FLIPSWITCH ALERT SYSTEMS

Presentation to Ran Goldblatt and Associates at New Light Technologies

OVERVIEW

- Opportunity
- Methodology
- Analysis
- Conclusions
- Next Steps

OPPORTUNITY

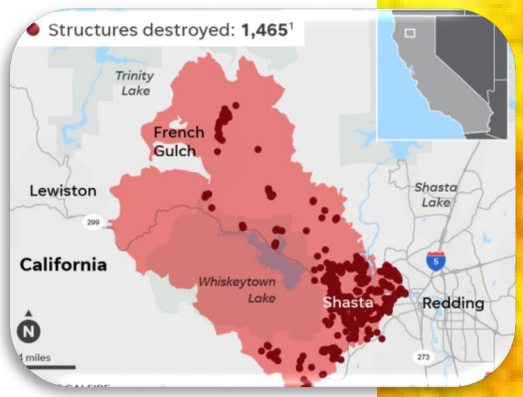
- In the event of an emergency, citizens typically rely on three key channels to alert them:
  - Government Agencies
  - Local First Responders
  - News Media
- Hyperconnected world
  - Everyone's a part of social media
  - No longer be necessary to "wait" for an informed source to issue an alert
- Can we provide an earlier indicator of a natural disaster event based on the content and frequency of social media posts?

METHODOLOGY

- Focus on a key event
  - Allow us to focus on the mechanics surrounding the disaster event
  - Build with an eye to scale up to include other disaster events
- Procure Twitter activity around that event
- Use NLP to create a model to predict/signal future events

METHODOLOGY

FOCUS EVENT SELECTION



CARR FIRE

- 7th largest California Wildfire on record
  - Burned 229,651 acres
  - Destroyed over1,600 structures
  - Over 3,500 firefighter personnel responded
- Key dates to analyze:
  - July 23 – 24, 2018
  - First full week of July 22
- Well covered throughout social media

METHODOLOGY

SOCIAL MEDIA SELECTION

TWITTER VIA INTERNET ARCHIVE

- Curated tweet libraries
- Access about 1,000,000 tweets a day
- Available for the time periods we sought

Source: www.internetarchive.org

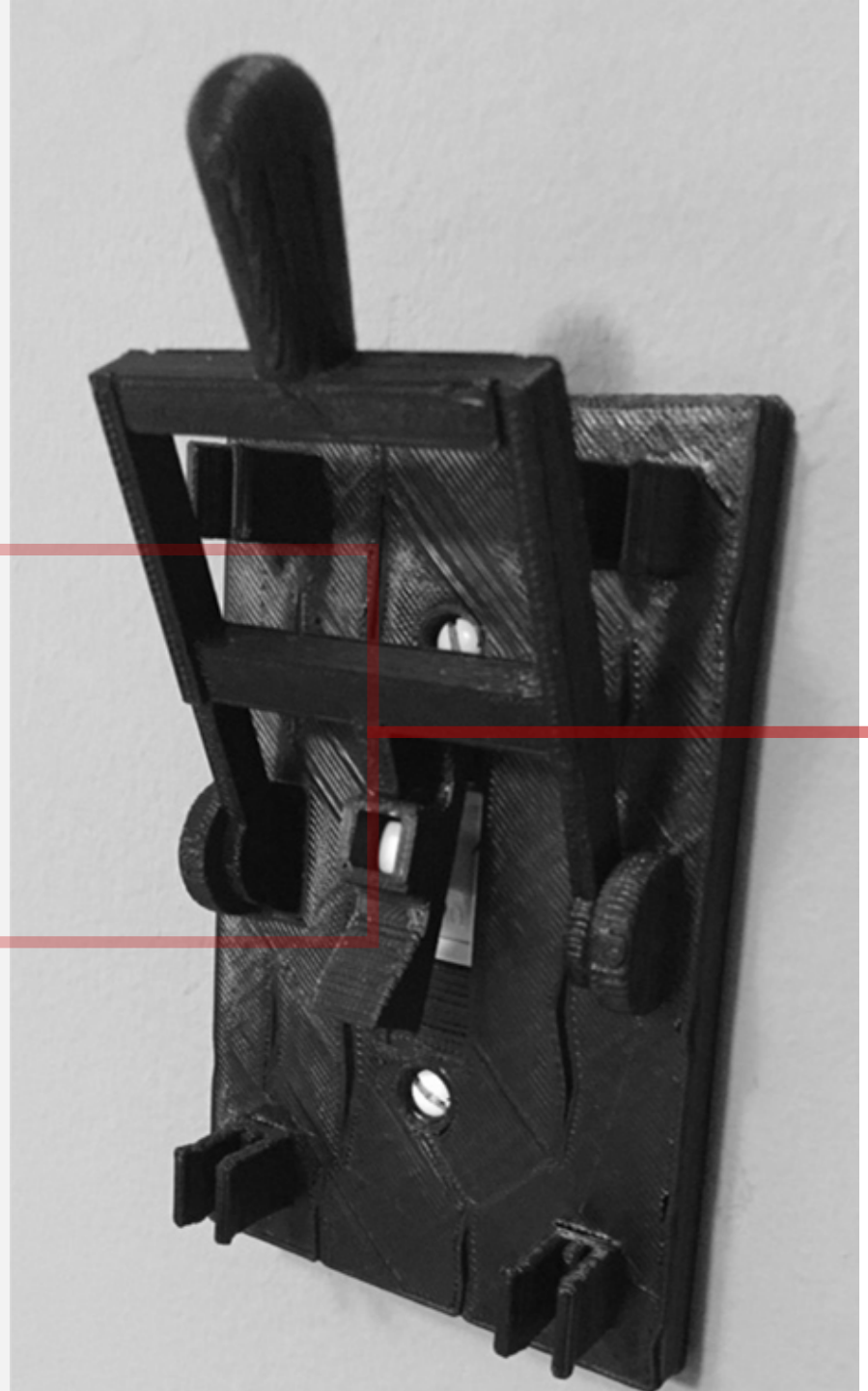
FLIPSWITCH

CONTENT

REFINED
KEYWORD LIST

TWEET RATE

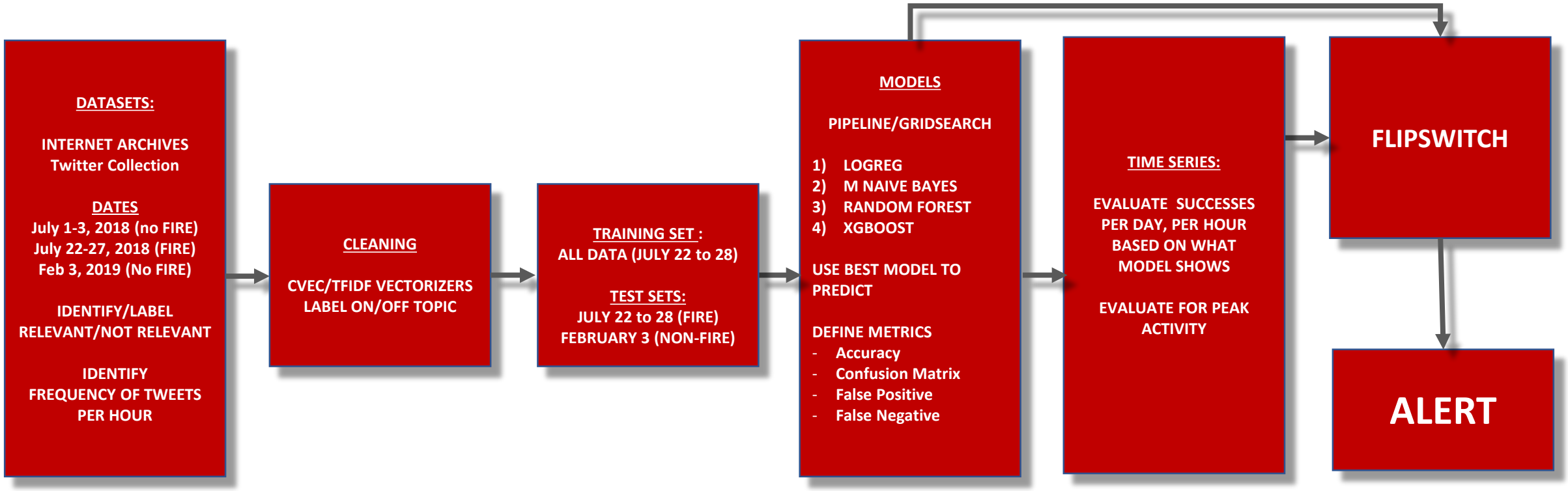
PER HOUR
PER DAY



CONFIRM ALERT

ANALYSIS: OUR PROCESS

THE STRUCTURE TO CREATE THE FLIPSWITCH



ANALYSIS

MODEL PERFORMANCE

- Models performed well overall
- Random Forest and XG Boost were most effective

MODEL	ACCURACY SCORE
LOGISTIC REGRESSION	CVEC 99.6% TFIDF 98.4%
NAÏVE BAYES	CVEC 98.3% TFIDF 98.2%
RANDOM FOREST	CVEC 99.6% TFIDF 99.8%
XG BOOST	CVEC 99.7% TFIDF 99.7%

ANALYSIS

TOP MODEL PERFORMANCE

- Compared Confusion Matrices of both models on test set
- XG Boost outperformed Random Forest in minimizing false positives and false negatives

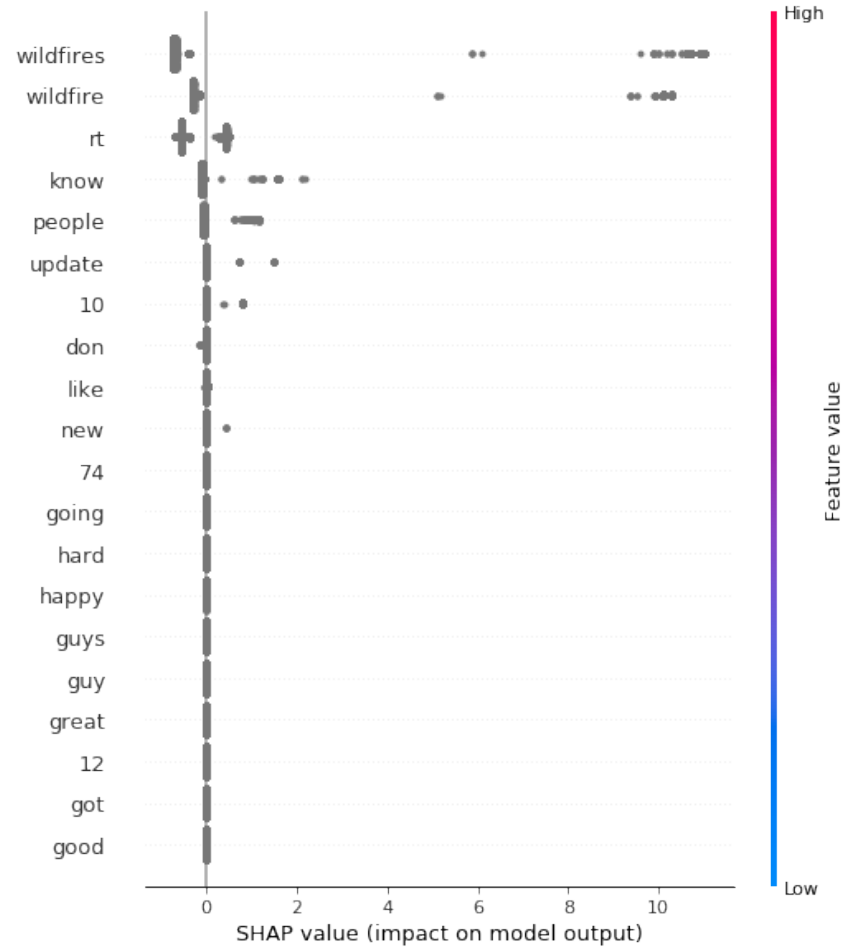
RANDOM FOREST

	Actual Positive	Actual Negative
Predicted Positive	173,875	34
Predicted Negative	0	6

XG BOOST

	Actual Positive	Actual Negative
Predicted Positive	173,909	0
Predicted Negative	0	6

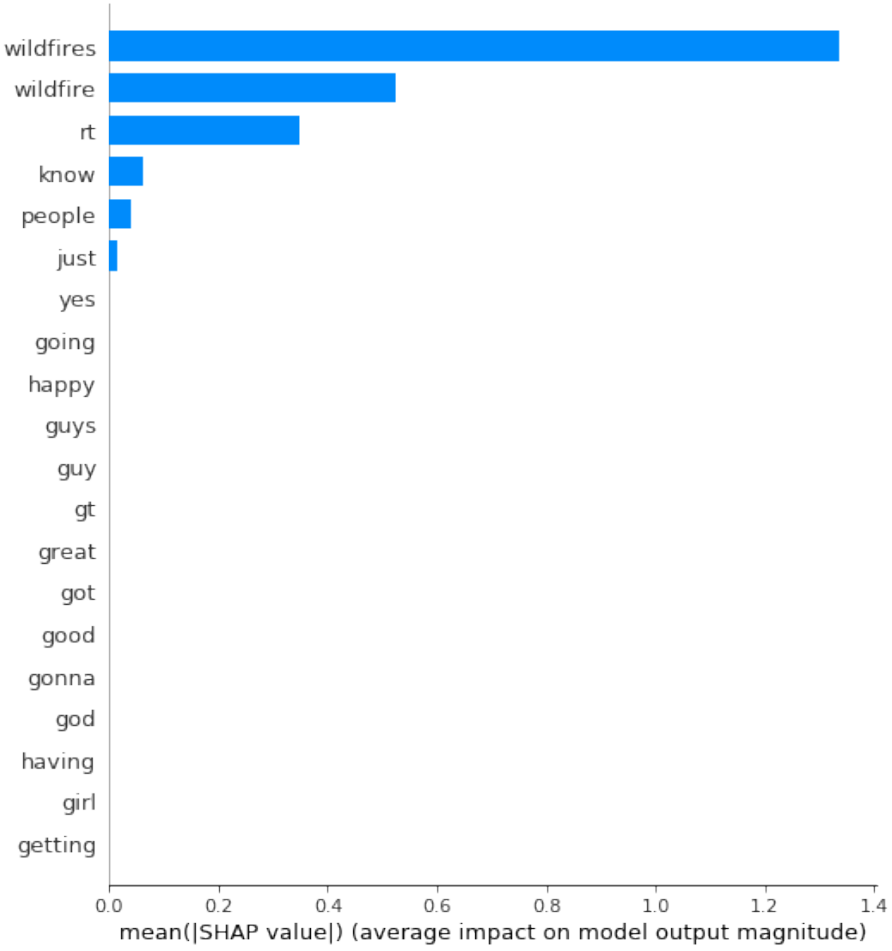
ANALYSIS



SHAP VALUE ASSESSMENT

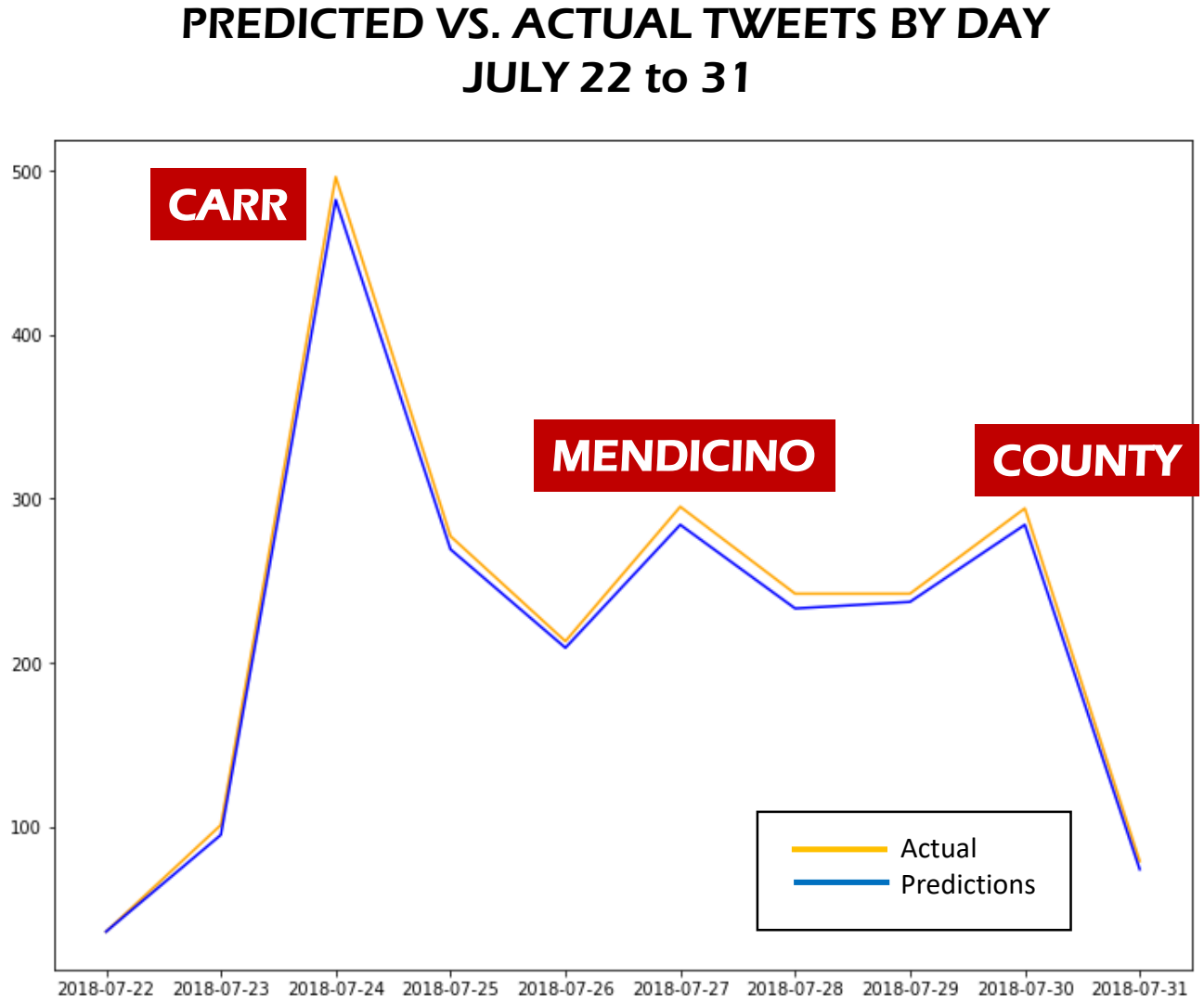
Measures the impact of variables taking into account the interaction with other variables.

Calculates feature importance by comparing model prediction with and without the feature.



ANALYSIS: TIMESERIES

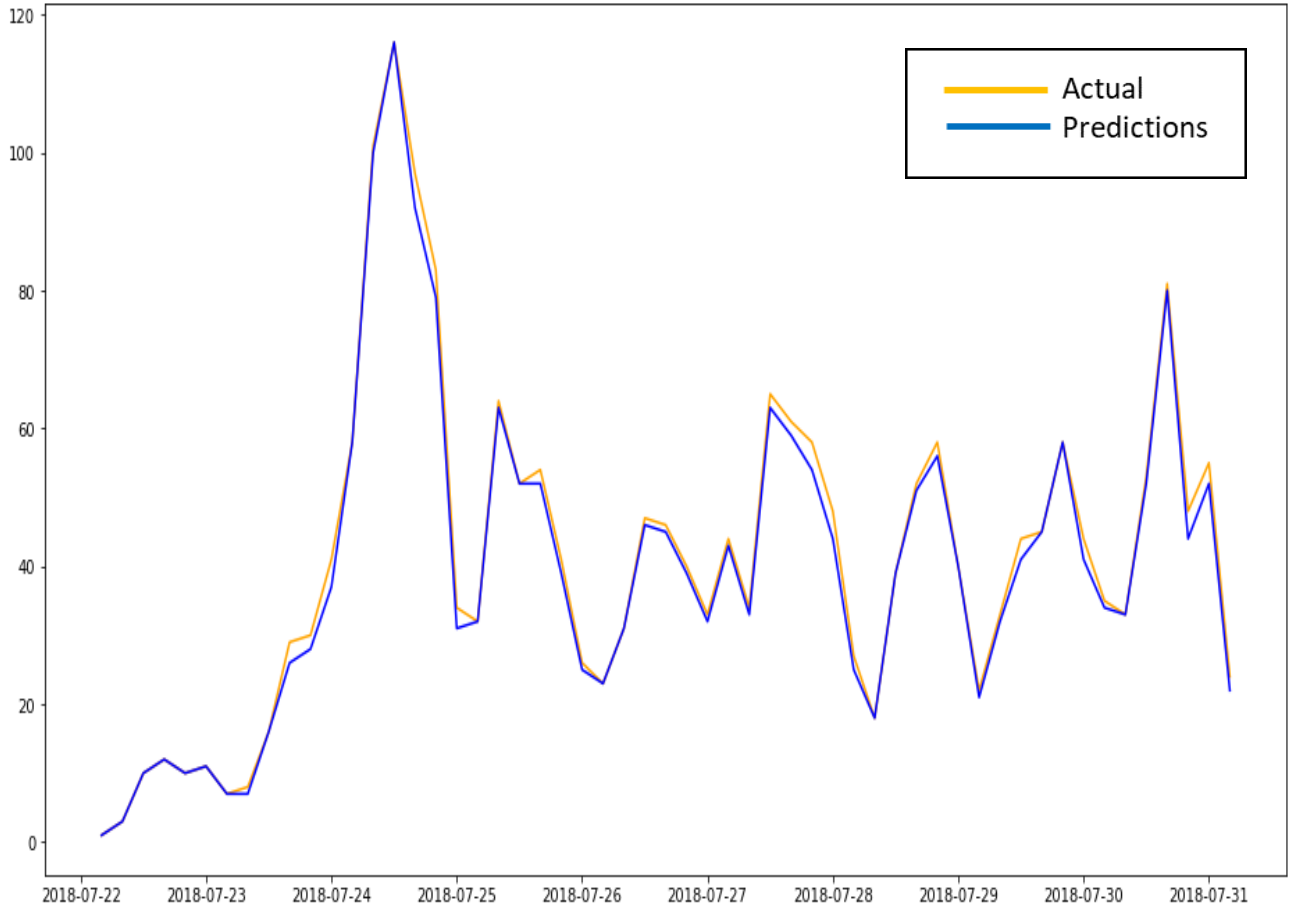
- Period analyzed: July 22 to 31
- Three clear spikes of twitter activity
- Spikes correlated twitter content and frequency with start of fire activity
- Leveraged largest spikes to train our models



ANALYSIS: TIMESERIES

- Period analyzed: July 22 to 31
- Clear spikes of twitter activity
- Spikes correlated twitter content and frequency with start of fire activity
- Close alignment of actual and predictions

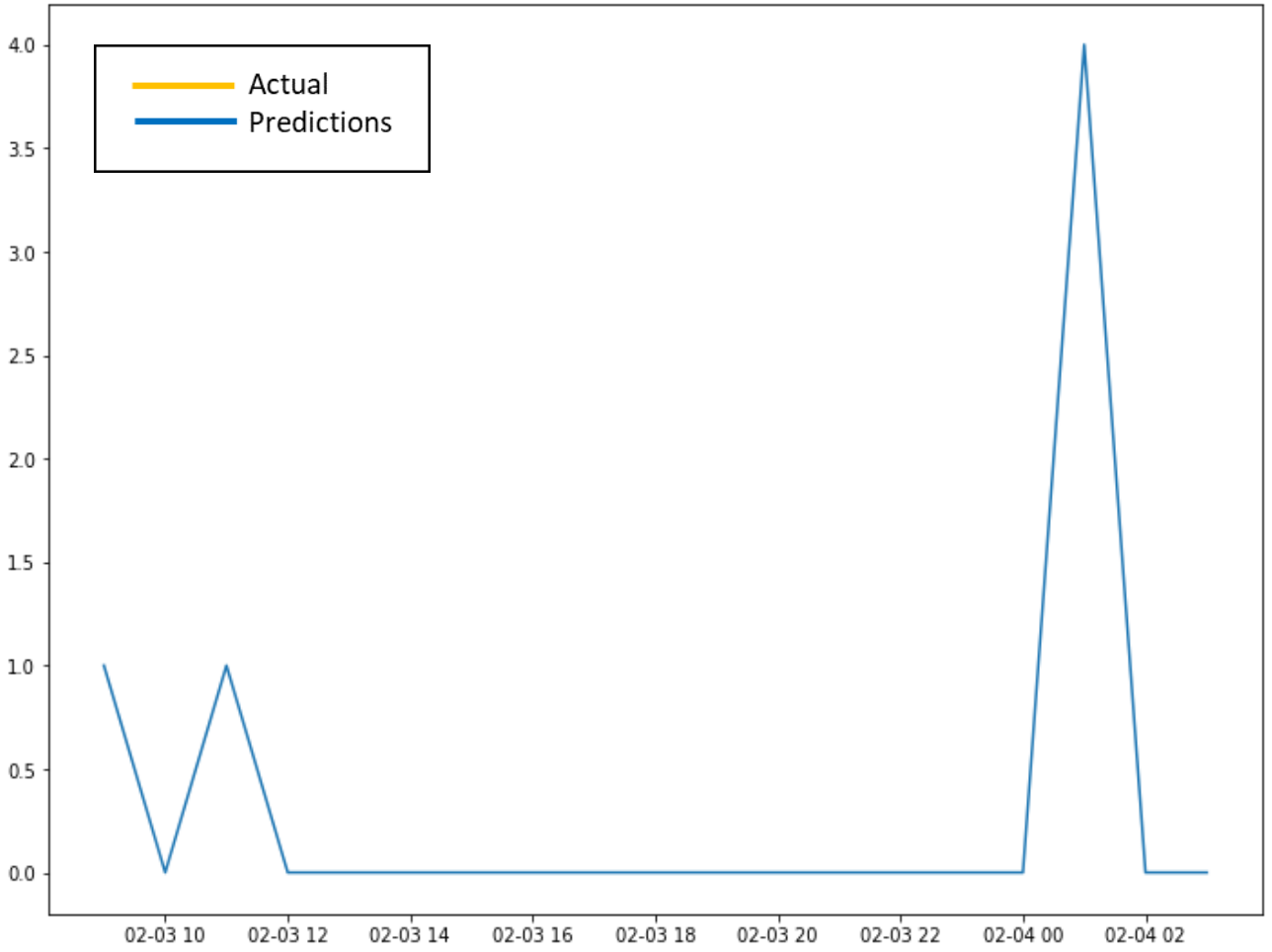
PREDICTED VS. ACTUAL TWEETS PER DAY MEASURED EVERY 4 HOURS - JULY 22 to 31



ANALYSIS: TIMESERIES

- Period analyzed: February 3, 2019
- Confirmed day with no wildfire activity
- Chart reflects tweets per hour throughout the day
- Predicted and Actual aligned

PREDICTED VS. ACTUAL TWITTER ACTIVTY
February 3, 2019



CONCLUSION/NEXT STEPS

- FLIPSWITCH = SUCCESS
  - Identified and demonstrated the two key elements
  - We can train a signal on content and frequency
- CONNECT MODEL TO DASHBOARD FOR REAL TIME ALERTS
  - With more time in development, our next phase would connect our model to an app or web-based dashboard
  - Continuously monitor the twitter stream
  - Indicate when confirmed positive posts were reaching crisis levels

CONCLUSION/NEXT STEPS

- SEEK TO ADD DETAIL OF LOCATION/GEOCODES
  - Challenge: Not all twitter users share their location
  - Not universally available through Internet Archive curated collection.
  - Our team believes in keeping data pure
    - Uncomfortable simulating a location
    - May/may not be tied to a specific area of response.
  - If universally validated = an asset to the alert.
- BUILD OUT CATEGORY MODULES FOR OTHER NATURAL DISASTERS
  - Each set of keywords for an event to be carefully selected and tested.
  - Our terminology was researched, debated, vetted and tested before integration
  - Take same approach with each natural disaster considered to expand this program.

THANK YOU

WE ARE READY WHEN YOU ARE.

JUST FLIP THE SWITCH...