

CS272 Project Pitch: Humanitarian-Centric Multi-label Topic Classification from Twitter Crisis Data

Team: NLTweetRelief

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1 Project Overview

1.1 Problem Setup

Swift and comprehensive response to disaster situations is crucial for maintaining safety in society. However, it can be difficult to quickly understand the full extent of a disaster, as severity may not immediately be known. With the proliferation of social media giving everyone unfettered access to the internet, disasters are often first reported on Twitter and other social, mobile-based platforms. Improvements in deep learning have enabled scientists to track, tag, and categorize Tweets such that disaster response may be swift. In particular, connecting social media information about disasters to humanitarian causes (loss of life, injury, caution, etc.) is an ongoing body of research. However, with existing datasets few researchers have framed the problem as a multilabel classification, assuming one semantic context per tweet or message. In social media platforms without character limits (Facebook, Instagram, etc.), it is both possible and likely that messages about a crisis may span multiple topics. Models that can tag text with several labels, as well as localize the information relevant to that tag, are indispensable for organizing information about a crisis for later dissemination.

Multilabel classification has been done before (Schulz et al., 2014), however, it was done using TF-IDF vectors with a neural network. Multiple unsupervised information extraction from crisis twitter data has also been done before, to rank the importance of tweets (Interdonato et al., 2018). Multiple methods to decide whether tweets during crisis are relevant or not exist (Kruspe et al., 2020), as well as methods to map crises using twitter's geolocation data (Middleton et al., 2014) as well as methods to create reports from these datasets (Di Corso et al., 2017).

1.2 Proposed Approach

On April 8, 2021, HumAID (Imran and Ofli, 2021) - the largest collection of disaster related tweets - compiled and annotated for a variety of humanitarian sub-incidents (loss of life, injury, property damage, etc.), was released. We feel this presents an unique opportunity to develop a multilabel NLP system that can also extract text relevant to each detected tag. Since each tweet in our dataset is aligned with a single humanitarian label, we would define a data augmentation approach protocol samples are sets of tweets (1 to k) with corresponding labels indicating the category and the text associated with it. After training this data on all disasters up to 2017, we would evaluate the system on messages from disasters occurring from 2018 onward. We will likely make use of a transformer-based model trained on general text and may also embed the original tweets using a crisis-specific embedding model (Nguyen et al., 2017).

1.3 Evaluation Plan

For the traditional classification performance on the multilabel objective, a log-loss or cross entropy can be utilized to extract how well the model generalizes in its multilabel objective. In addition, a word error rate across the extracted messages will determine how precise and complete the textual extractions were for each label.

1.4 Computational Requirements

Our datasets will likely fit in 10GB of RAM during experimentation and we will probably leverage GPU support via one of the ICS Computing servers available to us. Storage space for our solutions will represent less than 2 GB.

References

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