



Identifying Crisis Response Communities in Online Social Networks for Compound Disasters: The Case of Hurricane Laura and Covid-19



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Introduction

- On August 27, 2020, in the middle of the Covid-19 pandemic, hurricane Laura, one of the strongest and deadliest "Category 4" hurricanes, made landfall with peak intensity in Cameron, Louisiana.
- Social media platforms (SMPs) play an important role in disseminating information during disaster.
- People can reach and connect with more individuals in less time, which explains the recent surge in the use of online social media during disasters.
- The crisis worsens when there is a communication gap between vulnerable communities and emergency management agencies.

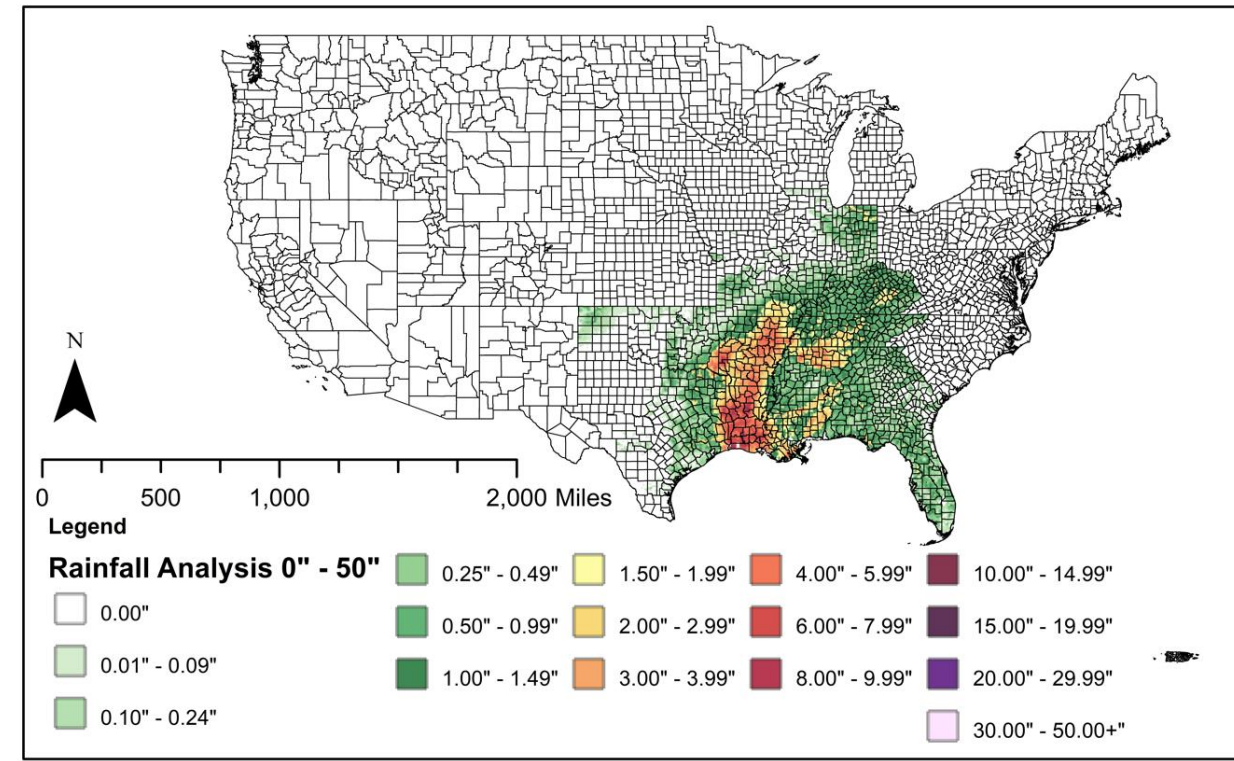


Figure 1: Heavy Rainfall due to Hurricane Laura

Objectives

Identifying the communication pattern during a compound hazard: Hurricane Laura in the middle of Covid 19 pandemic

Research Questions

- Who are the agents of the social network, and what are their communication patterns?
- How does crisis communication differ from one community to another community?
- What is the role of different agencies in the social network?

Methodology

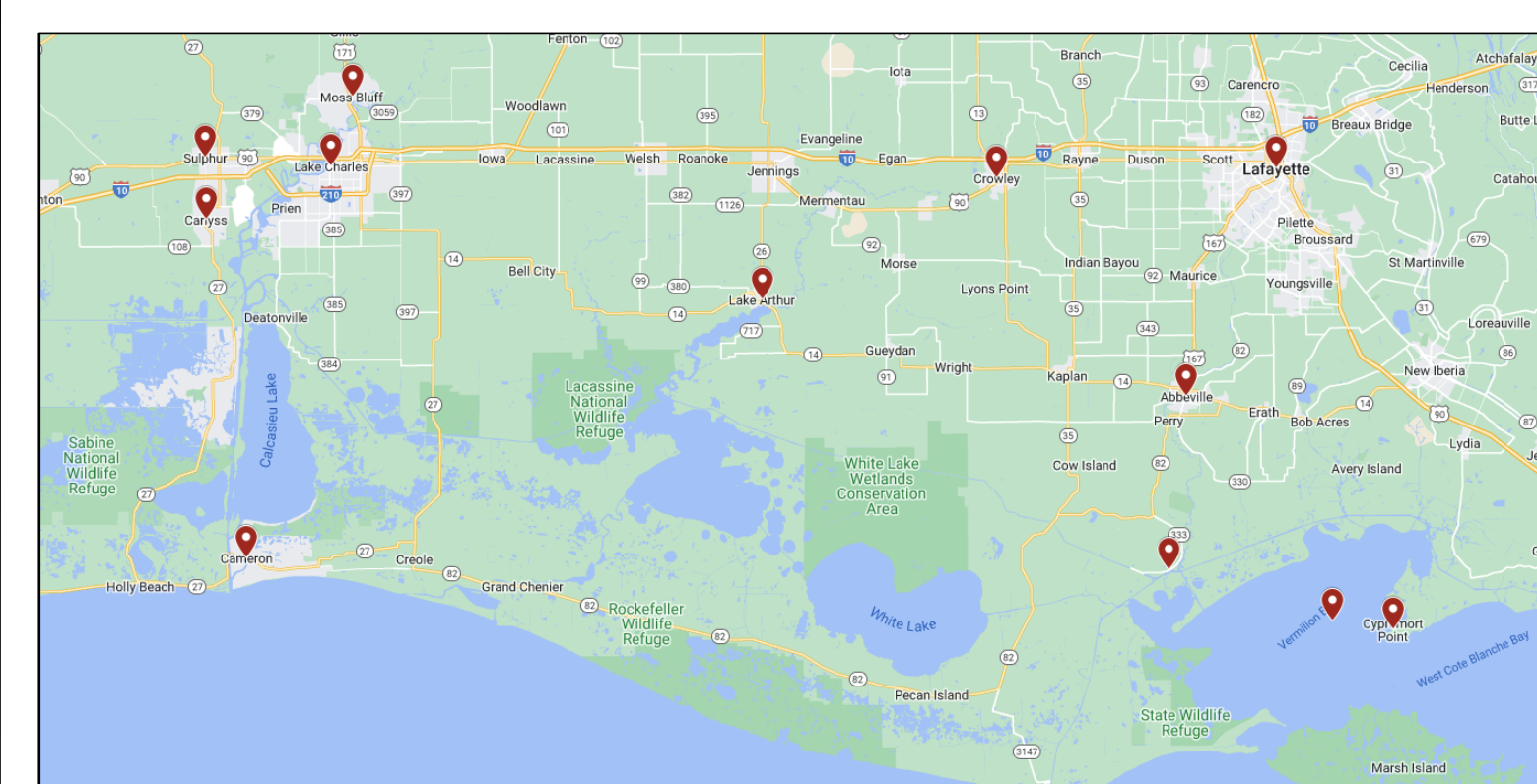


Figure 2: Severely Impacted Areas in Louisiana by Hurricane Laura

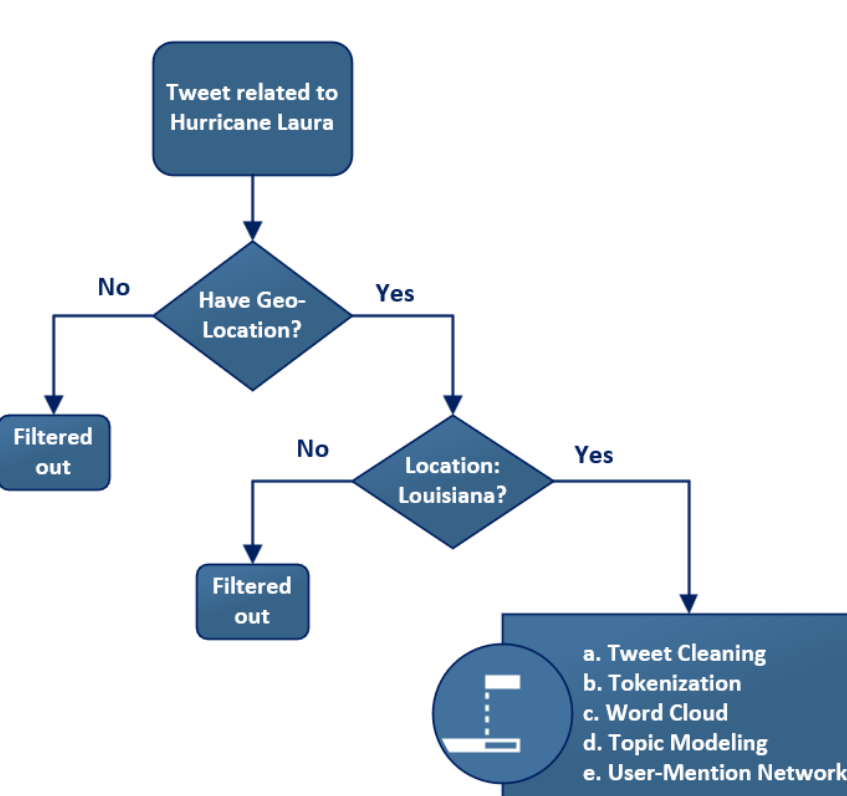


Figure 3: Framework of the study

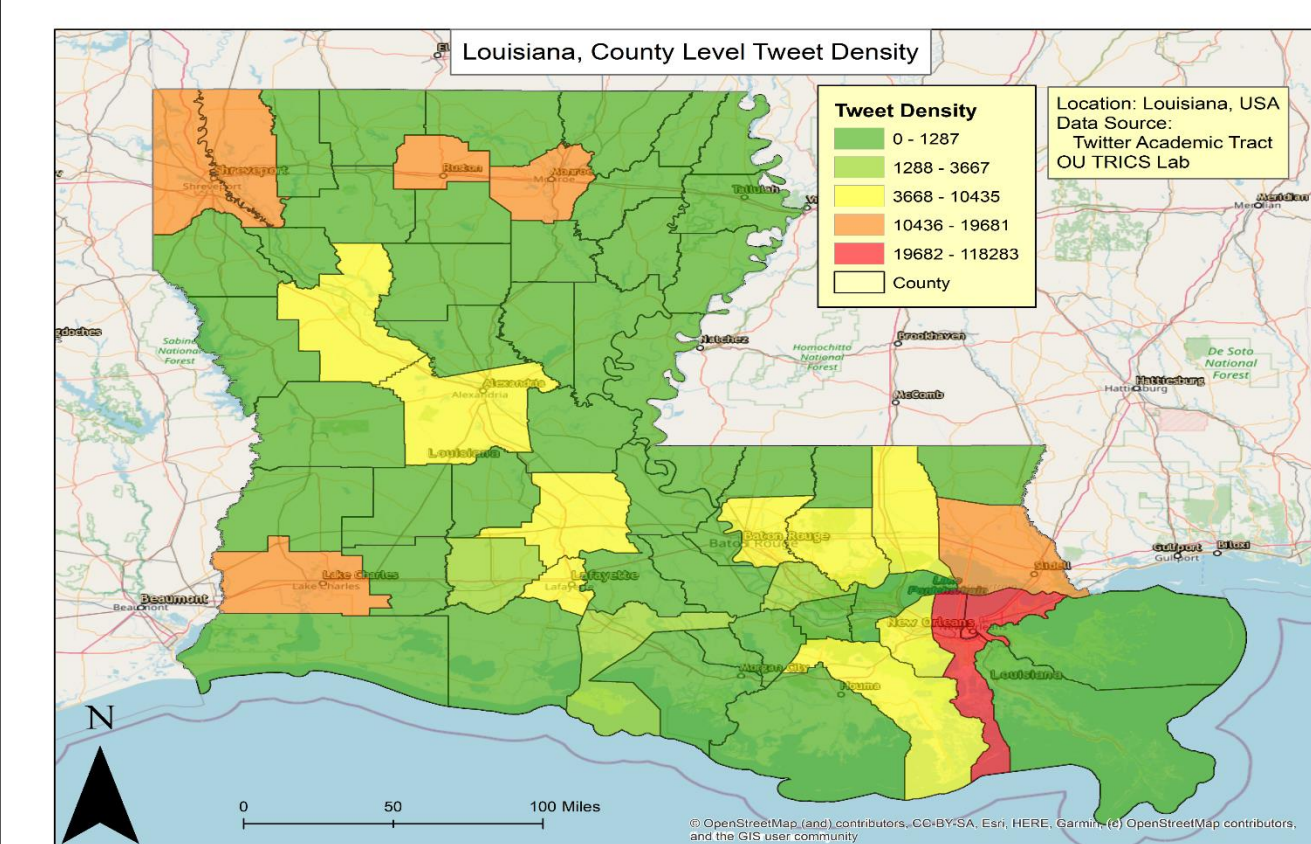


Figure 4: County Level Tweet Density

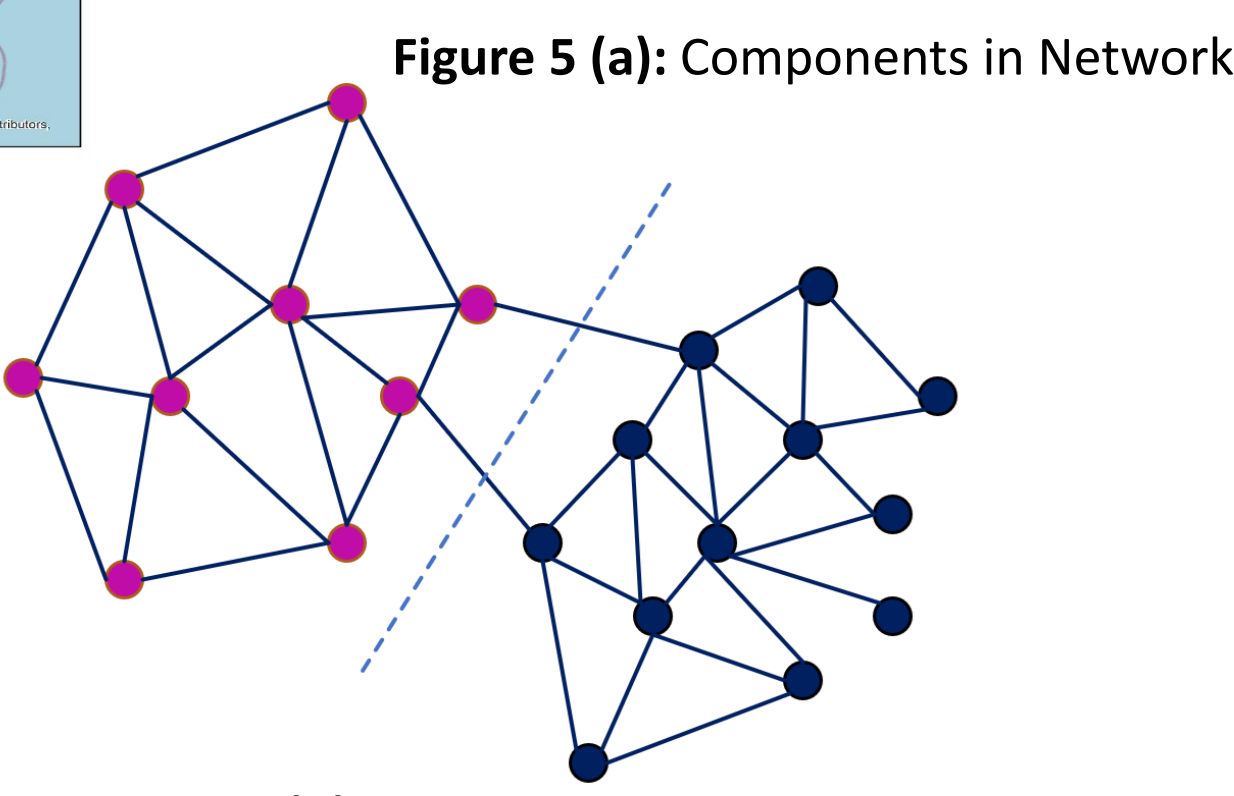


Figure 5 (b): Community in Network

Analysis Tools

- Temporal Analysis with Sentiment Ratings
- Word cloud Heatmap
- User-mention Network
- Community Detection
- Word Bigram
- Topic Modeling

Results and Discussions

Temporal Heatmaps

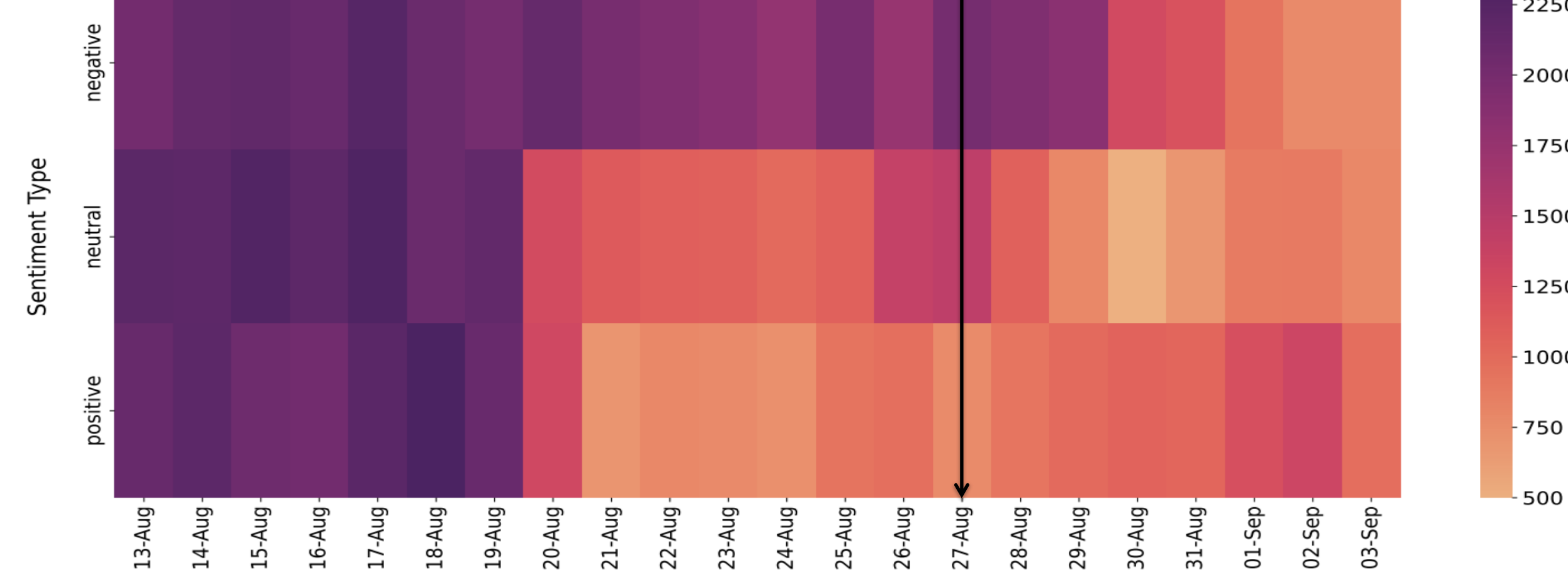


Figure 6: Temporal heatmaps of tweet sentiment type

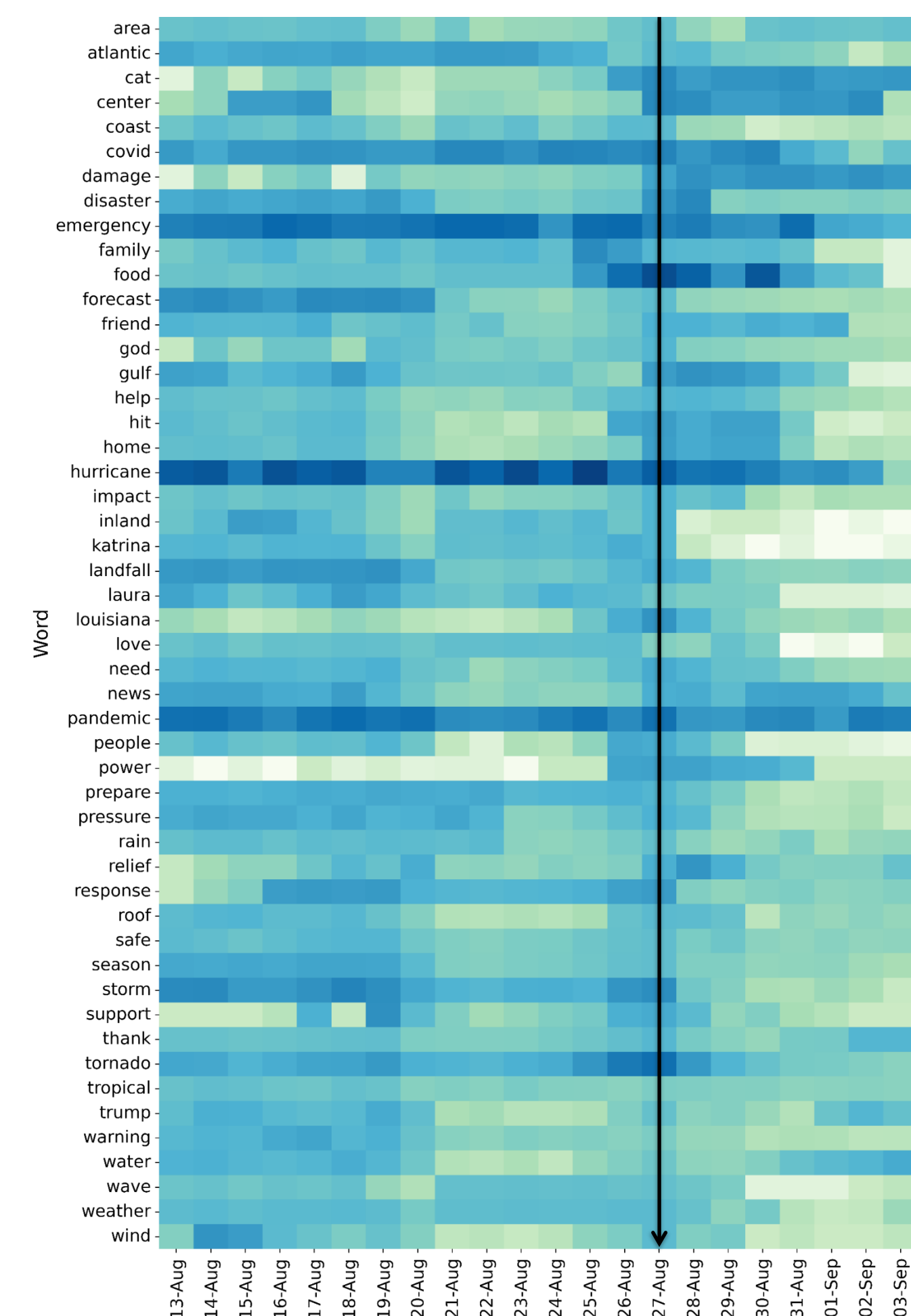


Figure 7 (a): Temporal heatmaps for top 50 words

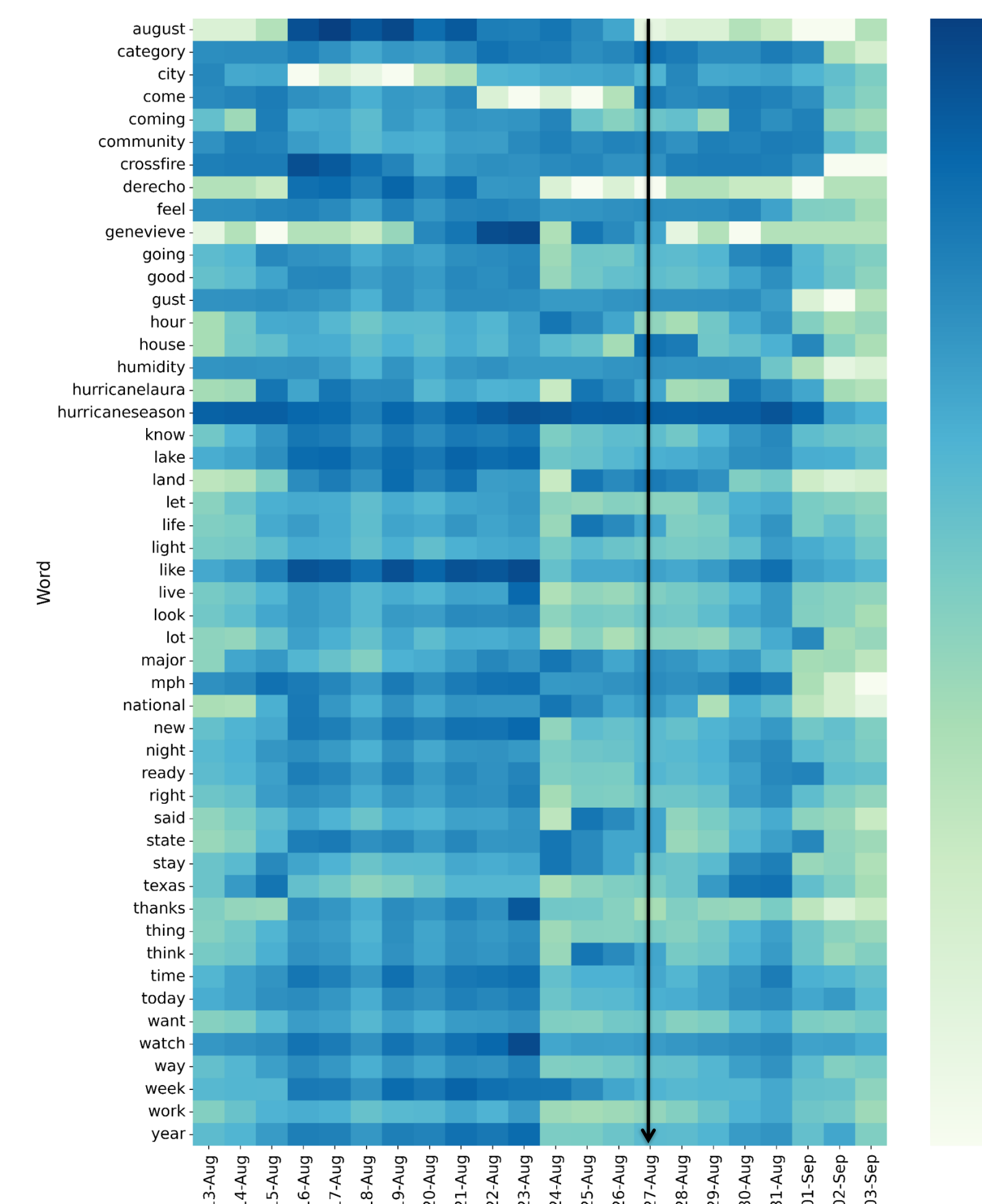


Figure 7 (b): Temporal heatmaps for top 51 to 100 words

Community Detection

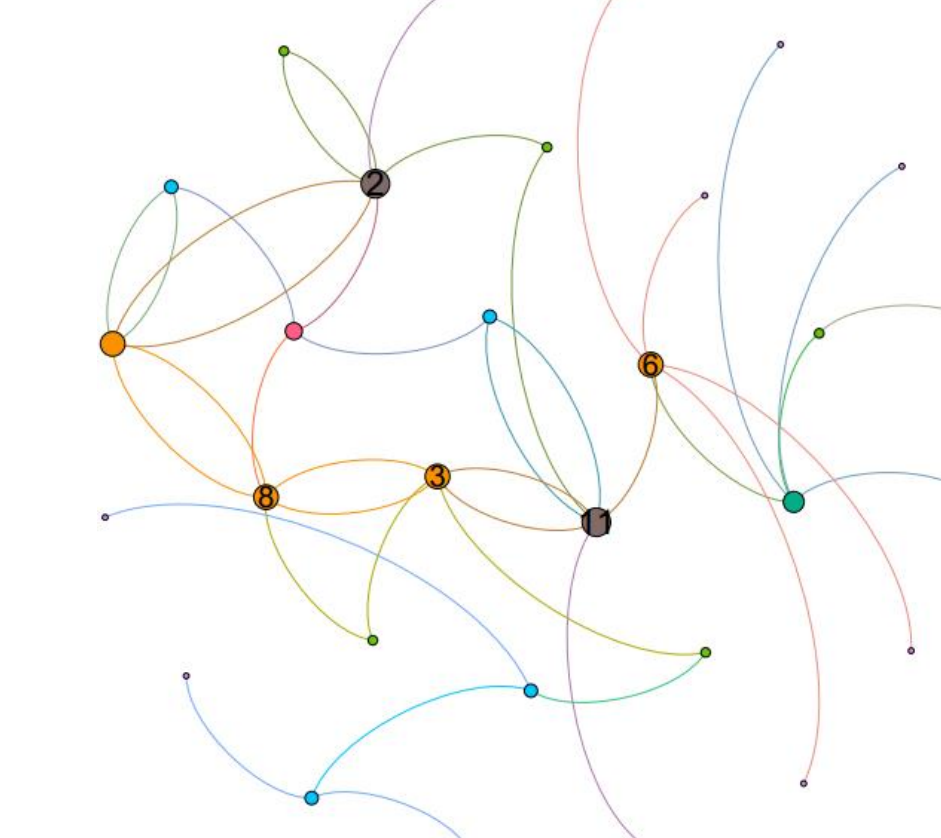


Figure 10 (a) Community 1: Sports page (L.C. Pride Basketball), Athletes, online news portal (12 News now), journalist, Food Bank to Fight Hunger

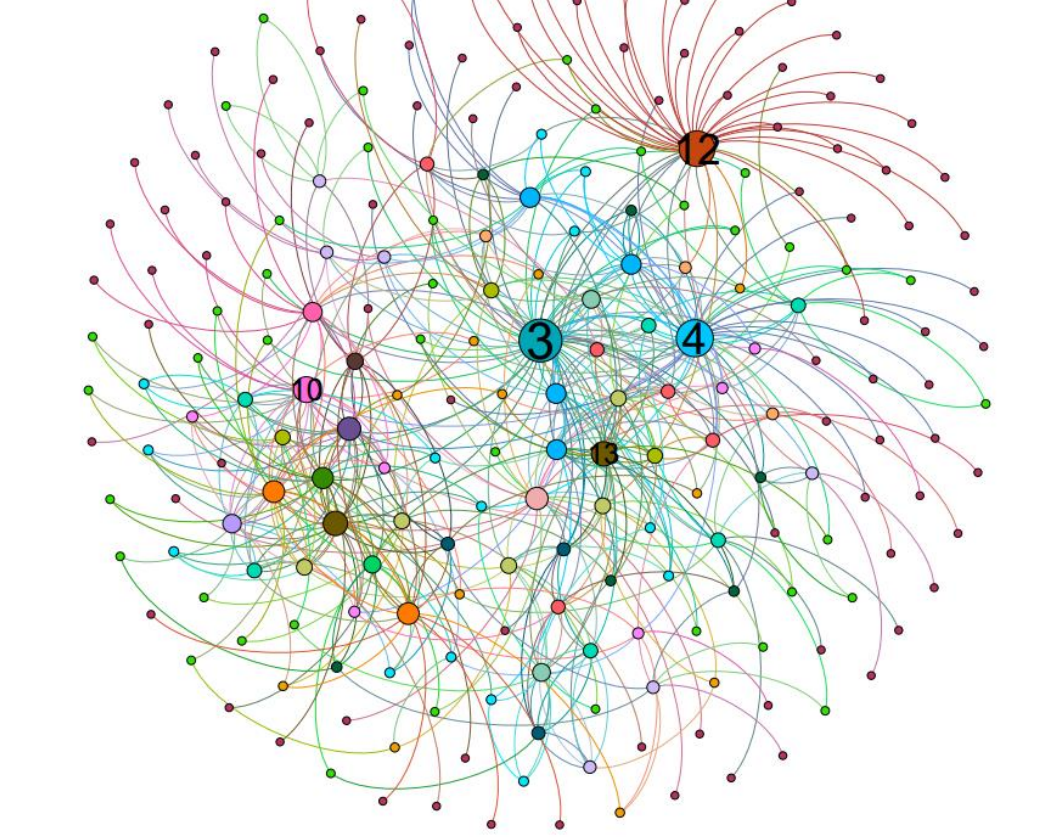


Figure 10 (b) Community 2: TV. news channel (CNN), Educator, Louisiana watershed flood center, social organization (Kappa Sigma)

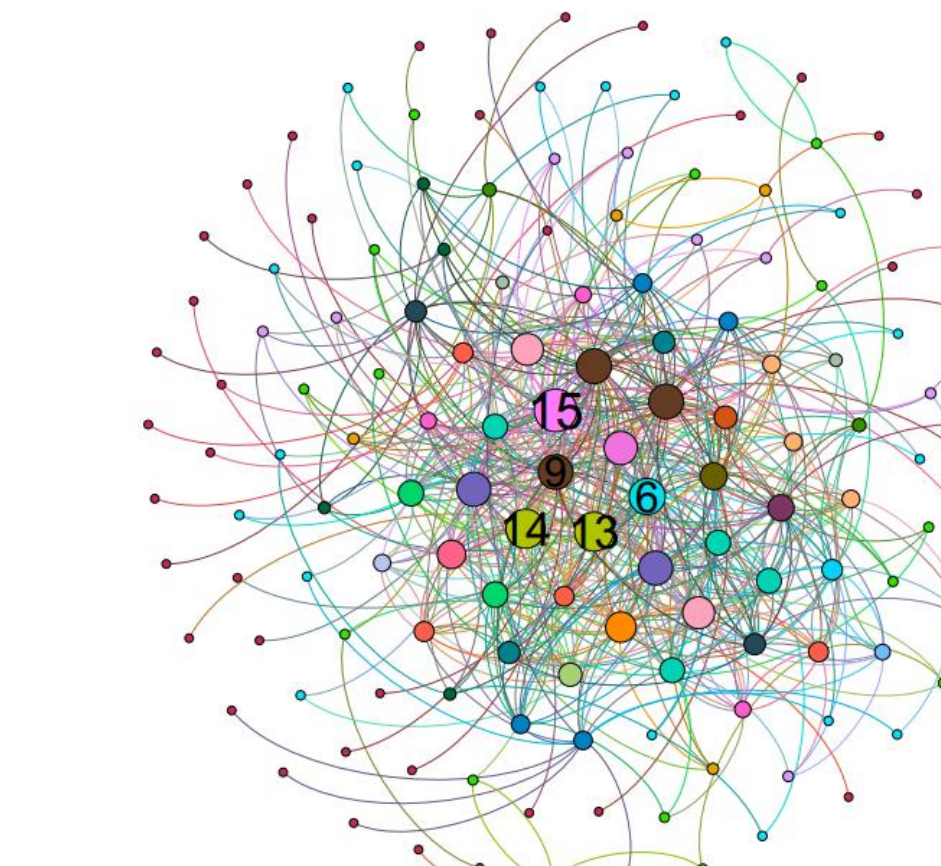


Figure 10 (c) Community 3: National Weather Service Office Lake Charles, University of Louisiana at Lafayette Black Male Leadership Association, Radio Station (Mustang 107.1, 1063 radio Lafayette), KLFY-TV, Fox 15

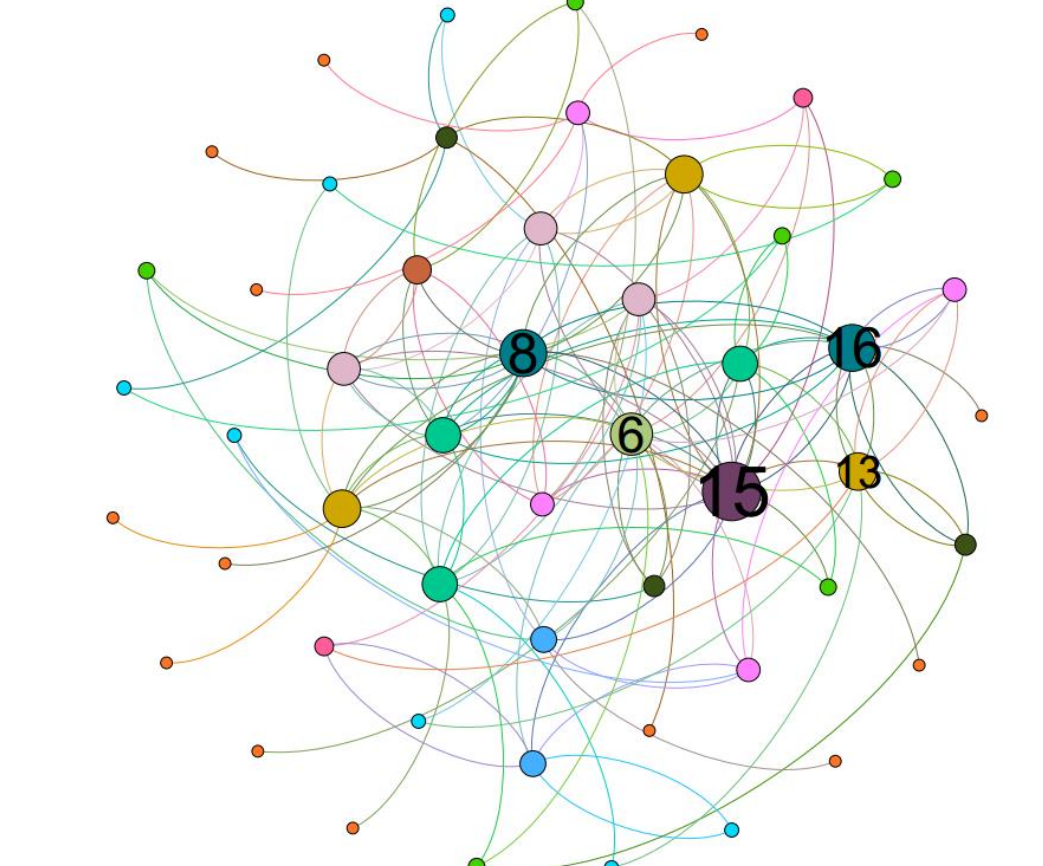


Figure 10 (d) Community 4: National Incident Management Systems and Advanced Technologies, News, Beacon Club

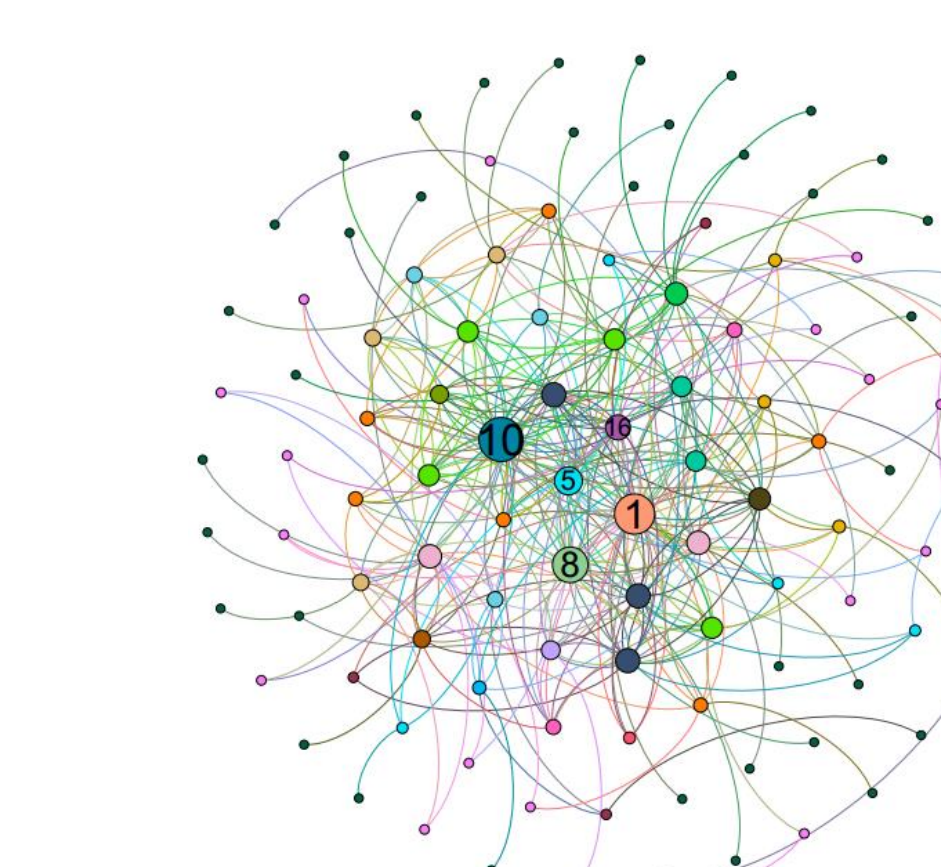


Figure 10 (e) Community 5: Louisiana Business Emergency Operations Center, The City-Parish of Lafayette, KPLC7News

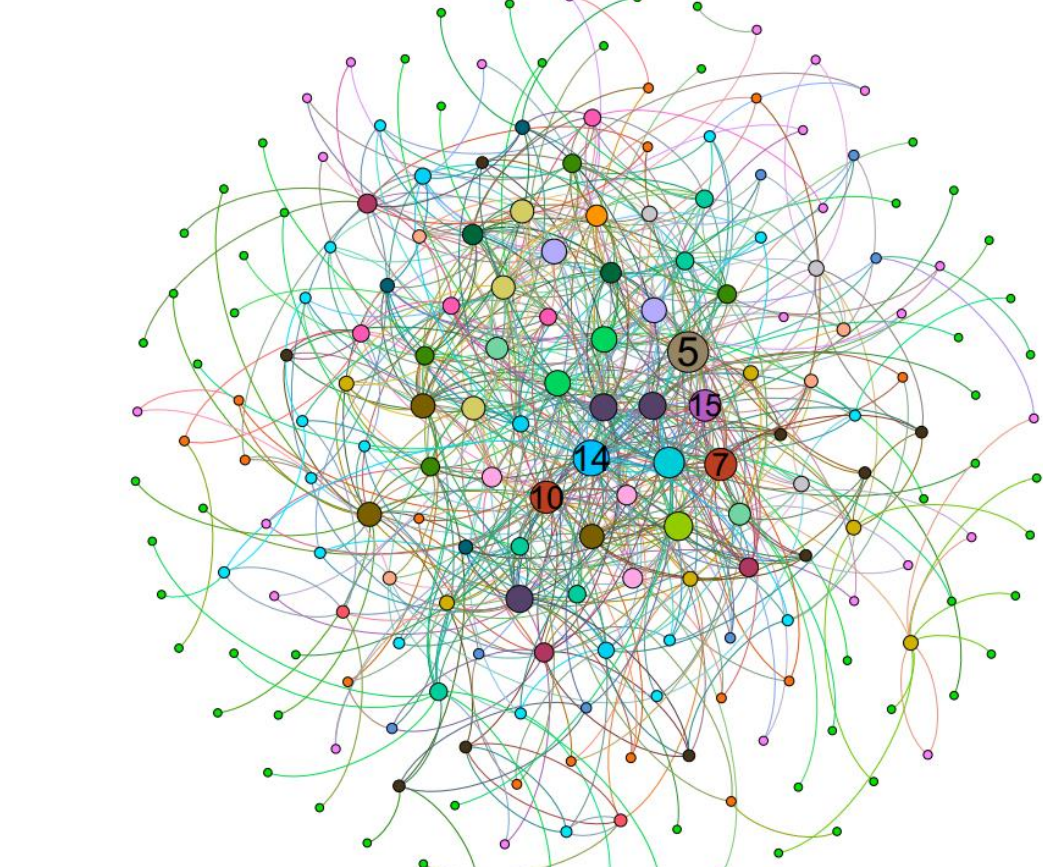


Figure 10 (f) Community 6: Memorial Health System, Lafayette Utilities System, KATC TV, Latest News



Figure 10 (g) Community 7: KLFY-TV, Utility System, Townsquare Media Station, McNeese Football

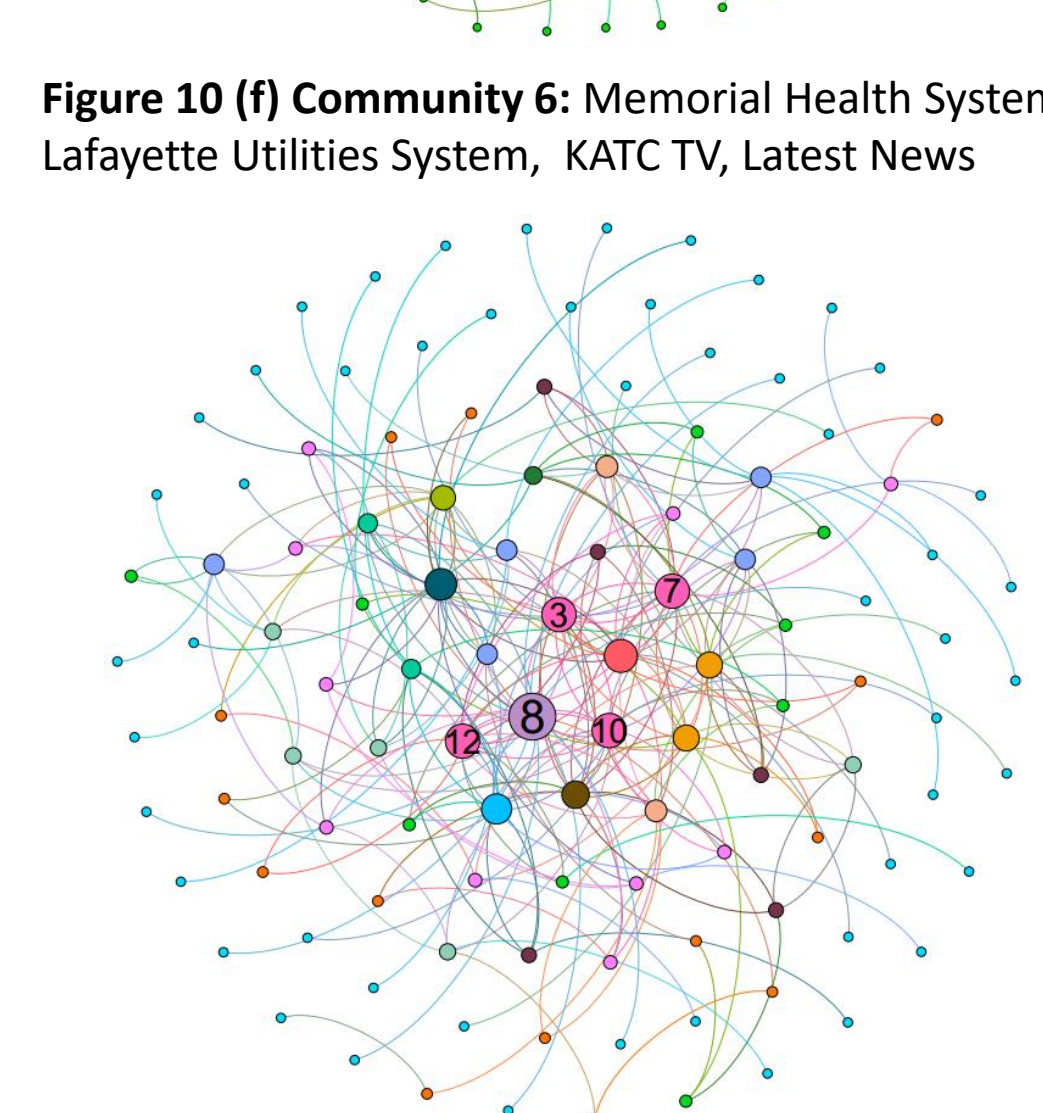


Figure 10 (h) Community 8: News @ Lake Charles, McNeese State University, Fox 4, United Way of Acadiana

Network Analysis

Network Properties

Nodes: 10,614
Edges: 16,923
Avg. Degree: 1.69
Diameter: 12
Components: 21
Communities: 78

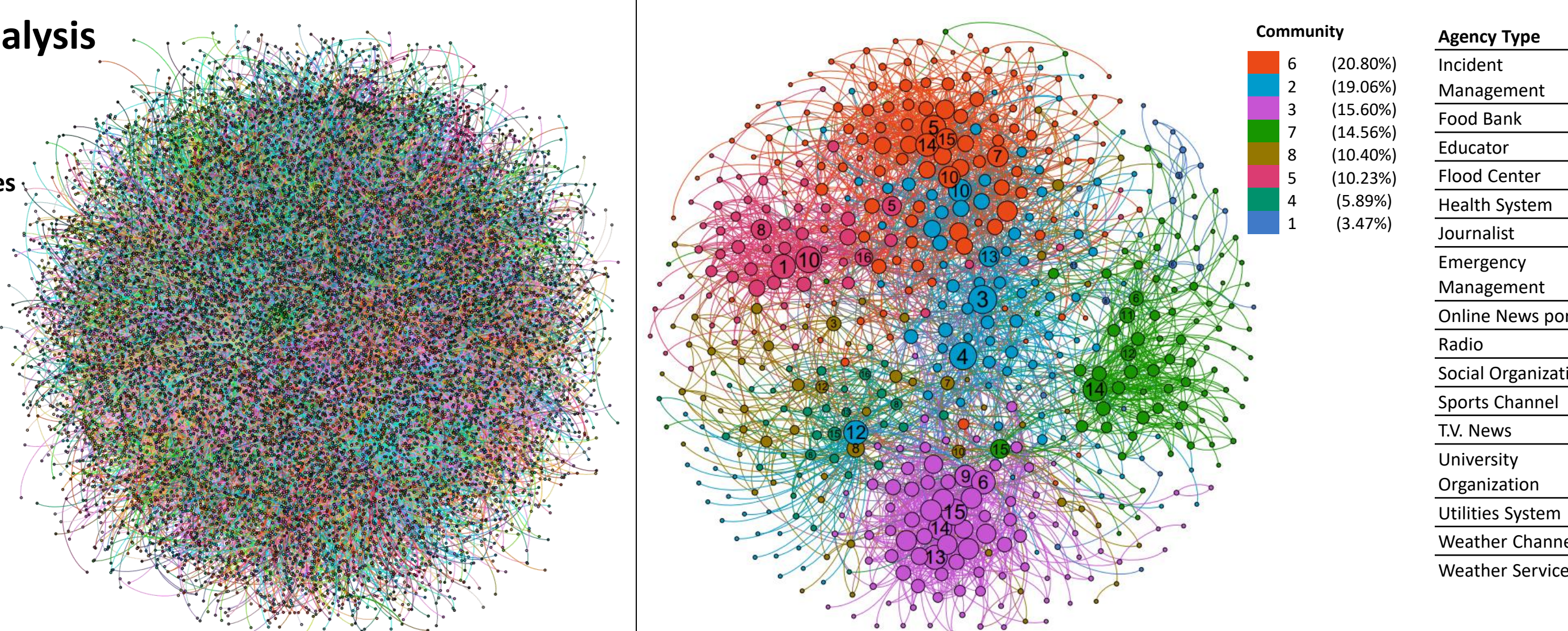


Figure 8: Hurricane Laura User-Mention Directed Network

Figure 9: Subgraph: Largest Component of User-Mention Directed Network

Conclusions and Key Insights

- Sports channels, university clubs, utility systems, weather channels, social organizations, health systems, and online news portals are the most connected and influential node in their respective communities.
- Although emergency management and law enforcement agencies play a critical role in responding to such emergencies, the online communities found in this study revealed that university-related organizations, social organizations, distinct journalist, TV channels, news portal, weather service, sports page were found very active in the social network.
- The most common topic of conversation in each community is utility disruption (i.e., power, internet, water, gas), followed by property damage; however, each community has its own unique conversations, such as evacuation, insurance coverage, election campaign, fundraising, and so on.
- The twenty-one components found in this study indicate that there is twenty-one isolated group with poor engagement. In future crisis communications, this communication gap should be addressed.
- Emergency management and law enforcement agencies should be more active on social media, in addition to their physical presence. They can reach out to more people in a shorter period and learn about their necessities through social media.

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