An Approach to Computational Crisis Narrative Analysis: A Case-study of Social Media Narratives Around the COVID-19 Crisis in India

Henna Paakki*, Faeze Ghorbanpour*, Nitin Sawhney*

* Department of Computer Science, Aalto University
P.O.Box 15400, FI-00076 AALTO, Espoo, Finland
henna.paakki@aalto.fi

1. Introduction

Societal crises create an empty narrative space and a need for explanation about the crisis, related risks and required mitigation actions (Sellnow et al., 2019). Crises are socially constructed through discourses and have the potential to change social structures and perceptions (Walby, 2015). Crisis narratives also have an important role in attributing blame and structuring crisis responses and recovery plans (Walby, 2015, p. 14). The role of social media has increased significantly as a forum for seeking information about crises, as well as for discursive sense-making. People use discourses and narratives related to a crisis to construct the world socially and epistemologically and to explain the impending crisis (Joffe, 2003; Bednarek et al., 2022), which makes it important for authorities, experts and crisis regulators to understand various discourses around the crisis. This paper examines the possibilities for analyzing social media discourses using a novel computational approach, using a discourse act classifier based on zero-shot learning (Yin et al., 2019) to categorize discourse types into narrative function groups (Labov, 1972). Such tools can help support other means of inquiry and crisis preparedness. Our empirical case study examines discourses around the COVID-19 pandemic in the context of English-language social media in India. This abstract describes an ongoing research project.

2. Goal of the paper

As crisis discourses on social media encompass a large set of data, there is a need for computational methods that can support close readings. Although some methods have been developed for computational discourse and narrative analysis (Piper et al., 2021), this line of research needs more tools. Lakoff and Narayanan have proposed that computational narrative analysis could be approached by focusing on the structural building blocks of narratives (Lakoff and Narayanan, 2010), which have been outlined in linguistics and social sciences (Labov 1972; Labov and Waletzky, 1967; van Dijk, 1976). Such rules can aid computational models.

Narratives encase human motivations, goals, emotions, actions, events, and outcomes, elements that have been considered essential for computational models to understand (Lakoff and Narayanan, 2010). We posit that sense-making in crisis is action (Joffe, 2003), at the surface-level formulated as discursive actions (Edwards and Potter, 1993; Schegloff, 2007). Thus, for capturing social media narratives, we explore the validity of using a widely used and well-established narrative functions theory from linguistics (Labov, 1972; Labov and Waletzky, 1967) to categorize social media comments based on their functions. These functions have already been used to computationally analyze more traditional narratives like personal histories or short stories (see e.g., Li et al., 2017). We explore the possibilities for further extending their use to analyzing changes in social media discourses around crises.

Many narrative theories agree that a sequence of events that forms a narrative whole includes first 1.) an **orientation** to the story or situation (identifying the time, place, persons, and situation of the narrative), some type of 2.) **complication** or disruption (the core event that creates tension in the narrative), 3.) an **evaluation** (clarification of why or how the events are important), and finally 4.) a **resolution** (how the story ends or how the core problematic event is resolved) (Lakoff and Narayanan 2010; Labov, 1972; Labov and Waletzky, 1967; Todorov 1971; Van Dijk, 1976). Conflict in communication is central in the narrative space surrounding a crisis and needs to be managed for successful crisis mitigation (Sellnow et al., 2019). Central to crisis discourses are critical events that have transformative power: they mobilize discourses and transform perspectives on the crisis through conflict (Jørgensen & Phillips, 2002). Thus, we might expect crisis narratives to involve a significant complication phase that needs to be followed by a resolution phase.

We maintain that by analyzing the functional categories of orientation, complication, evaluation, and resolution, it is possible to understand shifts in perspectives to the ongoing crisis, ones that contribute to the narrativization of the crisis. Furthermore, we expect that it is possible to identify points of discursive struggle within crisis discourses, points where critical understandings of the crisis are negotiated to achieve a consensus or to legitimize a selected narrative (Jørgensen & Phillips, 2002; Sellnow et al., 2019). This is central in understanding how a consensus on crisis resolution is achieved. We seek to investigate the validity and utility of computationally categorizing social media crisis discourses based on their functions. We ask:

1. Can narrative functions be applied to analyzing online crisis discourses using a computational model? Are these functions operationalizable through discursive actions?
2. Do social media comments grouped by their actions correspond well enough to the functions of orientation, complication, evaluation, and resolution?
3. By using these function-based groupings, is it possible to find patterns of narrativization in online crisis discourses? Do comments have different functions at different points in time during the crisis?

3. Data sources and sampling

Crisis news reporting has a significant impact on citizen perspectives on the crisis (Kasperson et al., 1988). We are thus interested in this relationship between the evolution of crisis news discourses and how citizen discourses develop during a long-lasting crisis. YouTube news channels' crisis news videos and their comments offer an opportunity for investigating this interaction over time. We examine viewer comments to crisis news videos on English-language NDTV news' YouTube channel during the Covid-19 crisis in India, in conjunction with news reports and contextual insights on the pandemic. The data were collected using a scraper and the YouTube API. They involve the beginning of the crisis (1/2020-8/2020), acute vaccination phase of the crisis (02/2021-08/2021), and a later prolonged phase of crisis (11/2021-02/2022). Channel selection criteria included that the channel should be among the most followed English news providers in the country, one of the most trusted (Newman et al., 2021), that the channel allows viewer comments, has a wide viewership and is politically as close to the centre as possible. The Indian context is of interest as trust in news has been reported to be low (Newman et al., 2021), and as the Global South perspectives have not been sufficiently represented in research.

4. Methods

Our approach is mixed, utilizing computational modeling to analyze a large set of data to achieve reproducibility and quantifiability, but also employing qualitative close reading.

To operationalize the narrative functions theory, we posit that this can be approached through the pragmatic items of discursive actions, as these are often used to analyze accountability, agency, position, and intention in conversation (Edwards and Potter, 1993; Schegloff, 2007). We expect that in our social media data, the function of informing statements is to mostly **orient** to the crisis and to express beliefs; questions, accusations and challenges most often express a **complication** or problematize some aspect of the crisis; evaluations and appreciations mostly attempt to elaborate and **evaluate** the situation; and requests and proposals aim at a **resolution** of some aspect of the crisis (Couper-Kuhlen and Selting, 2017; Turowetz and Maynard, 2010). Thus, we argue that what a comment does can be used to conclude what function it has within the larger crisis narrative. The selection of actions is based on frameworks of core actions in social interaction (Clark and Schaefer, 1989), ones found relevant across different contexts (Stivers et al., 2010) and computer-mediated communication (Paakki et al., 2021).

We manually annotated a set of 438 social media crisis news comments with actions. First, two annotators independently annotated the same set of comments, then compared and negotiated their annotations and resolved all conflicts, analyzing especially the difficult cases. Then annotators resumed annotation work, and finally an inter-annotator score was calculated using Krippendorf's alpha. We achieved a score of 0.75, which indicates a good degree of agreement. Using the hand-labelled comments, we trained a classifier using few-shot learning (Yan et al., 2018), achieving an f1 score of 0.50. We also ran a zero-shot NLI classifier (Yin et al., 2019), which at the present time achieved better results (f1 0.61) and was thus used for labeling all comments. The labeling followed carefully prepared annotation guidelines based on the descriptions of actions in the literature (e.g. Couper-Kuhlen and Selting, 2017; Schegloff, 2007). The whole action annotation scheme involved 13 classes following research on which actions are relevant and common in computer-mediated communication (Paakki et al., 2021). It involved responsive actions (e.g. apology, acceptance) that were not included in the function groups. At this stage, we concentrate on the 8 actions described above.

We further sorted comments into groups based on their action label by using a python script. We proceeded to validate our approach by 1.) qualitatively analyzing the functions (per Labov, 1972) of a set of hand-labeled comments from a time-period from 17th-25th August 2021 (125 comments excluding doubles), based on their content, comparing this analysis to our action-based computational classification, and 2) using time-series analysis to investigate the emergence of function groups at different times during the crisis. We calculated a threshold to identify significant peaks in function group values ($1.5 \times \mathrm{SD}\ over\ group\ mean$). We suspected that if the narrative functions were applicable to analyzing social media crisis discourses, there should be significant changes in which function groups are most common in crisis comments at different times.

5. Results

Our validation step 1 shows that the computational classification of comments gives us similar results as our manual analysis. The time-period chosen involved an especially high amount of complication actions in both the manually annotated set as well as the computationally annotated set. These are mostly related to criticism or mistrust in authorities and the COVID-19 vaccine, comments about negative symptoms from the vaccine, confusion about who to trust and what to do, but also some arguments that support the authorities. The qualitative analysis of the functions of comments corresponds sufficiently well to the action-based computational categorization: most statements and announcements had an orientation function also in our qualitative analysis; most questions, accusations and challenges served a complication function; evaluations and appreciations corresponded well with the evaluation function; and requests and proposals mostly aimed at some type of a resolution. However, 10% of comments did not fall into the assumed function group based on action type. In some cases actions had another function than expected: informing statements sometimes provided a complication in a few cases where negative effects from vaccines were described, evaluations sometimes had an orientation function, and some long comments involved more than one significant function.

Secondly, our preliminary results from the time-series analysis show that there are significant changes in which functions crisis news comments have at different points of the crisis timeline. Within the NDTV crisis news comments during the early phase of the Corona crisis, there are more significant peaks in orientation or resolution oriented discourses. During the acute mid-phase of the crisis, the frequency of comments that have a complication function is significantly higher. At the last phase, functions become dispersed, i.e. none of the function groups come above the threshold. The time-series analysis is still a work in progress, but the results so far show that the crisis narrative achieves its most conflictive point at the acute mid-phase of crisis where COVID-19 vaccinations have become relevant.

6. Conclusion

Our results so far show that the Labovian narrative theory is to some extent applicable to analyzing crisis discourses on social media. The applied model allows us to analyze how the functions of discourses shift along the crisis timeline, and to identify significant points of discursive struggle. The operationalization of functions through actions seems to work sufficiently well, as it allows a justifiable and pragmatic frame for annotation, rooted in a well-researched field.

Based on our results, the action-based categorization has some limitations that need consideration, as the actions used do not always correspond to the expected function. However, the narrative function categories are highly abstract and thus difficult to classify as such, as we found in some earlier experiments, and thus for a computational model we consider an action-based labeling scheme to be a more pragmatic approach. Social media discourses did not exactly follow the Labovian narrative structure in our empirical case: although complication-oriented discourses seemed to occur during the second phase similarly to the narrative theory, the early phase already involved significant crisis resolution discourses. The dataset for our third phase of crisis should be extended in later research to gain further insights into whether discourses related to some function group might emerge as significant. Further research also needs to investigate if similar patterns of narrativization can be found in different cultural contexts and crises, and whether social media discourses follow their own pattern of narrative structure as compared to Labov's theory (1972). Also, our few-shot classification also needs more work to achieve higher accuracy in action classification. Action classification for social media comments is not an easy task, for example because comments might often involve several actions, and as deciding what action a comment represents sometimes requires interpretation that is hard to define clearly for each case in annotation guidelines. Thus, action classification in this area requires more work.

This research advances the development of the growing line of computational narrative analysis methods, elaborating on the possibilities for using narrative functions to understand the narrativization of crisis discourses. We argue that such tools are needed for supporting other means of research into crisis communication, for a multi-sided understanding of perspectives on crisis and social media engagement. Further, as social media is a site used to influence public opinion and to spread disinformation, the various discursive conflicts taking place in this arena are essential for crisis communicators to both understand and manage.

7. References

Leiming Yan, Yuhui Zheng, and Jie Cao. 2018. Few-shot learning for short text classification. *Multimedia Tools and Applications,* 77(22):29799–29810.

Monika Bednarek, Andrew Ross, Olga Boichak, Y.J. Doran, Georgia Carr, Eduardo Altmann, and Tristram Alexander. 2022. Winning the discursive struggle? The impact of a significant environmental crisis event on dominant climate discourses on Twitter. *Discourse, Context & Media,* 45:100564.

Herbert Clark and Edward F. Schaefer. 1989. Contributing to Discourse. *Cognitive Science*, 13(2):259–294.

Derek Edwards and Jonathan Potter. 1993. Language and causation: A discursive action model of description and attribution. *Psychological review*, 100(1):23–41.

Elizabeth Couper-Kuhlen and Margret Selting. 2017. *Interactional linguistics: Studying language in social interaction.* Cambridge University Press.

Kishaloy Halder, Alan Akbik, Josip Krapac, and Roland Vollgraf. 2020. Task-Aware Representation of Sentences for Generic Text Classification. In: *Proceedings of the 28th International Conference on Computational Linguistics*, pages 3202–3213, Barcelona, Spain. International Committee on Computational Linguistics.

Hélène Joffe. 2003. Risk: From Perception to Social Representation. *British Journal of Social Psychology,* 42(1): 55–73.

Marianne Jørgensen and Louise Phillips. 2002. *Discourse analysis as theory and method.* Sage, London.

Robert Kasperson, Ortwin Renn, Paul Slovic, Halina Brown, Jacque Emel, Robert Goble, Jeanne Kasperson, and Samuel Ratick. 1988. The social amplification of risk: A conceptual framework. *Risk analysis*, 8(2):177–187.

William Labov. 1972. *Language in the Inner City.* Philadelphia: University of Pennsylvania Press.

William Labov and Joshua Waletzky. 1967. Narrative analysis: oral versions of personal experience. In: J. Helms, ed., *Essays in the Verbal and Visual Arts*, pages 12–44. University of Washington Press, Seattle.

George Lakoff and Srini Narayanan. 2010. Toward a computational model of narrative. In: *2010 AAAI Fall Symposium Series*, pages 21–28, Menlo Park, California. https://www.aaai.org/ocs/index.php/FSS/FSS10/paper/view/2323

Nic Newman, Richard Fletcher, Anne Schulz, Simge Andi, Craig Robertson, and Rasmus Nielsen. 2021. *Reuters institute digital news report 2021*. Reuters Institute for the Study of Journalism, Oxford.

Henna Paakki, Heidi Vepsäläinen, and Antti Salovaara. 2021. Disruptive online communication: How asymmetric trolling-like response strategies steer conversation off the track. *Computer Supported Cooperative Work*, 30(3):425–461.

Andrew Piper, Richard So, and David Bamman. 2021. Narrative Theory for Computational Narrative Understanding. In: *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*, pages 298–311, Online and Punta Cana, Dominican Republic. 10.18653/v1/2021.emnlp-main.26

Emanuel Schegloff. 2007. *Sequence Organization in Interaction: A Primer in Conversation Analysis*. Cambridge; New York: Cambridge University Press.

Timothy Sellnow, Deanna Sellnow, Emily Helsel, Jason Martin and Jason Parker. 2019. Risk and crisis communication narratives in response to rapidly emerging diseases. *Journal of Risk Research*, 22(7):897–908.

Tanya Stivers, Nick Enfield, and Stephen Levinson 2010. Question–Response Sequences in Conversation Across Ten Languages: an Introduction. *Journal of Pragmatics*, 42(10):2615–2619.

Tzvetan Todorov. 1971. The Two Principles of Narrative. *Diacritics*, 1(1):37–44.

Teun A Van Dijk. 1976. Philosophy of action and theory of narrative. *Poetics*, 5(4):287–338.

Jason Turowetz and Douglas Maynard. 2010. Morality in the social interactional and discursive world of everyday life. In: Hitlin S. and Vaisey S., eds., *Handbook of the Sociology of Morality*, pages 503–526, Springer, New York.

Sylvia Walby. 2015. *Crisis*. Polity Press, Cambridge.