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# A Digital Platform for Local Foodborne Illness and Outbreak Surveillance

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## Objective

Develop a platform to enable local surveillance of foodborne illness reported on social media and restaurant review sites for supplementing traditional foodborne disease surveillance programs. In this presentation, we will discuss our collaboration with local public health departments to develop a foodborne disease surveillance Dashboard.

## Introduction

Foodborne illness affects 1 in 4 Americans, annually. However, only a fraction of affected individuals seek medical attention. To supplement traditional approaches to foodborne disease surveillance, researchers and public health departments are considering reports of foodborne illness on social media sites [1, 2]. In this project, we work with local public health departments to develop a platform that uses digital data sources such as, Twitter and Yelp, to supplement foodborne disease surveillance efforts. In addition to monitoring reports of illness, this platform can also be used to respond to suspected foodborne illness reports and spur restaurant inspections to ensure food safety. To this end, we have developed a Dashboard that monitors social media chatter for reports of food poisoning in real-time. The Dashboard facilitates responding to illness reports and contacting consumers to provide additional information through a reporting form. The Dashboard is low cost, easy to use and designed to enable easy implementation for any region.

## Methods

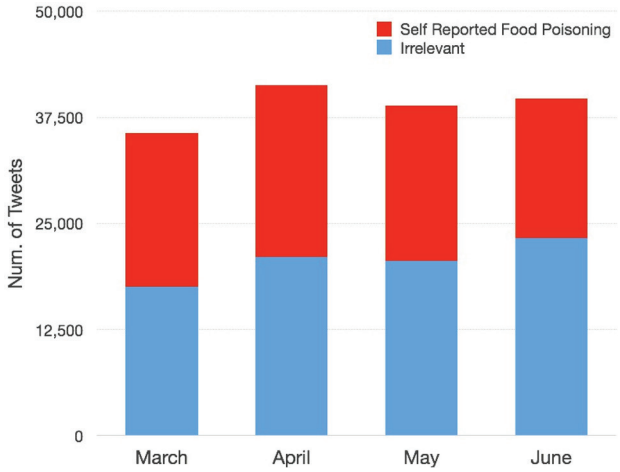
Our database currently consist of 1.5 million foodservice reviews and 680 million tweets. For the tweets, approximately 10% have a geo-coordinate provided by the users. We inferred the geo-coordinates of another 46% of tweets using the 'location' field from the Twitter user profile by querying the Google Maps API. For automated detection of foodborne illness reports, we first develop a list of keywords consisting of foodborne disease symptoms and disease names. Next, we use text matching to filter the reports that contain at least one of the keywords. We then use a supervised machine learning classifier to extract the relevant reports. A report, for example, in which an individual mentions experiencing food poisoning after eating at a restaurant is considered relevant. However, a report is considered irrelevant when a keyword is used in another context (e.g. "this restaurant is sick!"). We developed a support vector machine classifier (SVM) that aims to create maximum separation between the irrelevant and relevant reports by identifying the optimal hyperplane. The process of developing a reliable classifier is iterative and requires refinement over multiple rounds of feature selection and parameter configuration.

## Results

The SVM classifier was evaluated using 6084 tweets. The classifier had an accuracy and precision of 85% and 82%, respectively. These performance results are promising, especially since the training set was unbalanced and relevant and irrelevant tweet classes were extremely similar. We next ran the classifier on a real-time Twitter stream of tweets containing at least one foodborne illness keyword. Over a four-month period in 2015, approximately 50% of the tweets were identified by the classifier as being true self-reported food poisoning incidents (Figure 1).

## Conclusions

Restaurants with lower food safety scores have been associated with higher outbreak reports [3]. Real-time surveillance of foodborne illness reports can aid local public health departments to identify and limit the spread of foodborne disease outbreaks.




## Keywords

Foodborne illness; Surveillance; Social media; Outbreak

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