Civique – Using Social Media to Detect Urban Emergencies

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Roadmap

- Motivation
- Approach
- Pre-processing
- Post-visualization
- Architecture
- Evaluation & Results
- Demo

Motivation

- In 2015, **53%** of all unnatural deaths in India were caused by **car accidents**, and **6%** by accidental **fires**.
- The Indian subcontinent alone suffered seven **earthquakes** in 2015, with the recent Nepal earthquake alone **killing more than 9000** people and **injuring 23,000**.
- The need to *quickly bridge the gap between people and the concerned authorities*.

Challenges

- **Location tagged tweets:** Otherwise, event detection techniques to extract the spatio-temporal data from the tweet can be vague, and lead to false alarms.
- A mechanism of **reliability score** of tweets in order to avoid false alarm, in case of extraction of spatio-temporal data.
- A **sophisticated language processing component** to sanitize the tweet input before event detection.
- A **channel with the concerned authorities** to take serious action, on alarms raised.
- An urban emergency such as a natural disaster could affect communications severely, in case of an earthquake or a cyclone, communications channels like Internet connectivity may get disrupted easily.

Approach

- We choose Twitter as the platform for collecting data, and detecting emergency event / incidents.
- Using Twitter APIs, we collect data for text classification, and label them manually for two steps:
  - **Emergency / Non – Emergency Tweet.**
  - **Emergency Type of the Tweet.**
- Our system performs pre-processing as described below.
- Classification techniques such as Support Vector Machines (SVM), and Naive Bayes (NB) used for training, and 10 fold cross validation was performed for evaluation.
- Twitter Streaming APIs are used to stream twitter data on a real-time basis.
  - The data is filtered through a set of keywords, which depict an emergency like situation.

Approach (Contd.)

- The system uses the first classifier to detect whether the tweet belongs to an Emergency situation or not.
    - In case of an emergency, the tweet is sent to the second classifier for Emergency type classification.
- The tweet is then visualized on the web interface, and the android application interface, along with its location on a map.

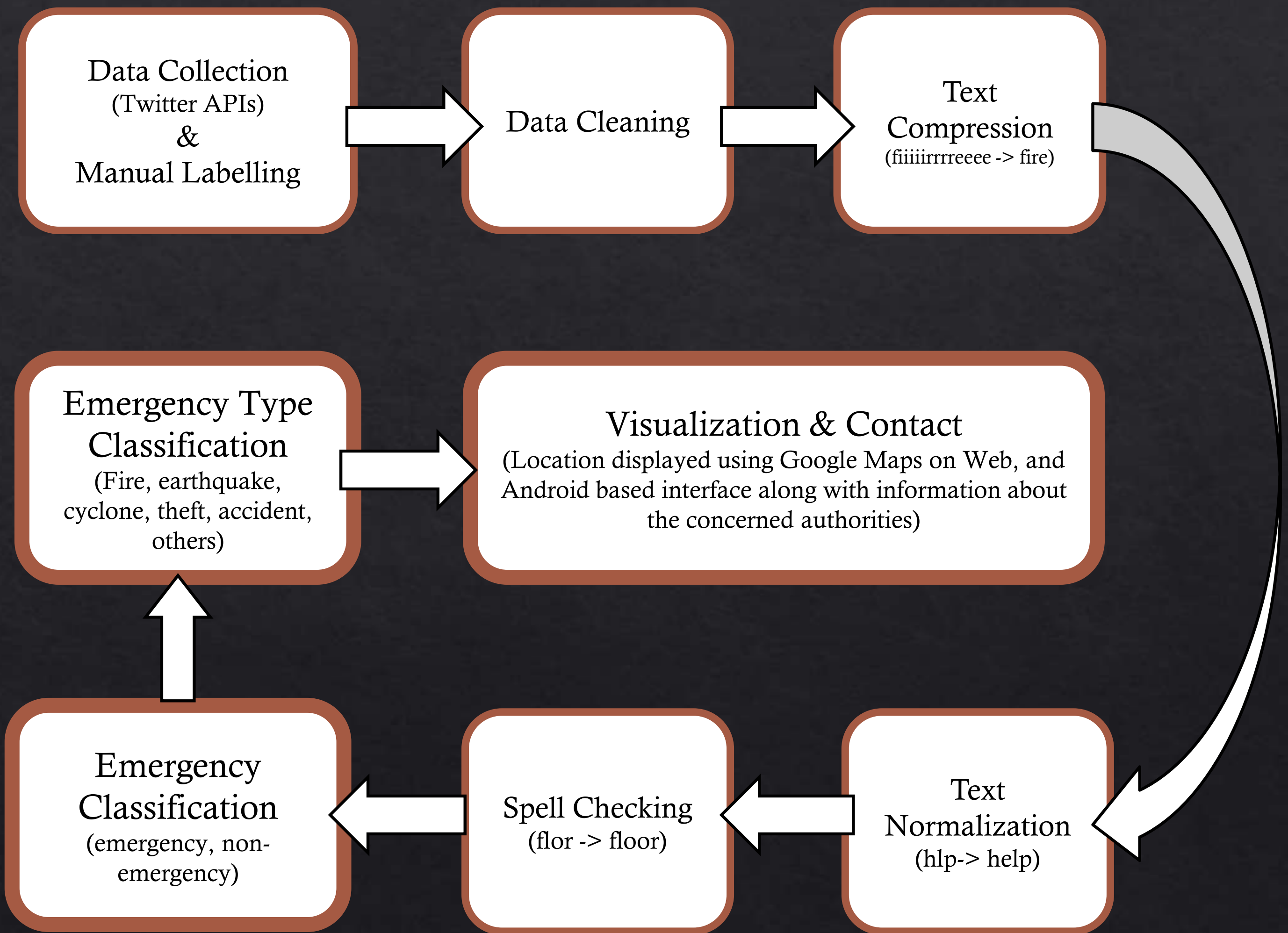
Pre-Processing

- Our system employs a sophisticated pre-processing module, which lets us sanitize the tweet for both, training, and detection.
- We clean data by removing username, hashtags, emoticons, URLs, etc.
- **Compression:** Heuristic based - all the repeated windows of character length greater than two are compressed.
- **Normalization:** Implemented the normalization system by (Kanojia et. al., 2015) as a Phrase Based Statistical Machine Translation system.
- **Spell Checking:** The JAVA API of Jazzy spell checker is used for handling spelling mistakes.

Post-Visualization

- We try to display the contact information of the concerned authority on the interface, which leads the user to contact them.
- For e.g., In case of a fire, the contact information of the nearest fire depot along with the central number is displayed.
- In case of an earthquake, the nearest disaster management center / police station and hospitals will be displayed.

System Architecture



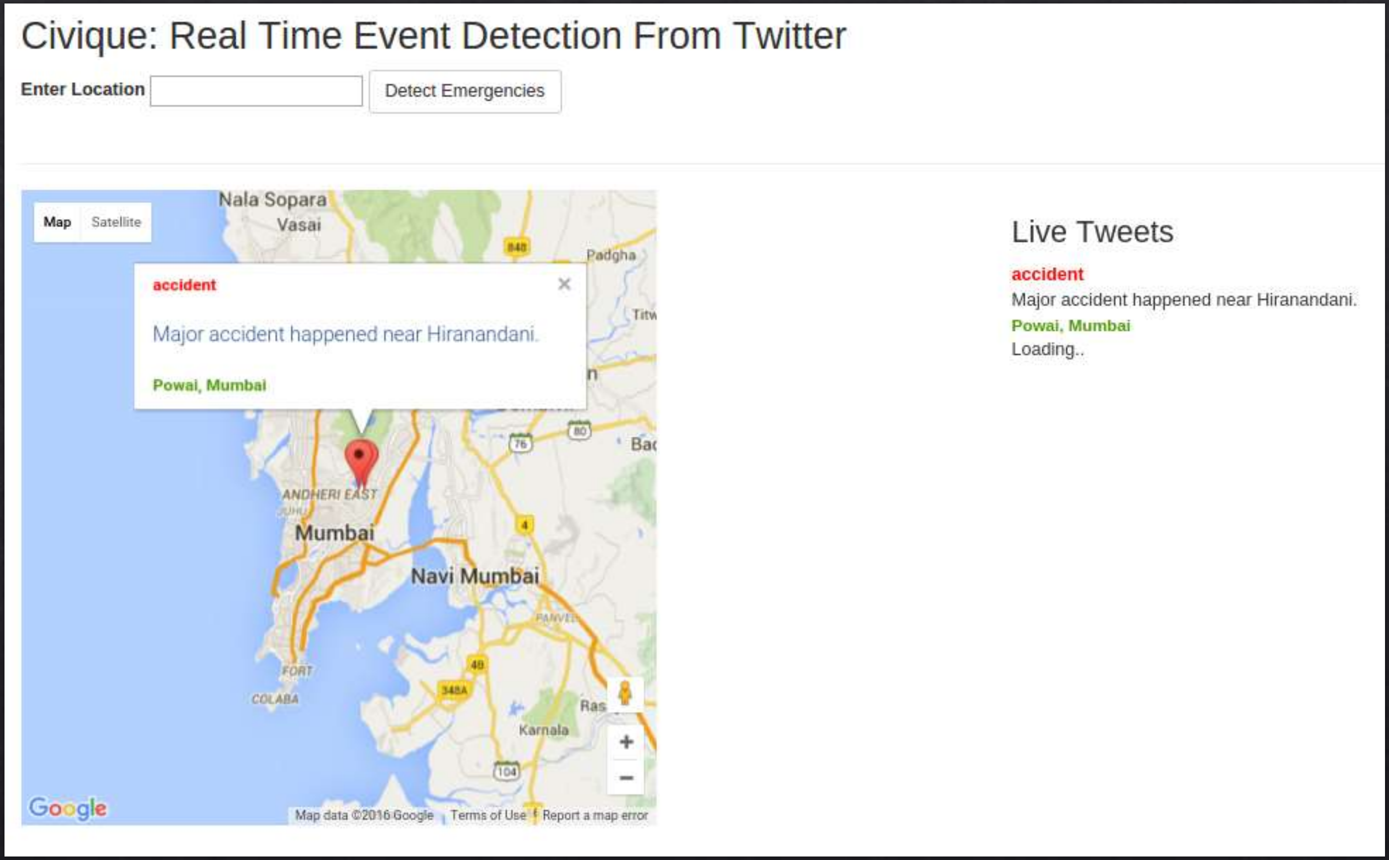
System Evaluation

- We evaluate our system techniques using standard precision, recall and f-score.
- Our system uses ~3200 manually labelled tweets to train the data.
- We perform ten fold cross validation for both SVM and NB.
- We choose SVM for classification step one, and NB for classification step two, based on F-scores, as shown in the table below.
- Manual Evaluation revealed **false positives** such as:
    - I am sooooo so drunk right nowwwwwwwww.
    - fire in my office , the boss is angry.

Evaluation Results

Classifier	Step One	Step Two
SVM	**88.0%**	90.5%
NB	67.9%	**92%**

Screenshot



Civique: Real Time Event Detection From Twitter
Enter Location
Detect Emergencies
Map
Satellite
Nala Sopara
Vasai
Padgha
accident
Major accident happened near Hiranandani.
Powai, Mumbai
ANDHERI EAST
Mumbai
Navi Mumbai
FORT
COLABA
Karnala
Google
Map data ©2016 Google
Terms of Use
Report a map error
Live Tweets
accident
Major accident happened near Hiranandani.
Powai, Mumbai
Loading..

Demonstration

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Thank you! ☺

Questions ?