MAIS 202
Deliverable 1
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Social Media Enabled Crisis Informatics

0. Overview:

Our final goal is to build a map which contains real-time information of natural/human-induced disasters, allowing victims and rescue organizations to get updated in a timely manner. Alternatively, we would like to build a crisis analysis platform which extracts key information about a previous disaster from the given data.

1. Choice of dataset:

Our dataset is sourced from CrisisNLP (Imran, Mitra, & Castillo, 2016). Our preliminary plan is to select 2-3 tweet datasets from CrisisNLP related to a specific natural disaster (e.g. earthquakes), which allows us to solidify our model's performance on one type of disaster. If time permits, we will generalize the model to other types of disasters.

2. Methodology:

a. Data Preprocessing:

We will clean the data by removing irrelevant information, normalizing text, and applying techniques such as tokenization and stopword removal. This prepares the dataset for classification tasks like identifying critical reports (e.g., missing persons, evacuation updates).

b. Machine learning model:

For this project, we have chosen Convolutional Neural Networks (CNNs) to classify the data as informative or non-informative and then further apply multi-class labeling to the informative ones (e.g., infrastructure damage, casualties, donation needs).

CNNs are ideal because they automatically learn features from raw text data, eliminating the need for manual feature engineering, unlike logistic regression, random forest, or Naive Bayes, which rely heavily on carefully crafted features (Nguyen, Al-Mannai, Joty, Sajjad, Imran, & Mitra, 2017).

c. Evaluation Metric:

I. Confusion Matrix: To visualize and summarize the performance of the supervised classification algorithm.

II. ROC-AUC: For each class, to measure the trade-off between true positive (the post is correctly labeled with the class) and false positives rates (the post is incorrectly labeled with the class).

3. **Application:**

Ideally, the user can input the name/affected area of the crisis on a real-time interactive map. The system will output the relevant coordinates along with key information (missing people, infrastructure damage, displacement, donation needs, etc.).

However, due to the restricted scope of our project, the user will input a batch of unlabeled tweets of a previous crisis. The web app would collect user-defined inputs (keywords, locations, date range, etc.) to analyze and classify tweets related to crises. The outputs include classified tweet feeds (e.g., “collapsed building,” “request for medical aid”) and a pie chart that breaks down the tweet categories (e.g., 30% rescue requests, 40% infrastructure damage, etc.).

References

Imran, M., Mitra, P., & Castillo, C. (2016). Twitter as a lifeline: Human-annotated Twitter corpora for NLP of crisis-related messages. *In Proceedings of the 10th Language Resources and Evaluation Conference (LREC)* (pp. 1638–1643). Portorož, Slovenia.

Nguyen, D. T., Al-Mannai, K. A., Joty, S., Sajjad, H., Imran, M., & Mitra, P. (2017). Robust classification of crisis-related data on social networks using convolutional neural networks. *In Proceedings of the 11th International AAAI Conference on Web and Social Media (ICWSM)*. Montreal, Canada.