



Uncovering Emotions, Topics and User Engagement in Social Media Posts Associated with a Data Breach Crisis

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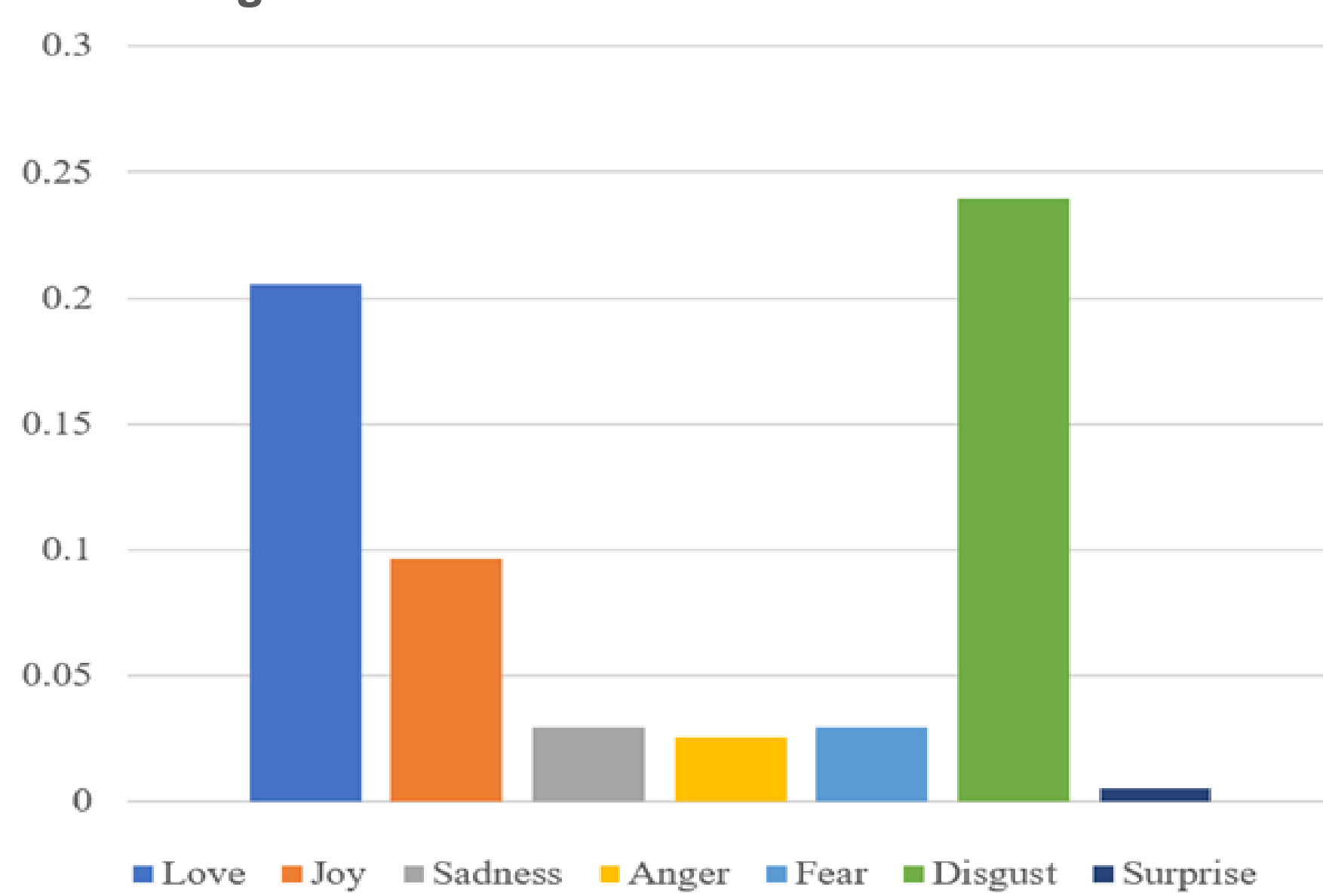
Introduction

- As a type of organizational crisis, data breach has become increasingly common around the world, and the costs associated with data breach are significant.
- Social media plays an important role in crisis management. Mining users' emotional states and main concerns in social media responses is useful for the enterprises to determine potential coping strategies.
- User engagement in social media is also a focal point in crisis management.
- This study aims at exploring emotions and topics embedded in social media posts related to a data breach incident. We also learned the effects of emotions and topics on user engagement.

Method & Results

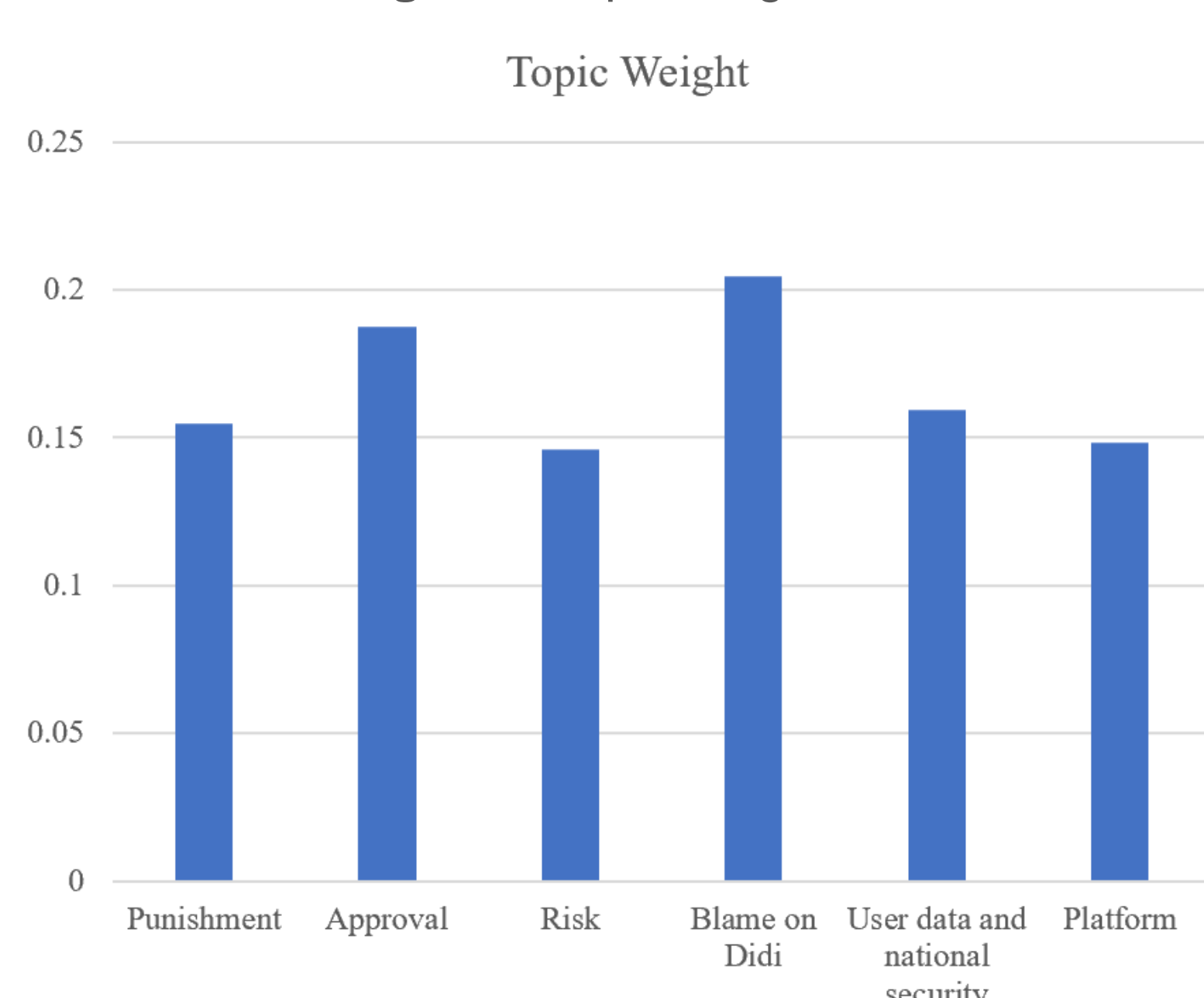
- Our research data were collected from **Sina Weibo**. All the Weibo posts are related to Didi data breach incident in China.
- We conducted a mixed methods study. In study 1, **emotion analysis based on LIWC and LDA topic modeling** were used for the qualitative analysis of social media posts. In study 2, we used **negative binomial regression model** to examine whether emotions and topics in social media posts can influence user engagement.

Figure 1 Distribution of discrete emotions



Among all the emotions, disgust accounts for the largest proportion (23.97%), followed by love (20.56%). Joy is the third major emotion expressed by social media users (9.68%). The proportions of sadness, anger, and fear are close to each other, which do not exceed 3%. Surprise has a very low proportion in all the social media posts (0.5%).

Figure 2 Topic weights



$$Topic_weight = \frac{\sum_{j=1}^{ND} P(T_i | D_j)}{\sum_{i=1}^{NT} \sum_{j=1}^{ND} P(T_i | D_j)} \quad (1)$$

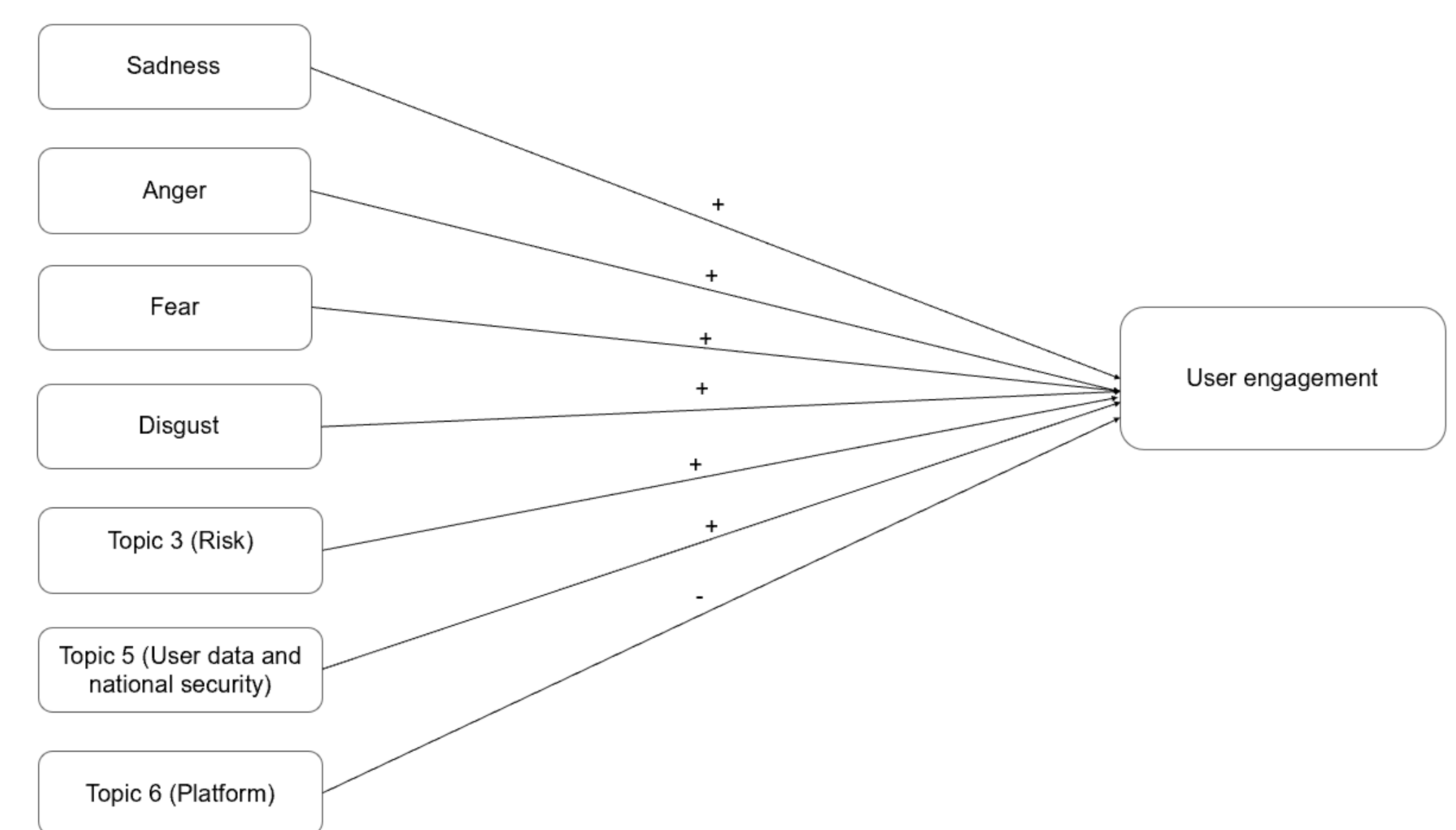
In Equation (1), $P(T_i | D_j)$ is the probability of topic T_i in document (Weibo post) D_j ; ND is the number of documents; NT is the number of topics. The results of topic weights are shown in **Figure 2**. It can be observed that "Approval" and "Blame on Didi" are two topics that received more attention. However, there are no significant differences among the other four topic categories.

Figure 3 Emotion distributions by topic category

Emotion	Punishment	Approval	Risk	Blame on Didi	User data and national security	Platform
Surprise	0.005	0.001	0.003	0.006	0.006	0.01
Disgust	0.15	0.27	0.2	0.23	0.33	0.34
Fear	0.04	0.03	0.03	0.02	0.04	0.02
Anger	0.005	0.01	0.05	0.01	0.01	0.08
Sadness	0.02	0.02	0.02	0.03	0.04	0.06
Joy	0.03	0.21	0.07	0.1	0.07	0.12
Love	0.17	0.34	0.17	0.15	0.22	0.19

- The distributions of surprise, fear, anger and sadness in all the topic categories are similar, with small proportions less than 0.1.
- Disgust accounts for large proportions in all the topic categories, and it means that online users are inclined to express their disgusted feelings of Didi's abuse of data.
- Positive emotions such as love and joy have the largest proportions in "Approval" category, and the positive expressions in this category mainly relate to users' supportive attitude toward the actions of Chinese government, which can protect user data security.

Figure 4 The effects of emotions and topics on user engagement



The results of negative binomial regression model show that Weibo posts with four negative emotions related words (Sadness, Anger, Fear, Disgust) are more likely to gain user engagement. Two topics have significant and positive effects on user engagement: "Risk" (coefficient = .377, $p < 0.01$) and "User data and national security" (coefficient = 0.308, $p < 0.01$). However, "Platform" related content has negative effect on user engagement.

Conclusion

- The results demonstrate the distribution of discrete emotions and content topics in social media posts, which helps the practitioners know users' emotional states and main concerns after a data breach incident.
- The results also show that emotions and content topics of social media posts can influence user engagement, and this finding may help enterprises make appropriate crisis management strategies.