Narratives and Needs: Analyzing Experiences of Cyclone Amphan Using Twitter Discourse

Ancil Crayton, João Fonseca, Kanav Mehra, Michelle Ng, Jared Ross, Marcelo Sandoval-Castañeda, Rachel von Gnechten

International Water Management Institute

1 Abstract

People often turn to social media to comment upon and share information about major global events. Accordingly, social media is receiving increasing attention as a rich data source for understanding people's social, political and economic experiences of extreme weather events. In this paper, we contribute two novel methodologies that leverage Twitter discourse to characterize narratives and identify unmet needs in response to Cyclone Amphan, which affected 18 million people in May 2020.

2 Motivation

We harness Twitter data to inform and assist on-the-ground relief efforts. Specifically, we propose two methodologies to (1) identify who and what is shaping the narratives around Cyclone Amphan and (2) identify unmet needs of people affected by Cyclone Amphan. We find this work to be particularly important during times when on-the-ground efforts are hindered (e.g. COVID-19).

We took Cyclone Amphan as our use case in exploring the potential for Twitter content to target relief efforts in response to extreme weather events. We first aimed to characterize how collective knowledge about Cyclone Amphan was produced on Twitter. Considering Twitter is a decentralized microblogging platform, anyone can add their commentary to an issue, influence its narrative and build new layers of interpretation for on-the-ground realities.

3 Data

We query around 470k tweets from the Twitter API over the time period of May 1, 2020 - June 15, 2020 with keywords 'Cyclone', 'Amphan', 'Cyclone Amphan', and 'Hurricane', adjusting the query to account for multiple spellings and language- and location-specific noise. We query data in four languages, including English, Hindi, Odia, and Bengali.

4 Methodology

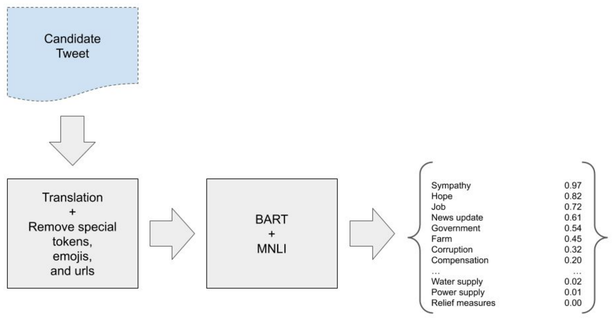
Preprocessing Tweets

i. Translate non-English tweets to English using the Google Translate API
ii. Remove URLs
iii. Remove reserved tokens such as 'FAV', 'RT', hashtags, and emojis
iv. Remove punctuation
v. Remove all stopwords based on the NLTK stopword list
vi. Lemmatize remaining words using NLTK's WordNetLemmatizer

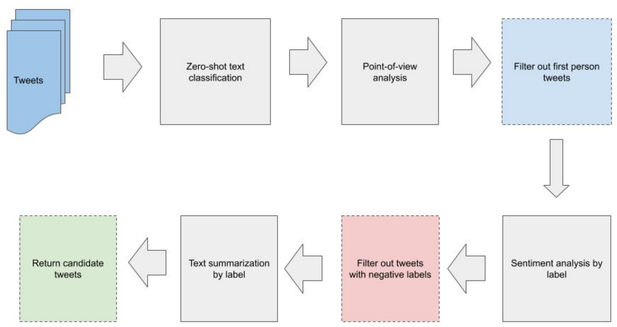
Feature Extraction

i. Point of view extraction to extract first person tweets
ii. Sentiment analysis using VADER
iii. Zero-shot classification using Yin et al. (2019) approach
iv. Embed tweets and users using Doc2Vec

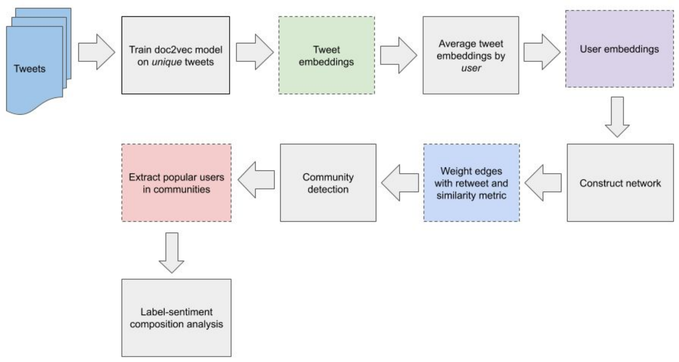
Zero-shot Text Classification Pipeline



Identifying Negative Experiences and Unmet Needs



Identifying Narratives and Influential Users



5 Results

Negative Experiences and Unmet Needs

Tweet Full Text	Label	Sentiment	Location
@siddhagroup Plz don't fool people. We r residents of Siddha Galaxia Oceania block. We r suffering from poor quality windows, bedrooms of residents flooded during Amphan cyclone. Lifts are not working since Amphan cyclone. No update from Siddha when the lifts will be repaired. Shame on u.	Housing	-0.8589	Kolkata, India
@PMOIndia @narendramodi Khejuri Block II in East Medinipur District,West Bengal is completely deatroyed caused to Amphan Cyclone Yesterday. Almost 250 Homes has been destroyed completely. I request to all Administrator to look into this area so that Khejuri Block II gets Proper help this time atleast.	Housing	-0.6326	Kolkata, India
This year, we will undergo huge crisis of food n income bcoz of Rabi crop loss n delay of kharif crop bcoz of Cyclone & Covid 19. We request @CMO_Odisha @Food_Odisha @stscdev to support us in this distress n provide crop insurance, food grains n crop storage @MoSarkar_Odisha	Farm	-0.7964	Odisha, India
@TimesNow After amphan the situation in Kolkata: No power for five days in the Tollygunge area. TMC goons beating up women for protesting. The councellor of ward 96 making fake promises. Please telecast this in your channel. We want a response. For the la	Criticism	-0.6124	Kolkata, India

Table 1. Sample of tweets from the negative experiences and unmet needs analysis. These results are from text summarization algorithm on first-person tweets over labels that have negative median sentiment scores - 'housing', 'farm', and 'criticism'. We set *K=50*. Our approach allows us to identify cases of home damage, including flooding and major destruction specifically in the Siddha Galaxia Oceania and Khejuri II blocks of Kolkata, India, respectively.

Narratives and Influential Users Results

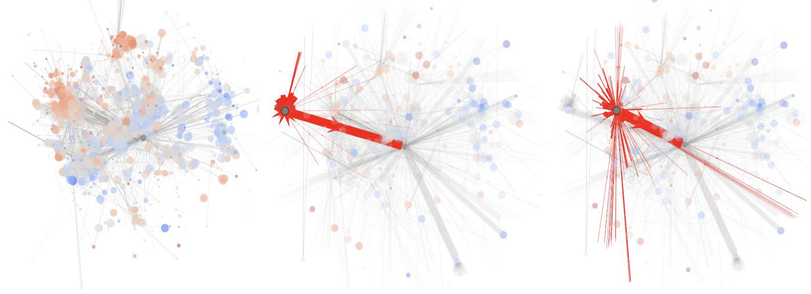


Figure 1. Twitter's user network, based on tweets related to Cyclone Amphan. Legend (left to right): (a) Sampled user network, node size varies according to the number of tweets related to Amphan, (b) with influential user Priyanka Gandhi Vadra highlighted, (c) influential user Narendra Modi highlighted. In both (b) and (c) node size varies according to the number of followers. All figures are sampled to 2000 edges. Specifically, Priyanka Gandhi Vadra (shown in Figure 3b), shows a similar type of discourse to the one of Narendra Modi (shown in Figure 3c), but with an opposite sentiment score (Priyanka Gandhi has a mean sentiment score -0.59, whereas Narendra Modi has 0.43). The discourse types followed by the two users are reflected based on their spatial proximity in the network. Priyanka Gandhi Vadra is the general secretary of the All India Congress Committee, an opposition party to the one of Narendra Modi, Bharatiya Janata Party.

6 Future Work

- **We plan to integrate this analysis into an end-to-end system that can be leveraged by disaster relief organizations, policymakers, and other researchers**
- **Validate the results of negative experiences and unmet needs pipeline and the zero-shot text classification approach using crowdsourcing methods**
- **Compare findings of our approach with on-the-ground efforts and needs-based assessments**