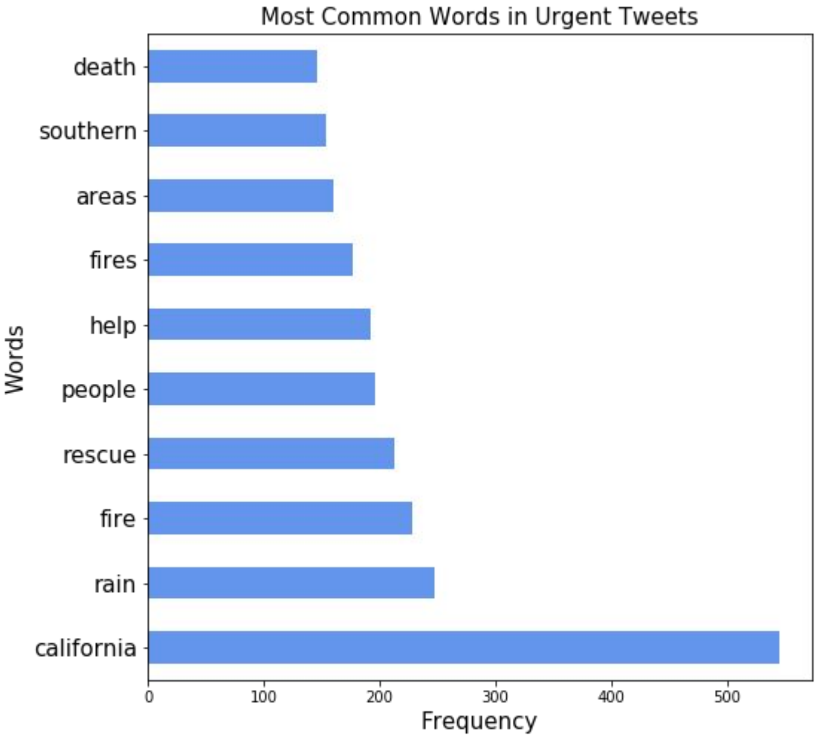
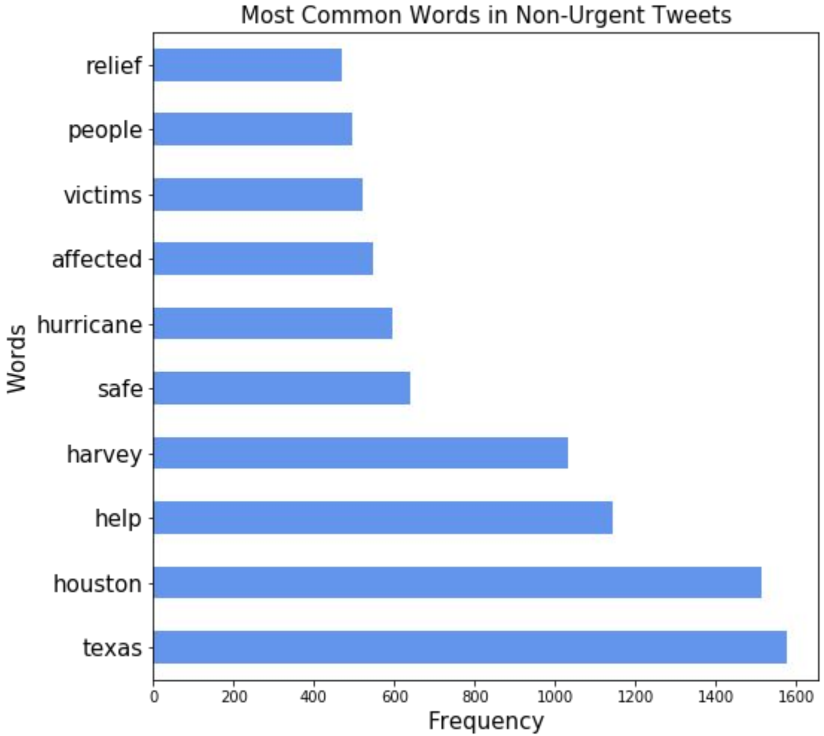
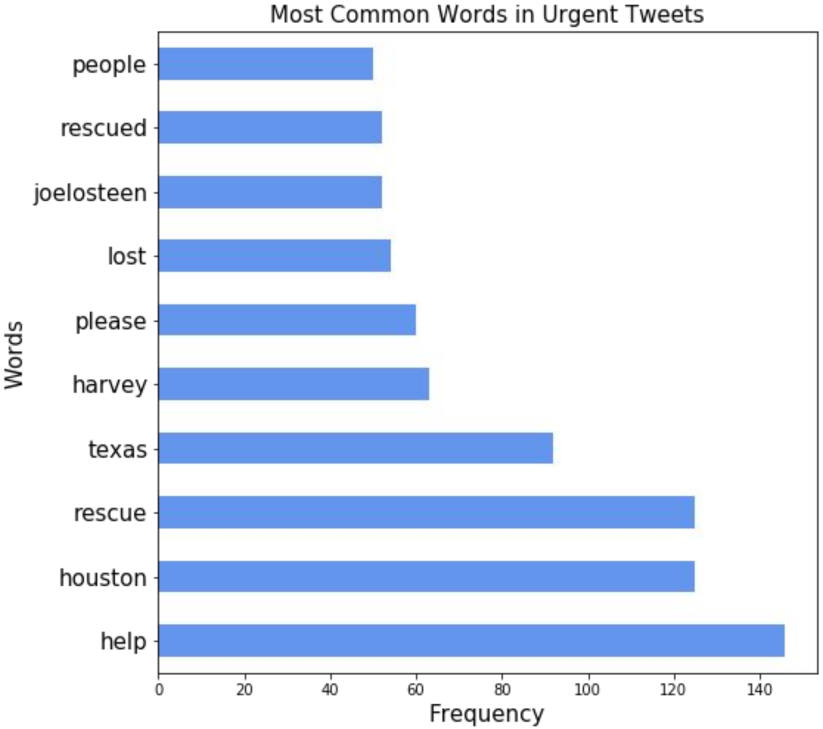
# Total Dataset





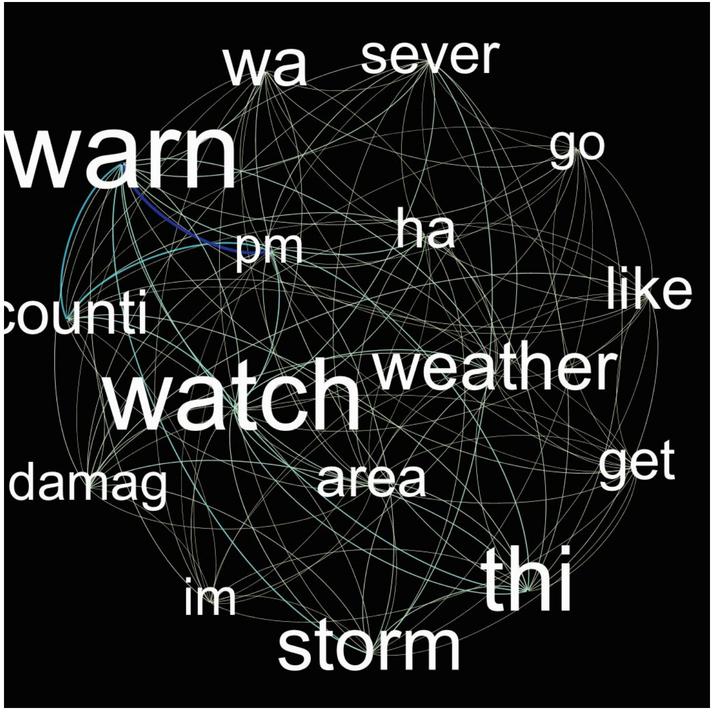
# Hurricanes


Most Common Words in Non-Urgent Tweets
Words
relief
people
victims
affected
hurricane
safe
harvey
help
houston
texas
0
200
400
600
800
1000
1200
1400
1600
Frequency

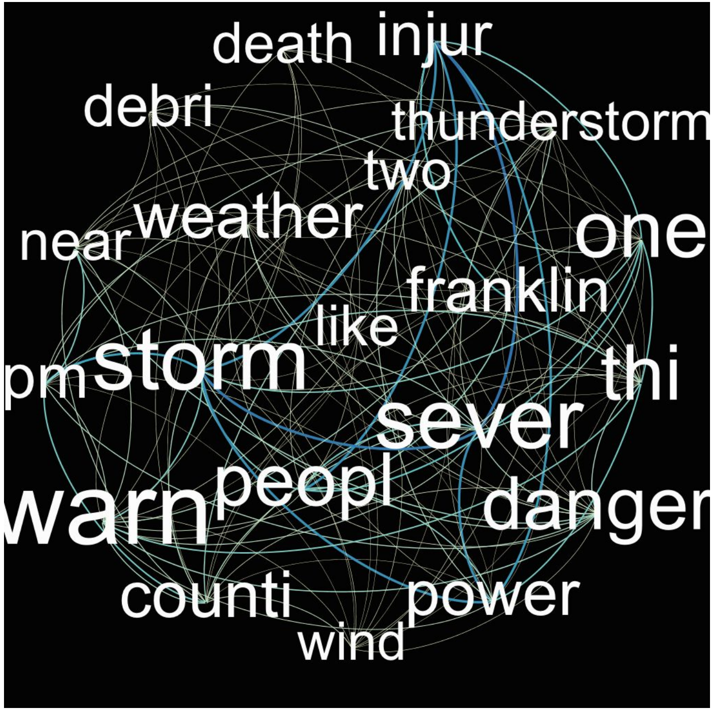

Most Common Words in Urgent Tweets
Words
people
rescued
joelosteen
lost
please
harvey
texas
rescue
houston
help
0
20
40
60
80
100
120
140
Frequency

# Tornado

**Non Urgent**

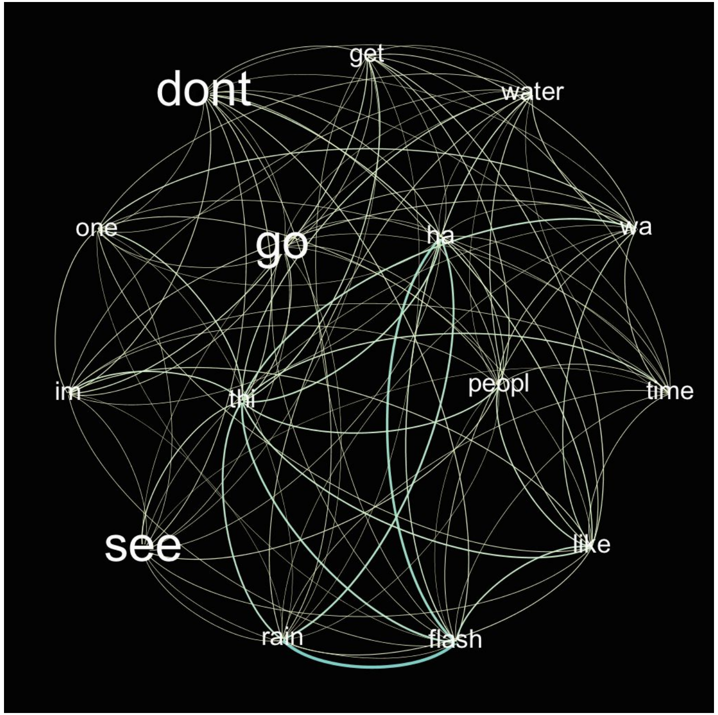


**Urgent**

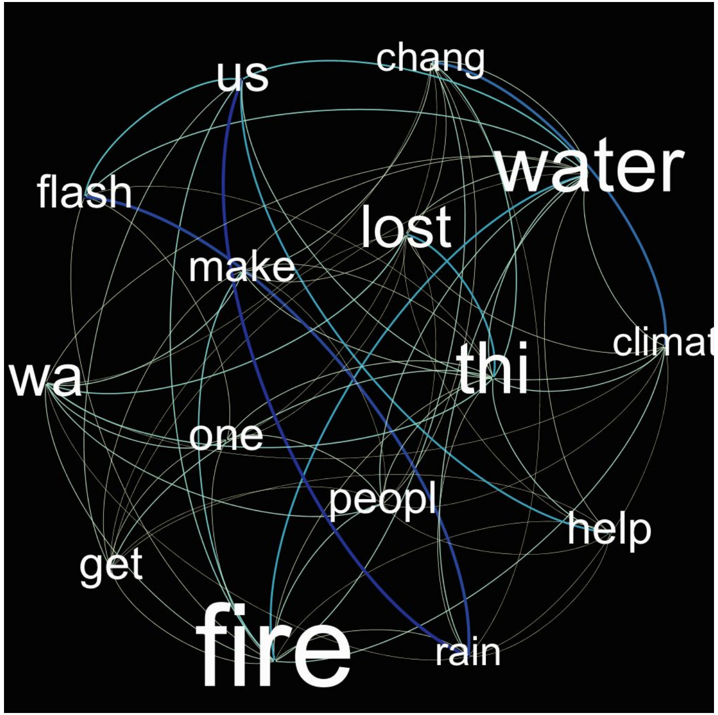


# Floods

**Non Urgent**

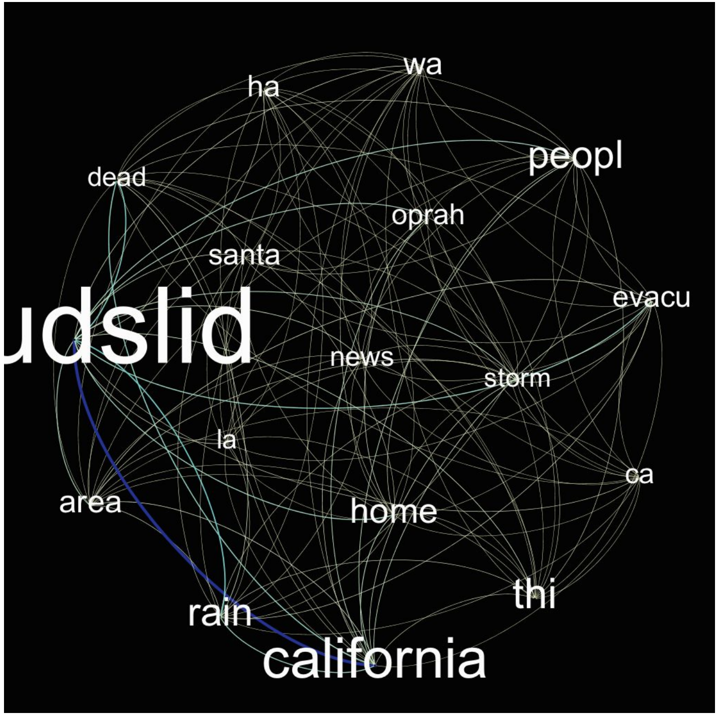


**Urgent**

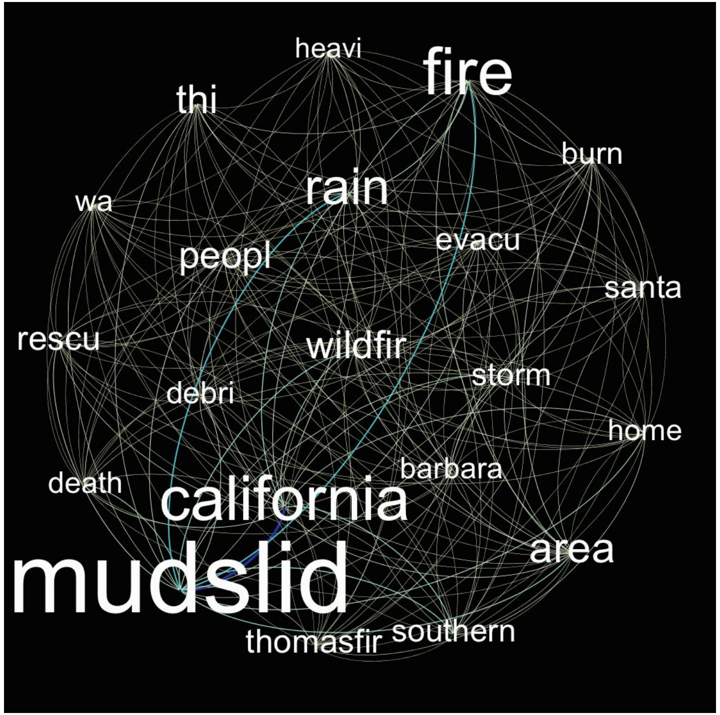


# Mudslides

**Non Urgent**

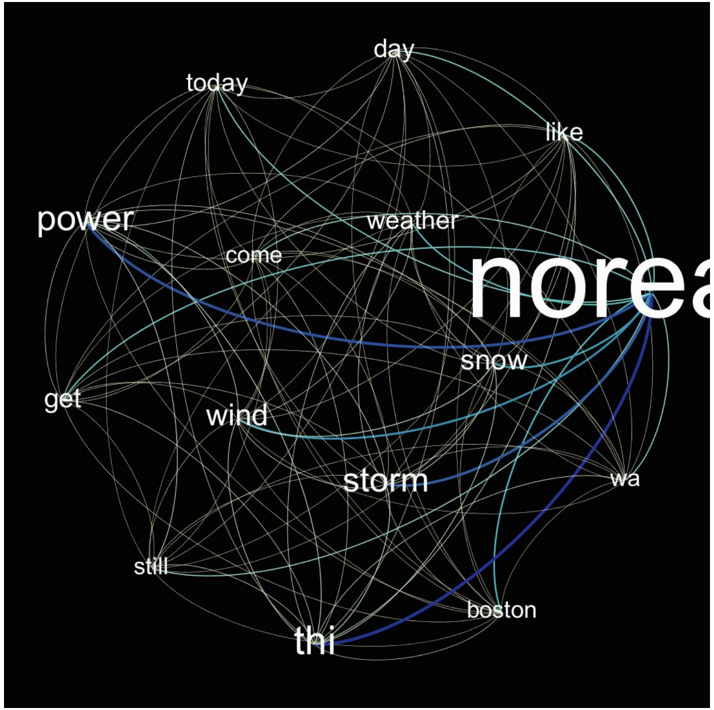


**Urgent**

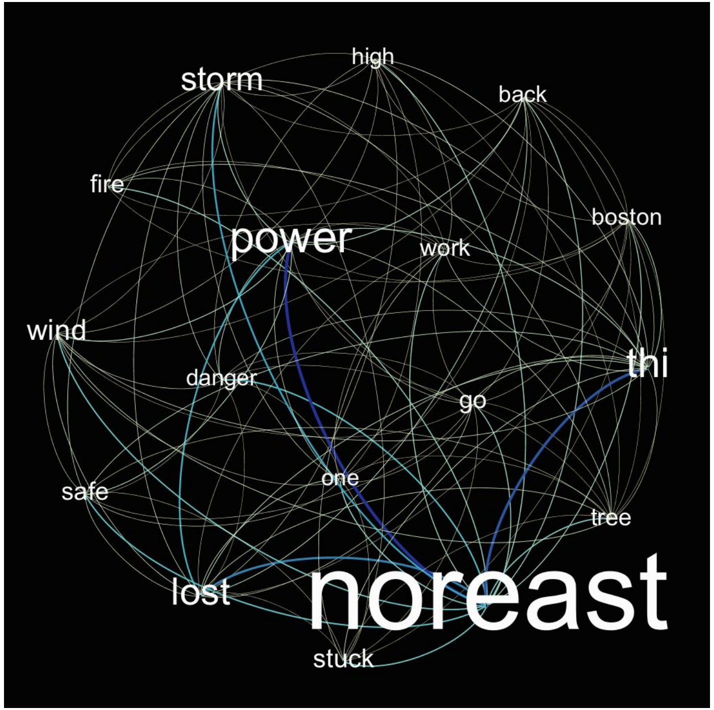


# Noreaster

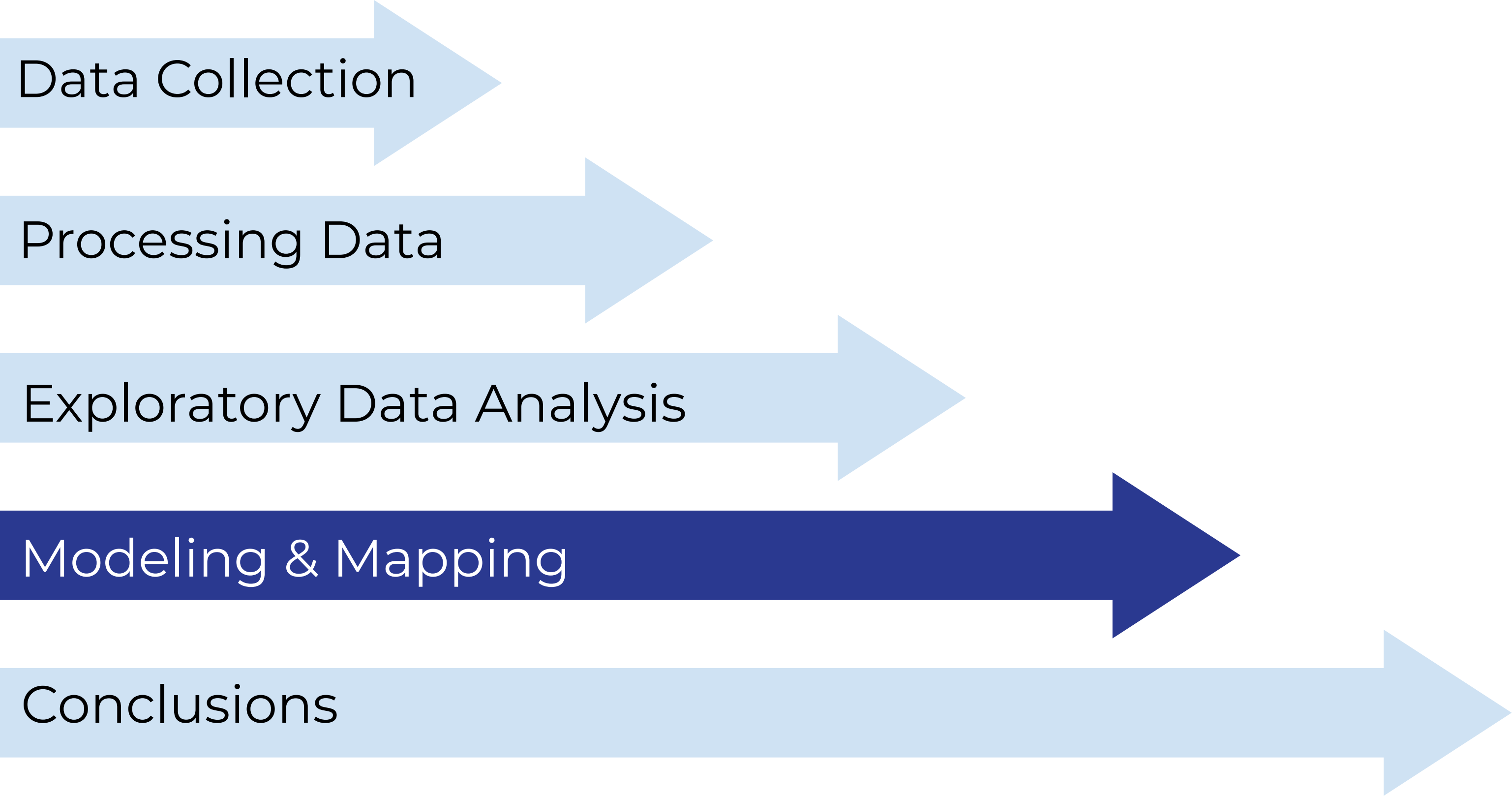
**Non Urgent**



**Urgent**



# Process



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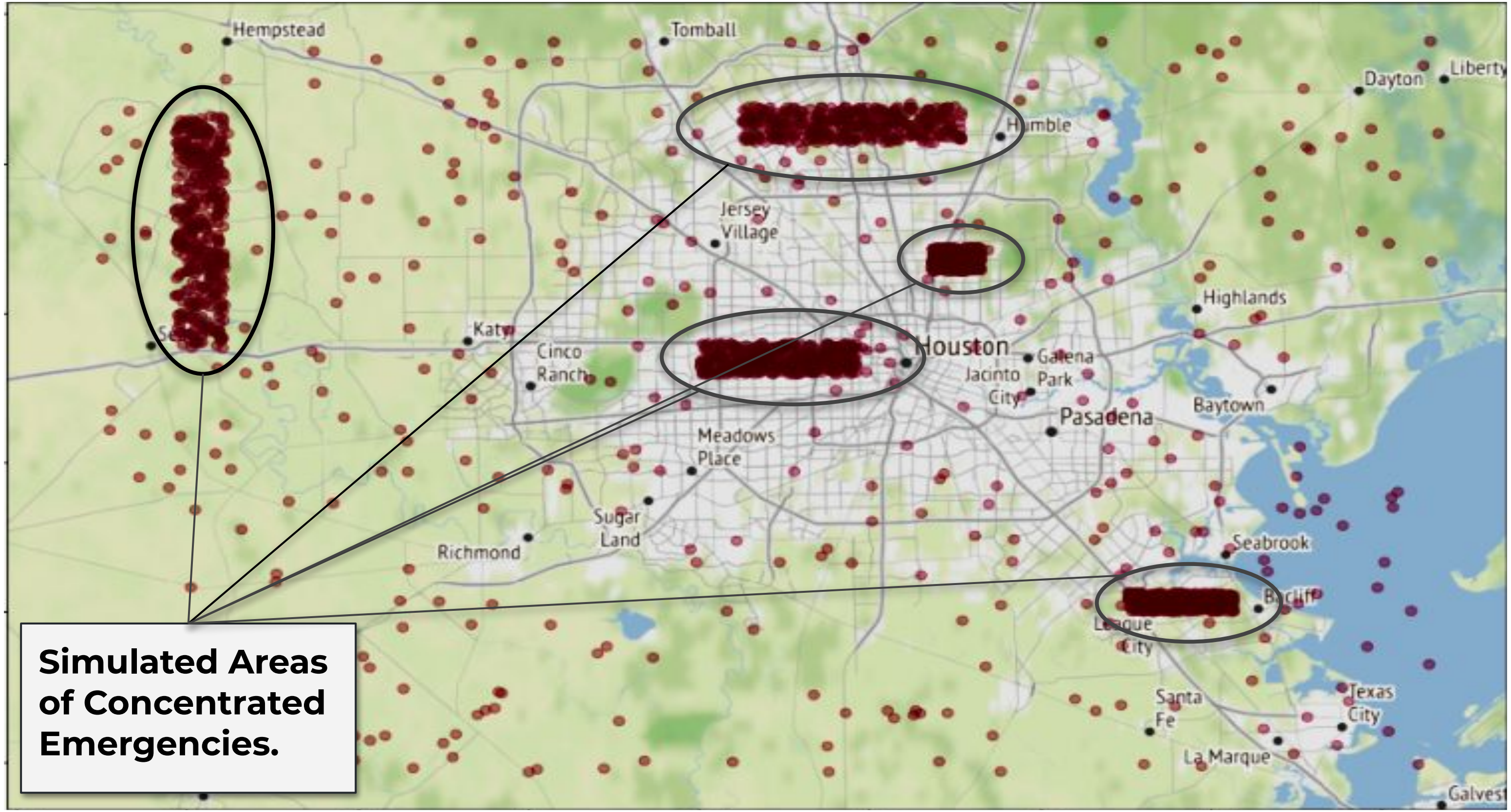
# Model Selection

- Several classification models were used
  - Logisitc regression, random forest, adaptive boosting
- CountVectorizer was used with a custom set of stop words
  - Including top words shared by positive/negative classes
- GridSearchCV was used to search through large sets of parameters
- Best model was determined to be AdaBoost

# Model Evaluation

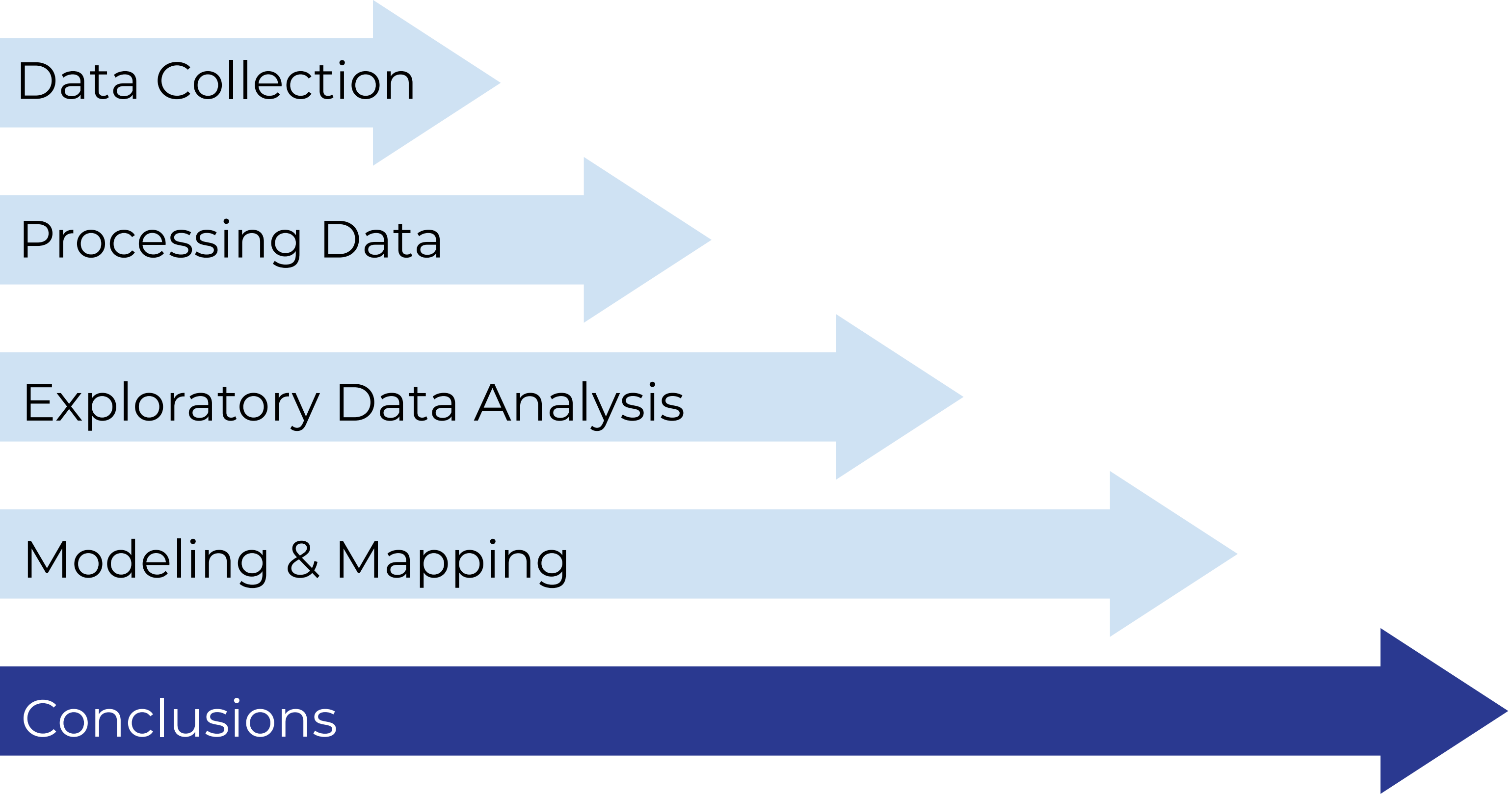
- Recall (sensitivity) was selected as the target metric
  - False negatives should be minimized
- Final model performance: 89% recall
  - 489 Predicted Positives / 551 Actual Positives
- Positive tweets are then visually represented

# Mapping Urgent Tweets



Simulated Areas of Concentrated Emergencies.

# Process



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## Limitations

- Identification Issues
- Data Issues
- Privacy Issues

## Recommendations

- Broader social media access.
- Real time geo-locations.
- Concentration of each post’s timing.
- Greater variation and quantity of posts.

# Thank You

Questions?