Public Cognition and Perception on Social Media in Crisis

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Crisis Informatics, Social Media Data, Risk Communication, Collective Attention, Risk Perception, Protective Action Decision Model, Word Embedding, BERTopic

EXTENDED ABSTRACT

Microblogging platforms have been increasingly used in crisis, facilitating more participatory communication between official response channels and affected communities. Despite the potential benefits, research has shown that disaster response organizations could not effectively utilize social media data due to data deluge (Knox 2022). To better understand the information needed for disaster response, we turn to the National Incident Management System Guidance for public information officers (PIOs) (*NIMS Basic Guidance for PIOs* 2020), the primary spokesperson for emergency management organizations. The guidance indicates that PIOs use social media for two major purposes, supporting their operational needs and gauging public perception of risk and incident response. To support the operational needs, the crisis informatics literature has heavily focused on information types supporting situational awareness, including serviceable, eyewitness or actionable information. However, the information representing public perception, such as people's cognitive and perceptual processes in response to incidents, has been less addressed at scale.

To bridge the gap between quantitative study in crisis informatics and information representing cognitive and perceptual processes and better support the task of PIOs, I focus on the study of people's cognitive and perceptual processes on social media for my research. Cognitive and perceptual processes refer to the way that people pay attention to or process environmental inputs, including the mental activities of acquisition, processing or evaluation of environmental cues, social cues, and warnings. These processes reveal people's perception of- and decision-making in response to potential threats. With this focus, I seek to answer the following research question: How could people's cognitive and perceptual processes be inferred from their social media activities in crisis to benefit stakeholders in incident response?

My interest in tracing this overall theme through a varied range of sub-tasks produces three more specific research questions:

RQ1. How can information exposure and attention be operationalized to highlight cognitive and perceptual processes?

RQ2. How do people's perception of risk communications from stakeholders vary in crisis?

RQ3. How could a principled and scalable pipeline be designed to identify people's cognitive and affective perceptions on Twitter?

I took cues from the Protective Action Decision Model (Lindell and Perry 2012) and leveraged baselines in the literature to address these research questions. To address the first research question, I proposed a metric that conceptualized and operationalized the predecision process. The proposed metric was incorporated into a pipeline and applied to two real-word events to recommend messages that represent the shift of collective attention of those locally affected with a specialized focus on cognitive and perceptual processes. To address the second research question, I went beyond the perception of risks to include perceptions of risk communications by stakeholders. I performed an empirical study of the relation between risk communications by stakeholders and different kinds

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of public perceptions (Lindell and Perry 2012). To address the third research question, I proposed a future work to provide benchmark coding schemes, datasets and models to quantitatively identify information representing cognitive and perceptual processes. I will leverage existing benchmark datasets in the literature (Olteanu et al. 2014; Imran et al. 2016; Alam et al. 2018; Zahra et al. 2020; Rudra et al. 2017; Mazloom et al. 2018; Purohit et al. 2018) and coding schemes in qualitative studies (Trumbo et al. 2016; Demuth et al. 2018) and create benchmark classification models.

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