Optimizing first-responder routes using real-time social media information

AMR
A Global Medical Response Solution

Dina Bahar, Samuel Hawkes, and Ramin Vafadary

OUTLINE

Part 1. Feasibility Study

Compare Twitter posts from before and after an incident to observe if vocabulary changes

Part 2. Use Case

Test emergency response directions query during a fire to see if Twitter detects any road blockages
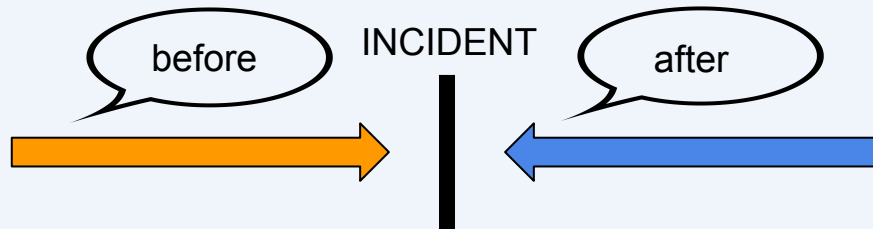
Part 1.
FEASIBILITY STUDY

PROBLEM STATEMENT

Can we detect the most common words people use to tweet about traffic incidents?

Part 1.
FEASIBILITY STUDY

	Process	Data Source
1.	Select a critical traffic incident	HERE.com API
2.	Use incident description terms as query keywords to collect tweets	GetOldTweets3
3.	Use NLP and Logistic Regression to predict whether a post came before or after the incident	

before   INCIDENT   after

Part 1.
FEASIBILITY STUDY

Logistic Regression model
- Tweets ONLY
- Custom Stopwords
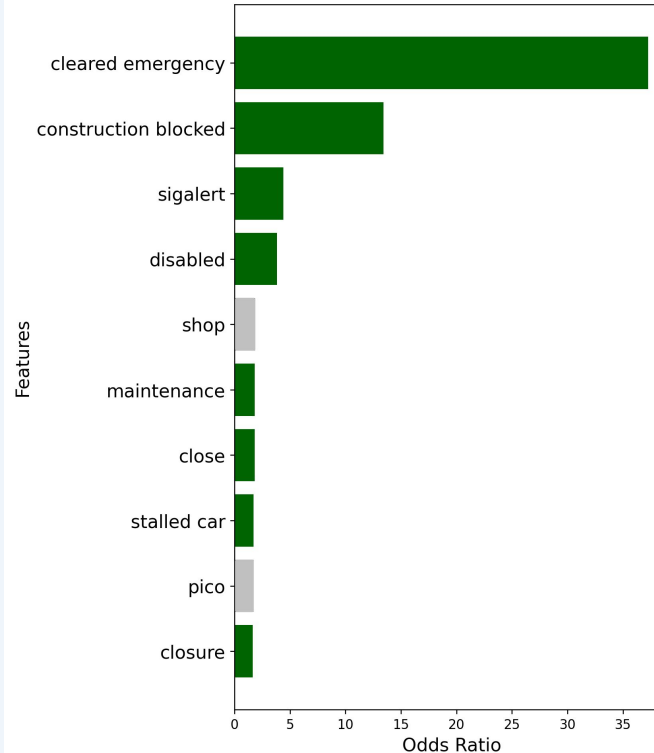- N-gram Range: 1 - 3
- Lasso Penalty

56%
Baseline Model

71% 71%
Train Score Test Score

Top 10 Exponentiated Coefficient Weights

Part 1. Feasibility Study → Coef. Weights →

```
['cleared emergency',
 'construction blocked',
 'sigalert',
 'disabled',
 'maintenance',
 'close',
 'stalled car',
 'closure',
 'stop',
 'crash blocking',
 'restriction',
 'police activity',
 'closed',
 'disabled vehicle',
 'collision unkn',
 'collision unkn incident',
 'new planned construction',
 'congestion 345',
 'congestion 345 28',
 'construction',
 'cleared planned construction',
 'cleared planned',
 'construction blocked 05',
 'construction ramp',
 'expect delays',
 'emergency construction blocked',
 'emergency',
 'injuries',]
```
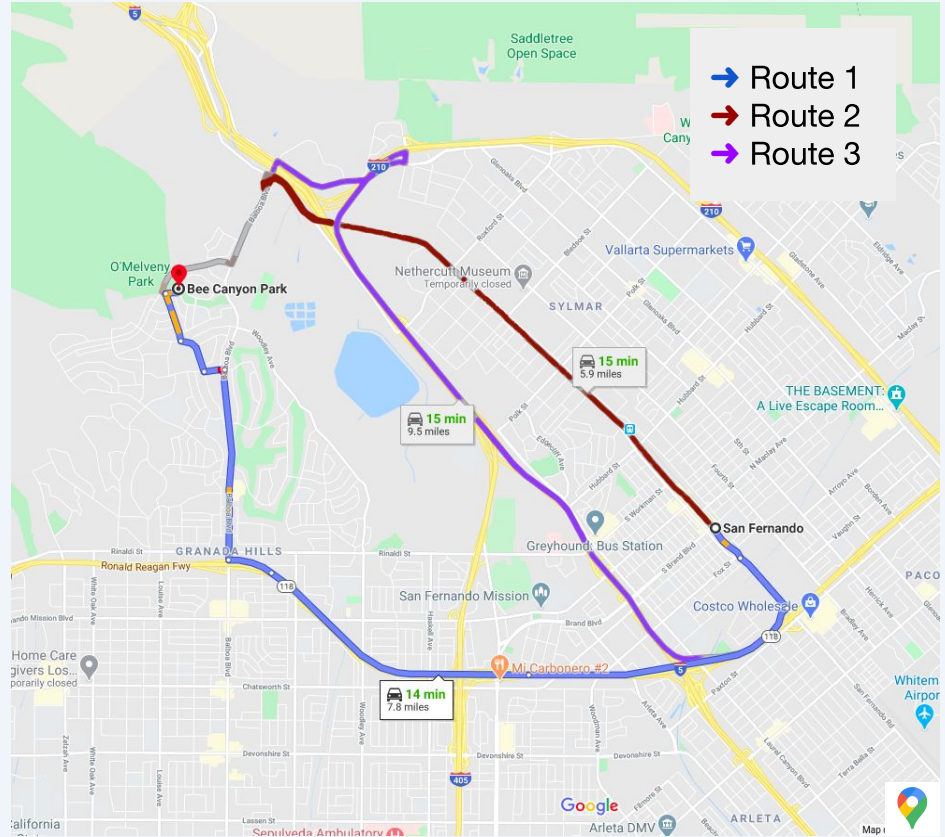
→ Incident Keywords → **Part 2. Use Case**

Part 2.
USE CASE

PROBLEM STATEMENT

Can Twitter be used to identify traffic problems in real-time during an emergency?

Routes suggested by Google Maps during the Saddle Ridge Fire

Part 2.
USE CASE

	Process	Data Source
1.	Collect list of route suggestions	Google Maps API
2.	Use street and highway names as query keywords to collect tweets during #SaddleridgeFire	GetOldTweets3
3.	Use incident keywords to label whether a post came before or after the incident	

AMR
A Global Medical Response Solution

Part 2.
USE CASE

	Route Details	No. of Tweets About Closed Roads
Route 1	118 Freeway	7
Route 2	Balboa Boulevard	0
Route 3	I-5 and I-210	57

Best route from Google Maps API
- A custom function based on the words obtained from the model is used
- It predicts which route is best from Google map API

CONCLUSION

Part 1.

Can we detect the most common words people use to tweet about traffic incidents?

YES ✅

Part 2.

Can Twitter be used to identify traffic problems in real-time during an emergency?

YES ✅

Flaws:
- People don't tweet & drive. May be at risk for false negatives
- Not a lot tweets regarding street routes
- No hashtags in case of an active emergency
- Noise in text data unrelated to traffic

RECOMMENDATION & NEXT STEPS

1. Spring for the paid version of HERE.com API to access more incidents

2. Integrate more incident data to cut down noise

3. Incorporating hashtags to strengthen Twitter queries

BONUS: Using local drivers with extensive neighborhood knowledge for finding the best route.