Using Twitter to Predict Power Outages

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Agenda

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4. Outage Tweets Map
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6. Predicted Outage Tweets Map
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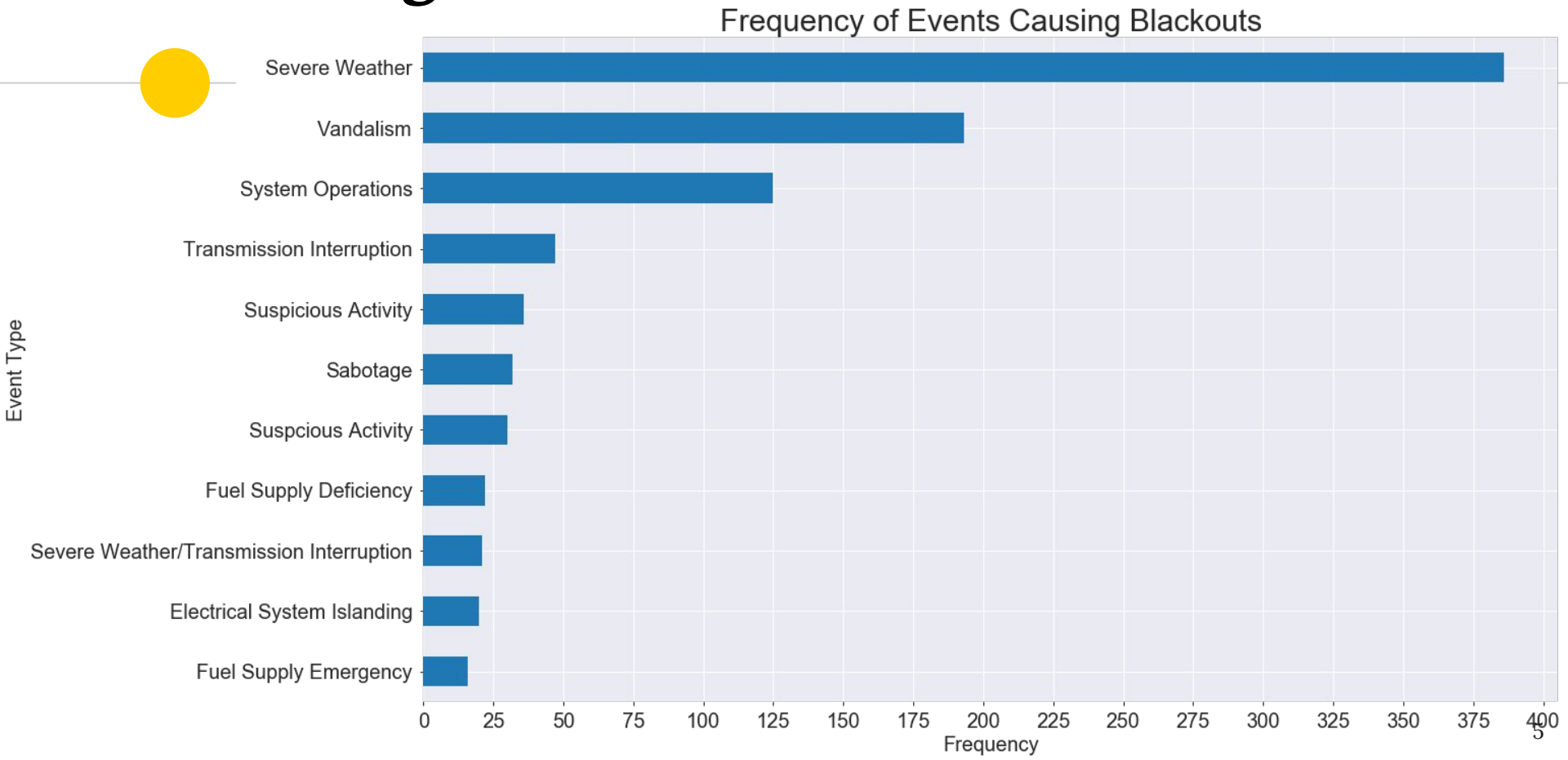
Problem Statement

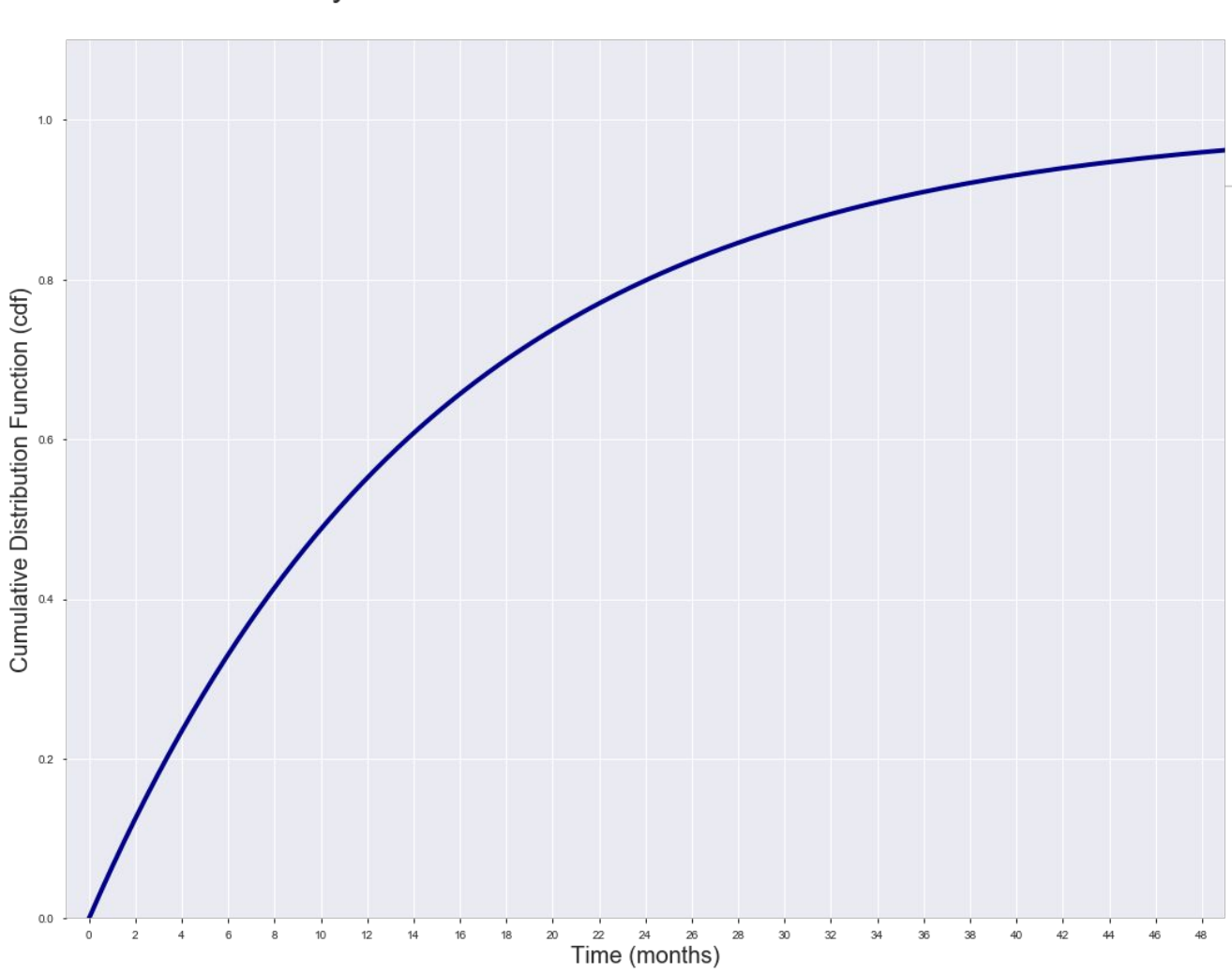
- Blackouts are inevitable
- Blackout detection strategy:
  - Satellite Image Classification
  - Advanced Meter Infrastructure (AMI)
- Alternative until AMI is integrated:
  - Utilize social media data to predict where blackouts occur

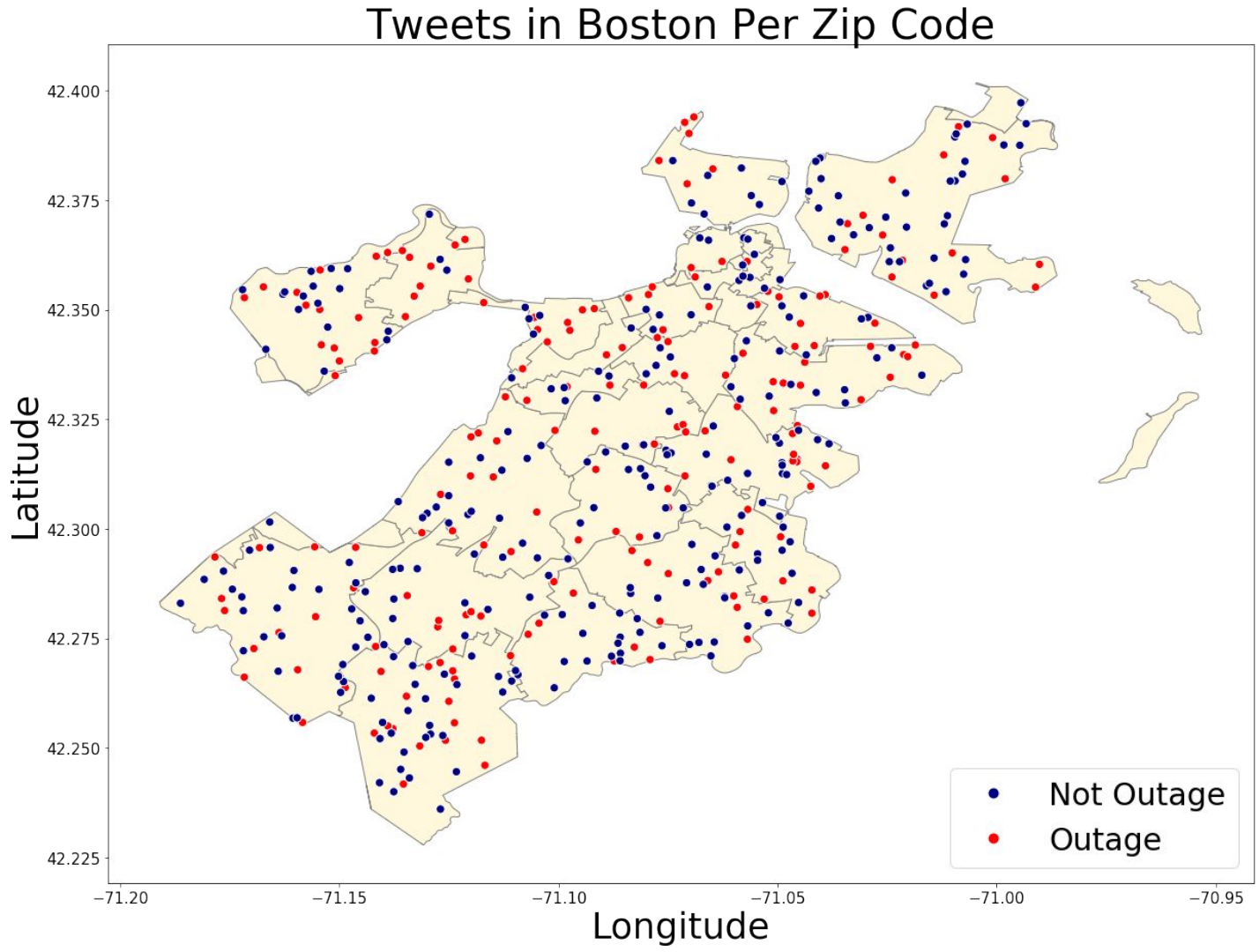
Data Collection

- Scraped Tweets (Jan. ‘14 to Sept. ‘19)
  - Python library: twitterscraper
- True Blackouts:
  - Department of Energy
    - Dates Blackout Occurred and Returned
    - Cause of Blackout
    - Areas Affected

Background


Frequency of Events Causing Blackouts
Severe Weather
Vandalism
System Operations
Transmission Interruption
Suspicious Activity
Sabotage
Suspcious Activity
Fuel Supply Deficiency
Severe Weather/Transmission Interruption
Electrical System Islanding
Fuel Supply Emergency
Event Type
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
Frequency


Probability of X or Less Months Until a Blackout in the USA
Cumulative Distribution Function (cdf)
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Time (months)



Outage Tweets Map

- No specific tweet locations available
- Randomly assigned values in Boston

NLP and Modeling

1. Tokenization
2. Frequency Threshold
   a. Min_df
3. Logistic Regression
4. Hyperparameter Tuning
   a. Regularization with C
   b. n_grams

Sample Words:

Outage

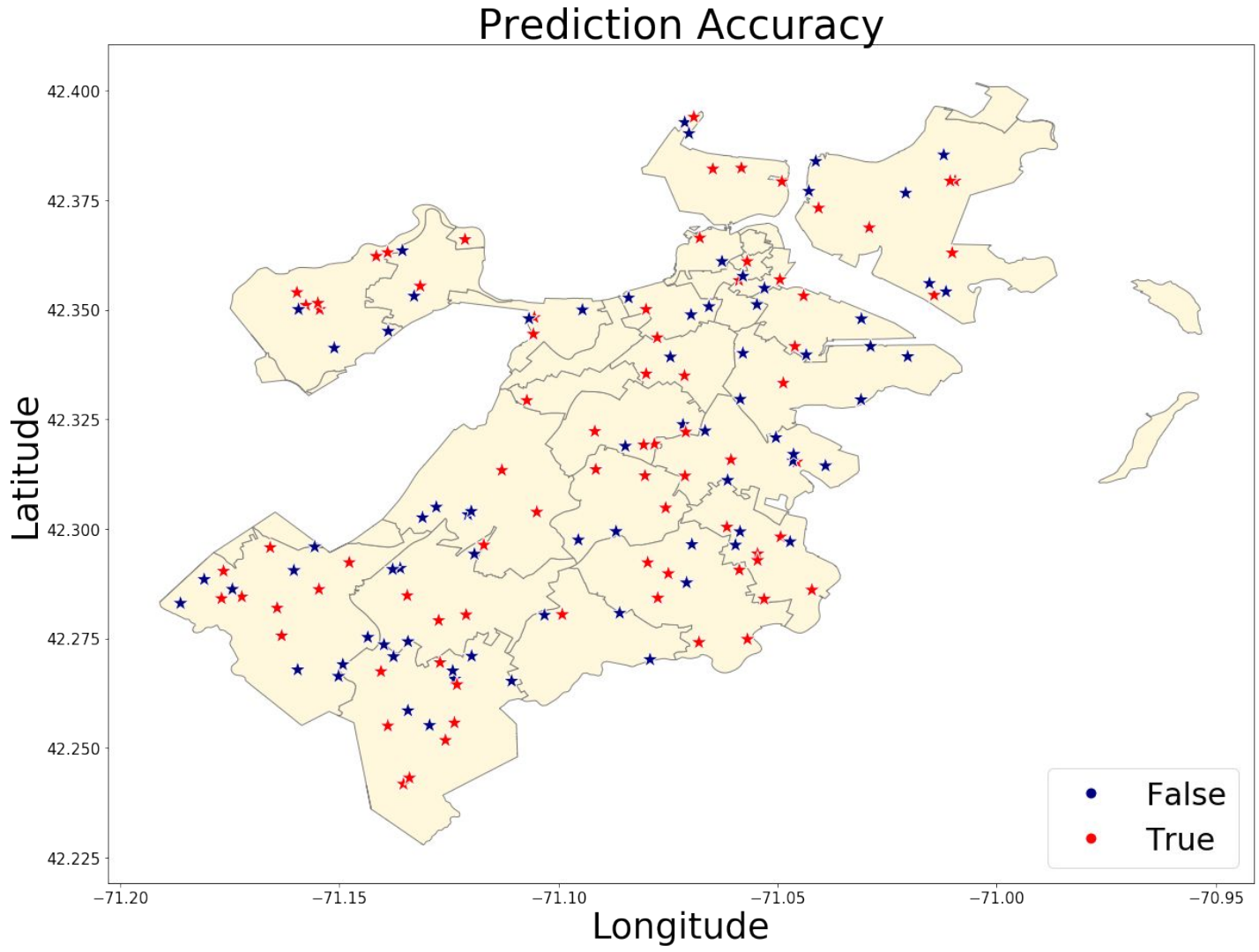
Blackout

School

vs.

ZZZ

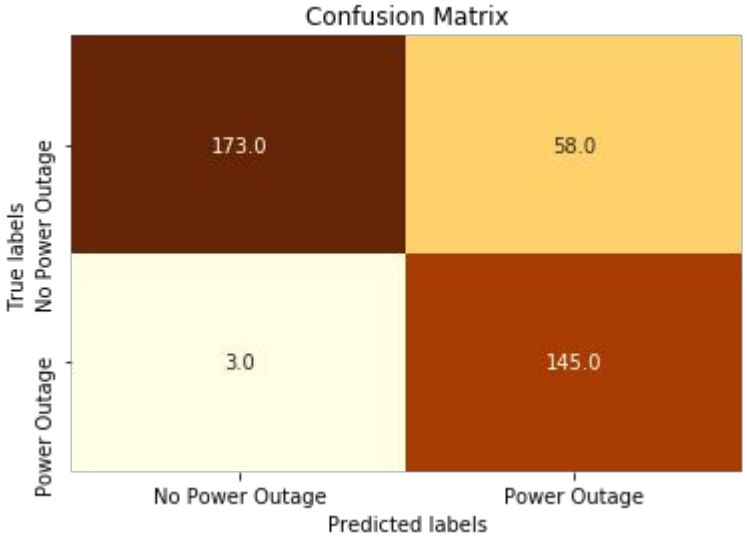
数算数

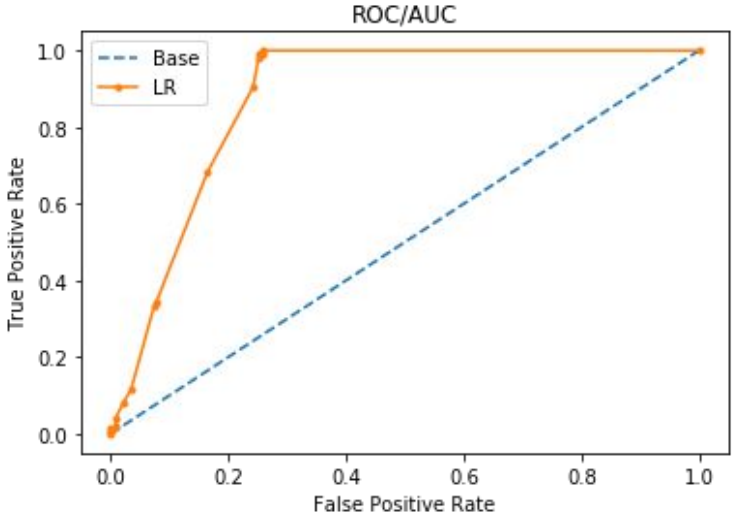


Predicted Outage Tweets Map

- Model Prediction Accuracy
- Clusters would be ideal

Model Assessment





Baseline – 77%

Accuracy – 84%

0.5 Threshold – Precision: 98% – Recall: 75%

0.7 Threshold – Precision: 69% – Recall: 92%

Future Directions

- Twitter API & Location
- Scale to more cities
- Scale to other common languages in the US
- Live map app

Thanks!

Any questions ?