Public Engagement with Official-Source Content in Crisis

Tristin Glunt
Department of Computer Science
University of New Mexico
tglunt@unm.edu

Marina Kogan
Department of Computer Science
University of New Mexico
mkogan@unm.edu

ABSTRACT

Authoritative online information is especially important in disaster, when social media users are seeking out time- and safety-critical information. In this work we investigate how people engage with the posts by authoritative accounts that fall into five social roles—politicians, government agencies, media, weather experts, and humanitarian organizations. More specifically, we explore whether in their disaster-time sensemaking activities social media users engage with the content from different types of authoritative sources differently, and why. We find that tweets by politicians garner most replies and shares, but not due to prevalence in them of tweet features that facilitate visibility and engagement—hashtags, URLs, and images. We find that while higher popularity of political accounts plays a role in higher engagement, it does not fully explain the differences. Preliminary qualitative analysis suggests that politicized event-related posts by politicians and politicized public response to their even innocuous tweets may affect engagement.

INTRODUCTION

Social media platforms are being increasingly used by the public in disasters arising from natural hazards for a variety of purposes. Sociologists of disaster have long pointed out that people directly affected by the crisis events are the true first responders, as they actively participate in the rescue and recovery efforts [4]. They also actively engage in the sensemaking activities [11], through discussing, verifying, and sharing information if it is helpful and trustworthy—whether

CHI'19 Extended Abstracts, May 4-9, 2019, Glasgow, Scotland, UK.

ACM ISBN 978-1-4503-5971-9/19/05.
DOI: https://doi.org/10.1145/3290607.3313061

KEYWORDS

Crisis Informatics; Computer-Supported Cooperative Work; Social Computing; Social Media.

because of the relevance of the content or due to the authoritativeness of its author. Trustworthiness of sources is especially important in disaster, when people seek out and engage with time- and safety-critical information [10], and thus often turn to official government and media sources [5, 6, 9]. Therefore, in this work we focus on how people engage with the content of authoritative sources.

Furthermore, in the context of the social disruption associated with disasters, well-established social roles become an especially important source of trust and social stability [11]. Different types of authoritative sources— journalists and politicians, for example— occupy different roles in the disaster-related information landscape and so may attract different kinds of engagement from the public. Thus, in this work we investigate how people engage with the posts by authoritative accounts that fall into five distinct social roles important in disaster—politicians, government agencies, media, weather experts, and humanitarian organizations. Specifically, we consider how people engage with—respond to and share—the content of these types of authoritative sources in disaster. To this end, we ask the following research questions:

- Do some types of authoritative sources get more engagement with their content than others?
- If so, (how) does the content produced by the types of authoritative sources that garner more engagement differ from that of others?
- What other factors contribute to the difference in engagement across types of authors?

BACKGROUND

Information Sharing in Crisis

A study of retweet activity in crisis found that retweets can be seen as an informal recommendation system for the content [9]. Moreover, Twitter users local to the event and the onlookers tended to recommend different types of content: while locals more frequently retweeted specific, disaster-relevant information, the global audience more often propagated the high-level, abstract view of the event. A later study has shown that this pattern of information propagation holds for a later event, affecting much more populous and diverse geographic area [6]. Qu and colleagues found that while Sina-Wiebo users used the platform during the 2010 Yushu earthquake for four major purposes —situation update, opinion expression, emotional support, and calling for action—action-related messages dominated the information that was propagated by the users [7].

Information Credibility and Engagement in Crisis

Castillo and colleagues [3] used machine learning and natural language processing techniques to evaluate credibility of tweets and found that trustworthy tweets often included URLs. This is consistent with an earlier finding by Hughes and Palen [5] that disaster-related tweets were more likely to include URLs and be retweets from media and government sources, spreading information from the confirmed credible sources. Therefore, in this work we consider whether presence of the URLs play any role in user engagement with the content of the five types of authoritative sources.

Another aspect of tweets that may contribute to how often people respond and share them

are hashtags. Research shows that hashtags produce ad hoc publics [2] and organize social media content into more coherent conversations. Making tweets on disaster-related topics easier to find, presence of hashtags therefore may boost engagement with the official content. Finally, small but burgeoning area of crisis informatics has been focusing on the role of images in the sensemaking activities in crisis. This research shows that images receive more engagement on social media than text-only content [8]. Thus, we consider how images affects engagement across the source types.

Importance of Social Roles in Crisis-Related Sensemaking

In the context of disaster, social roles become especially important. Weick suggests that shared meaning and stable social roles are mutually constitutive [11]. Thus, in the context of disaster, when the shared meaning is under threat of breakdown, established social roles provide especially vital signal for gaining trust in social media content. In this work, we focus on five types of authoritative sources to investigate if and how the five roles affect engagement with their content.

2017 Atlantic Hurricane Season

The 2017 Atlantic hurricane season was especially active and devastating: it produced ten hurricanes, six of which were classified as "major" (Category 3 or stronger with winds greater than 110 mph). Great swaths of south-eastern US, Mexico, Central America, and many island nations and territories in the Caribbean sustained extensive damage during this especially prolific hurricane season. This research focuses on the three hurricanes that made landfall classified as major—Harvey, Irma, and Maria, all of which produced massive destruction in several US states and territories, with Maria precipitating an estimated 2,975 fatalities in Puerto Rico.

DATA AND METHODS

Identifying Authoritative Sources

Authoritative sources are individuals and organizations who provide authoritative and credible hurricane information. We identified these sources both manually, employing the expertise of our collaborators at the National Center for Atmospheric Research (NCAR), and via user-created lists that compile Twitter accounts of official information. We created our manual rosters of users for each hurricane as it occurred, together with the sources that applied to all events. We also utilized public lists for Harvey and Irma, created by twitterers @mattdpearce, a national correspondent for the LA Times, and @FEMAlive, the official FEMA account that is only active during specific events.

In total, the research identified 796 Twitter accounts, 655 of which we were able to classify into one of five categories: Politicians —governors and congressional representatives for the affected states; Government Agencies—city, county, and state governments, federal emergency-response agencies (FEMA); Media —local through international news and media agencies, reporters; Weather experts; and Humanitarian Organizations—non-governmental organization that provide emergency assistance. We decided politicians and government should be separate categories, as

Table 1: Categories of Authoritative Sources

Category	*Accounts*	*Tweets*
Politicians	22 (3%)	9855 (4%)
Government	198 (30%)	46254 (18%)
Media	283 (43%)	125758 (48%)
Meteorologists	148 (23%)	80372 (31%)
Humanitarian	4 (1%)	696 (<1%)
Total	655	262935

exploratory qualitative analysis revealed that the content of their tweets differs a great deal. Source and tweet counts in the final data set for each authoritative category is shown in Table 1.

Twitter Data Collection

For each authoritative source, we collected: all tweets from the user, all tweets in reply to the user, and all retweets and quote tweets of the user's tweets. Collecting the replies and retweets of the authoritative sources allows us to study how other social media users engaged with their content. We collected this data for the period of Aug. 17-Oct. 26, 2017, starting with Harvey first forming and ending with dissipation of Maria. We are interested in public engagement at the height of disaster, thus we did not focus on the longer post-disaster response and recovery periods.

Data Analysis Methods

We constructed retweet counts for the official tweets following the method in [6]. For tweet-level variables (like retweet and reply counts), we calculated median values across all the tweets in each authoritative user category. To analyze the influence of tweet features (contains URL, hashtag, image) on the engagement, we calculated the median retweet and reply counts across the tweets within each official source category that contained (or not) that feature. We used medians and nonparametric statistical tests (Mann-Whitney, Kruskal–Wallis, Spearman's rank order correlation), as most aspects of authoritative sources and their tweets present long-tailed distributions (follower counts, retweet and reply counts). We used Bonferroni correction for multiple comparisons. For further comparison between engagement with the politicians' and media's content, we defined highly popular authoritative sources as those with 20K followers or more, based on the break in the bimodal empirical distribution of followers for the politicians.

Table 2: Median Number of Interactions

Category	*Retweets*	*Replies*
Politicians	41	3
Government	3	0
Media	1	0
Meteorologists	2	1
Humanitarian	4	0

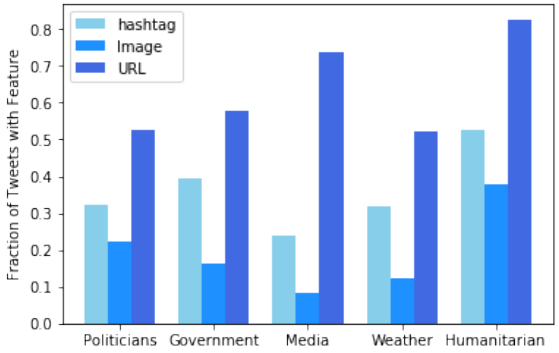

Figure 1: Percentage of tweets with useful features across the five categories of authoritative sources.

RESULTS

To determine whether content generated by different categories of authoritative sources solicited different levels of engagement from the public during disaster, we calculated median retweet and reply rates for tweets across each group. Table 2 shows that engagement is different across groups (Kruskal-Wallis, $p<<0.005$). Differences between all groups are statistically significant after the Bonferroni correction (Mann-Whitney, $p<0.005$). Table 2 shows that politicians' content garners much more interaction than that of other types of sources, both in terms of retweets and of replies. The meteorologists' content is the only other category that elicits any replies from the public, on average. This finding is rather intuitive as these sources tend to disseminate precise weather-related content, including visual representations of risk, such as hurricane path maps. Research shows that these types of images generate considerable engagement, including replies [1]. But what about the politicians' tweets that elicits such response from the public in crisis?

We next considered if the difference in engagement is due to politicians producing tweets better suited for crisis —more visible, informative, or engaging through inclusion of hashtags, URLs

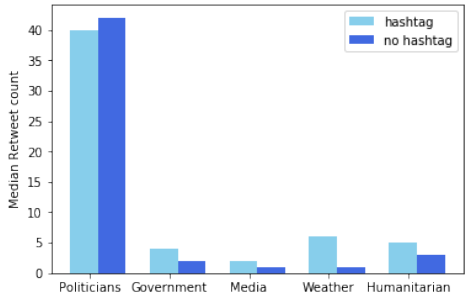

Figure 2: Median Retweet count for tweets with and without hashtags.

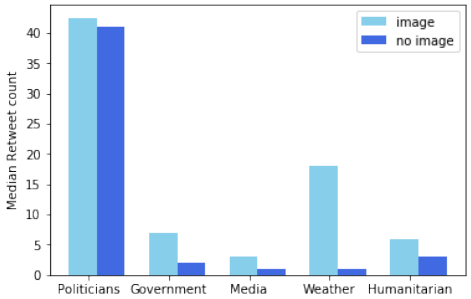

Figure 3: Median Retweet count for tweets with and without images.

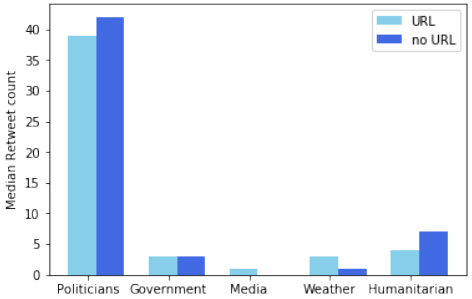

Figure 4: Median Retweet count for tweets with and without URLs.

and images. We find that the politicians do not include the most hashtags, URLs, or images in their tweets (Figure 1). Instead, humanitarian groups are using the most URLs, hashtags, and images —presumably to keep their safety-critical content visible (hashtags) and engaging (images), and to ensure its authoritative tone with the documentation from external sources (URLs).

Further, we investigated what impact including these features in tweets—hashtags, URLs, and images—has on the overall engagement. Figures 2-4 show the median retweet counts for tweets with and without those features in each category. These three figures suggest that including URLs, hashtags, and images did not garner any more retweets for the politicians (no hashtag shows more retweets, $p<0.05$). On the other hand, Figures 2 and 3 show that hashtags and images were helpful in getting more retweets for every other authoritative source category ($p<<0.001$). Similarly to retweets, politicians get more replies for tweets without hashtags ($p<0.05$), URLs ($p<0.01$), and images ($p<<0.001$), while meteorologists — for tweets with hashtags and images ($p<<0.001$).

Thus, increased engagement received by the politicians' content is not due to their tweets being better-suited for situational awareness—more visible and informative than other sources'. Besides quality of content, social media users also may engage with tweets due to the popularity or status of the author [6]. Thus, we next investigated whether politicians are more popular than other categories and if it affects how people respond and share their tweets. Figure 5 shows that the median follower count of politicians is much higher than any of the other groups ($p<<0.001$), seemingly confirming the role of popularity in engagement. However, the media have the second highest median follower count, yet, they garner the least overall interaction, on average (Table 2).

Thus, to further elucidate the role of popularity in the engagement, we focus on these two most popular groups—the politicians and the media. We divide these groups into highly-popular and regular authoritative sources (see details in Methods). We find that politicians' content still attracts more overall interaction even in the regular source subgroup (Table 3), although not to the same extent as with the highly-popular subgroup (all $p<<0.001$). Differing engagement, even while accounting for popularity, indicates that there are other factors that drive engagement with the politicians' content. Preliminary qualitative analysis of a sample of tweets suggests that politicians tend to more often refer to political topics even when communicating about disaster, while the general public also more often takes the conversations with them into a political direction.

DISCUSSION AND FUTURE WORK

Overall, we found that in crisis people engage differently with the content from various types of authoritative sources and identified some of the features that contribute to increased interaction with the politicians' tweets. Prominent political figures can be important sources of information in disaster, as their extensive follower networks expose vast swaths of people to their content. Politicians are also, in most cases, reliable sources of information, including the time- and safety-critical disasters-related content. However, we found that politicians do not often construct tweets with features that have been shown to be useful in crisis: hashtags for navigating large-scale conversations [2], URLs for relaying vetted and organized information [5], and images for communicating risk [1] and being more engaging [8]. We found other official sources being better

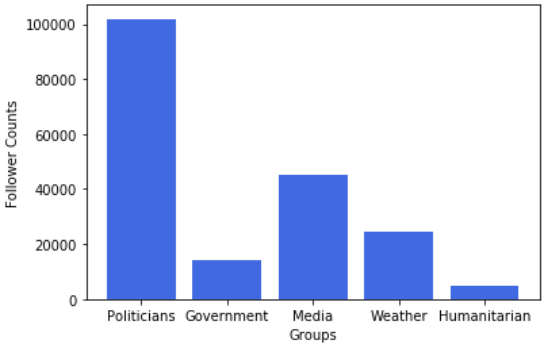

Figure 5: Median follower count across the five categories.

Table 3: Median Number of Interactions across Levels of Popularity

	Highly-Popular	*Regular*
		Retweets
Politicians	51	7
Media	2	0
		Replies
Politicians	5	0
Media	0	0

ACKNOWLEDGMENTS

We thank Rebecca Morss, Julie Demuth, Heather Lazrus and all our colleagues at NCAR for their collaboration on our larger research program on Communicating Hazard Information in the Modern Environment (CHIME). We thank Leysia Palen, Kenneth Anderson, Jennings Anderson, Melissa Bica and all our colleagues at the University of Colorado Boulder for their help in data collection.

at incorporating these features into their content: weather experts extensively make use of images, including those that communicate disaster risk and uncertainty [1], and those image tweets drive public's engagement with these accounts. In the social media environment where so many signals compete for users' limited attention, especially in crisis, highly-visible sources like politicians should ensure they are producing useful, quality content, and platform designers should employ mechanisms of visibility that foreground the authoritative voices that produce informative posts.

We found that popularity alone does not explain increased interaction with the politicians' content either. It is encouraging that users do not only focus on their most popular friends' tweets, yet it is still unclear what drives the engagement. Our preliminary qualitative analysis shows that politicians tend to post about disaster situations in more political terms, making them more controversial and potentially driving engagement. Even non-controversial tweets by politicians still often elicit politicized response, consistent with a finding that many replies to the official sources in 2017 hurricanes were about climate change, FEMA leadership, and other politicized topics [1].

These preliminary findings pose an interesting question for further investigation—what exactly drives engagement with politicians' tweets in disaster. Labeling of tweets across the five groups for nuanced aspects such as tone, controversy, and partisanship is a promising approach. Producing such a dataset would also enable NLP contributions—using sentiment analysis, named entity recognition, and word embeddings—that could automatically classify content as prone to high engagement in crisis. Our results also point to interesting aspects of the content produced by meteorologists and humanitarian organizations. Further analysis of tweet features that tend to drive engagement for these groups would make a valuable contribution to crisis informatics.

REFERENCES

[1] Bica, M., Dykes, J., Demuth, J., & Palen, L. Communicating Hurricane Risks: Multi-Method Examination of Risk Imagery Diffusion. .In *Proc. of CHI'2019.*

[2] Bruns, A., and Burgess J. E. (2011). The use of Twitter hashtags in the formation of ad hoc publics. In *6th European Consortium for Political Research General Conference,* 25-27 August 2011, University of Iceland, Reykjavik.

[3] Castillo, C., Mendoza, M., & Poblete, B. (2011, March). Information credibility on twitter. In *Proc. of WWW'2011.*

[4] Dynes, R. R. (1970). *Organized behavior in disaster*. Heath Lexington Books.

[5] Hughes, A. L., & Palen, L. Twitter adoption and use in mass convergence and emergency events. *International Journal of Emergency Management*, *6*(3), (2009), 248-260.

[6] Kogan, M., Palen, L. & Anderson. K. 2015. Think Local, Retweet Global: Retweeting by the Geographically-Vulnerable during Hurricane Sandy. In *Proceedings of* CSCW '15, 981-993.

[7] Qu, Y., Huang, C., Zhang, P., & Zhang, J. (2011, March). Microblogging after a major disaster in China: a case study of the 2010 Yushu earthquake. In *Proceedings of CSCW'2011.*

[8] Rogers, S. 2014. What fuels a Tweet's engagement? (2014). https: //blog.twitter.com/2014/what-fuels-a-tweets-engagement

[9] Starbird, K., & Palen, L. (2010). *Pass it on?: Retweeting in mass emergency*. International Community on Information Systems for Crisis Response and Management.

[10] Tapia, A. H., Bajpai, K., Jansen, B. J., & Yen, J. (2011). Seeking the Trustworthy Tweet: Can Microblogged Data Fit the Information Needs of Disaster Response and Humanitarian Relief Organizations. In *Proceedings of ISCRAM 2011.*

[11] Weick. 1993. The collapse of sensemaking in organizations: The Mann Gulch disaster. In *Administrative science quarterly*, 628-652.