

# Network typology, information sources, and messages of the infodemic twitter network under COVID-19

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**Abstract**

During the COVID-19 crisis, fake news, conspiracy theories, and backlash against specific groups emerged and were largely diffused via social media. This phenomenon has been described as an “infodemic,” and this study examined that the characteristics of infodemic on Twitter. Typological attributes of the infodemic Twitter network presented the features of “community clusters.” The frequently shared domains and URLs demonstrated coherent characteristics within the network. Top domains and URLs were trustworthy information sources, popular blogs, and public health research institutions. Interestingly, the most shared conversational content of the network was a COVID-19 relevant incident occurred at a church in Korea based on misinformation and false belief.

**KEYWORDS**

COVID-19, fake news, infodemic, social network analysis, twitter

## 1 | INTRODUCTION

Bessi and Ferrara (2016) argued that social media has been a channel to manipulate public opinions. In the context of the COVID-19 outbreak, Twitter networks have become a highly active venue by facilitating “one-to-many” and “many-to-many” communications. However, technology editor of *The Guardian* claimed that Twitter has become a focal point for misinformation and disinformation regarding the COVID-19 crisis (Hern, 2020, March 4, para. 1). The World Health Organization officially declared the epidemic of COVID-19 as a pandemic on March 11, 2020. As the confirmed cases and death tolls increase globally, fake news, conspiracy theories, and backlash against specific groups emerged and were mainly diffused via social media, a phenomenon that has been described as an infodemic (Hern & Sabbagh, 2020, March 10).

This study examined the characteristics of infodemic Twitter network in terms of network typology, information

sources and messages, and the following research questions were examined in this study

- What are the attributes of the infodemic Twitter network?
- What are the major information sources of the infodemic Twitter network?
- What are the majorly shared messages of the infodemic Twitter network?

### 1.1 | Data collection and data analysis

The tweet dataset was retrieved on Tuesday, March 17, 2020 through Application Programming Interface (API) using the import function of NodeXL (Smith, 2015). A total of 9,958 tweets (vertices) were collected, and a total of 14,211 relationships were analyzed for this study. All the collected tweets contain the term

“infodemic,” and each tweet creates an edge for individual relationship that “replies-to,” “mentions,” and a self-loop edge that is neither “replies-to.”

To answer the proposed research questions, this study examined network attributes, information sources, and messages in the infodemic Twitter network. This study conducted social network analysis (SNA) using NodeXL (Hansen, Shneiderman, & Smith, 2010). After removing 1,598 duplicated edges, a total of 12,613 unique relationships were investigated for the study. The Clauset-Newman-Moore algorithm was applied to create clusters to visualize the infodemic network. The infodemic Twitter network was visualized by employing the Harel-Koren Fast Multiscale layout algorithm to the data. The most frequently included URLs, domains, hashtags, words, and word pairs in the network were computed. The top influencers were assessed by applying betweenness centrality, a measure that how often a user is placed in the shortest path between other users and how the user connects groups by filling gaps in the network (Hansen et al., 2011).

## 2 | RESULTS

Typological attributes of the infodemic Twitter network presented that the features of “community clusters” (Smith, Rainie, Shneiderman, & Himelboim, 2014, p. 3). A few to

several medium-sized and many smaller groups were identified while lacking a dominant centralized cluster in Figure 1. This could be an evidence that infodemic has become a global topic with diverse degrees of interest to various locations and populations.

Table 1 illustrates that top influencers in the network. Top influencers included @who (the World Health Organization), @techreview (MIT Technology Review), @carolecadwalla (the writer for *The Guardian* and *The Observer*). Interestingly, @kyunghyang, a Korean daily newspaper, appeared as one of the top influencers in the network.

Table 2 displays the top domains and the largely shared URLs included the tweets of the network. The frequently shared domains and URLs demonstrated coherent characteristics with the network above. For example, top domains and URLs were trustworthy information sources, such as news media (cnn.com, nytimes.com, and scmp.com), reliable blog media (medium.com, technologyreview.com, and infodemic.blog), and research related institutions (orfonline.org and elsevierhealth.com).

Table 3 presents the top words and top word pairs that frequently shared in the network. The most outstanding topic in Table 3 is a news story about an event occurred in Korea. The minister of a church located in Kyeonggi province in South Korea, sprayed saltwater inside the church members’ mouths to

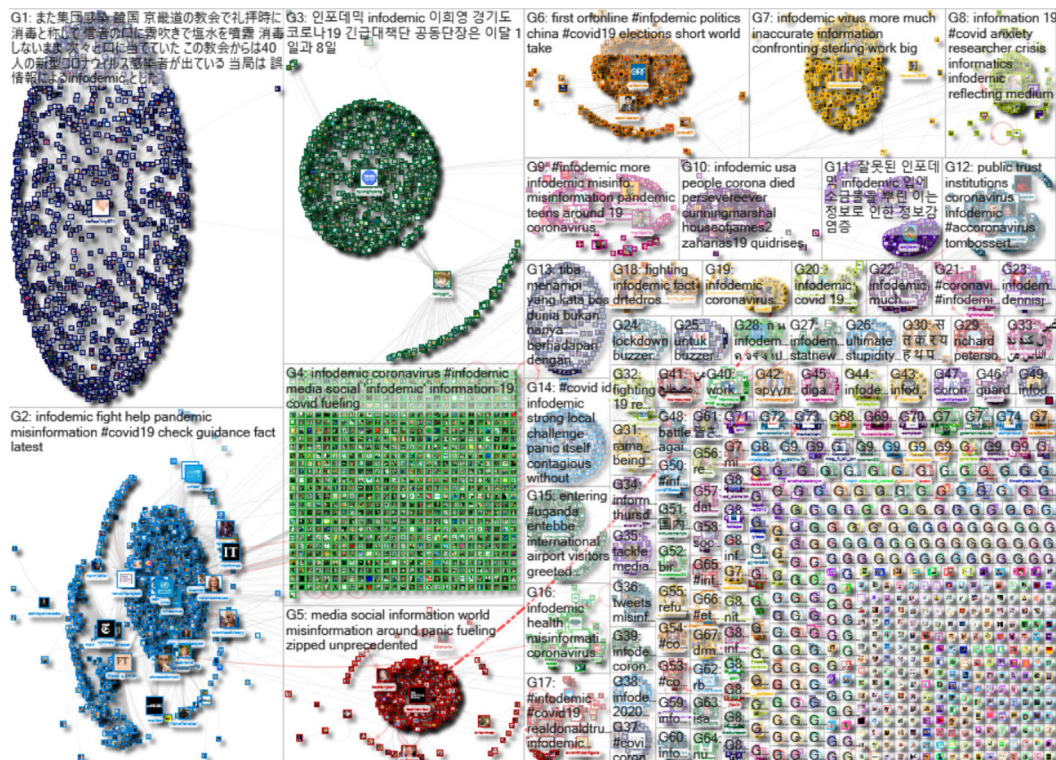


FIGURE 1 The infodemic twitter network with the top keywords of each group

**TABLE 1** Top influencers in the infodemic twitter network

	Vertices	Betweenness centrality
1	@who	9,036,956.38
2	@techreview	3,976,349.321
3	@carolecadwalla	2,739,411.825
4	@katestarbird	2,668,583.084
5	@epstein_dan	2,308,711.127
6	@cdcgov	2,180,476.893
7	@msmwatchdog2013	2,000,524.605
8	@tioffoal1ny67ii	1,916,820
9	@realdonaldtrump	1,750,222.428
10	@kyunghyang	1,558,580.333

prevent the novel coronavirus infection based on false belief and misinformation. However, using the same spray bottle for approximately 100 members, 46 of them were infected by the novel corona virus. Japanese top words and word pairs were largely representing this incident in Table 3. Top words and word pairs in Korean also presented this case. Interestingly, the most shared conversational content of the network was an COVID-19 relevant incident occurred

**TABLE 2** Top domains and top URLs in the tweets of infodemic twitter network

	Top domains	Top URLs (the entire graph count)
1	twitter.com (235)	https://www.orfonline.org/ (164)
2	medium.com (169)	https://medium.com/(116)
3	orfonline.org (169)	https://edition.cnn.com/ (65)
4	technologyreview.com (126)	https://infodemic.blog/ (54)
5	cnn.com (104)	https://secure.jbs.elsevierhealth.com (40)
6	Infodemic.Blog (76)	https://www.demokrasi.co.id/ (39)
7	nytimes.com (47)	https://www.technologyreview.com/ (39)
8	elsevierhealth.com (47)	https://mainichi.jp/ (38)
9	scmp.com (40)	https://www.weforum.org/ (29)
10	Co.id (39)	https://medium.com/ (26)

in a Korean church based on misinformation and belief.

**TABLE 3** Top 10 words and top word pairs of the infodemic twitter network

Total words (259,976)			
	Top words	Top word pairs	Top hashtags
1	Infodemic (5769)	また集団感染, 韓国 (1382)	covid19 (1319)
2	Information (1719)	韓国,京畿道の教会で礼拝時に消毒と称して (1382)	Infodemic (855)
3	#covid19 (1567)	京畿道の教会で礼拝時に消毒と称して, 信者の口に霧吹きで塩水を噴霧(1382)	Coronavirus (527)
4	Misinformation (1499)	信者の口に霧吹きで塩水を噴霧, 消毒しないまま(1382)	Covid (464)
5	Media (1406)	消毒しないまま, 次々と口に当てていた(1382)	Uganda (88)
6	また集団感染 (1382)	次々と口に当てていた, この教会からは40人の新型コロナウイルス感染者が出ている(1382)	Fakenews (74)
7	韓国 (1382)	この教会からは40人の新型コロナウイルス感染者が出ている, 当局は(1382)	Accoronavirus (76)
8	京畿道の教会で礼拝時に消毒と称して (1382)	当局は, 誤情報によるinfodemic (1382)	covid2019 (66)
9	信者の口に霧吹きで塩水を噴霧 (1382)	誤情報によるinfodemic, とした (1382)	Pandemic (64)
10	消毒しないまま (1382)	とした, この国はこんなこと信じるほど非常事態(1382)	Misinformation (62)

**TABLE 4** Word-level sentiment in the infodemic twitter network

	Positive	Word count (4,492/ 1.7%)	Negative	Word count (7,807/ 3%)
1	Guidance	507	Virus	741
2	Work	438	Panic	713
3	Trust	189	Rumors	535
4	Eloquent	164	Inaccurate	488
5	Bravo	164	Racism	453
6	Faith	119	Suffering	266
7	Faster	111	Rampant	263
8	Trump	111	Epidemic	235
9	Well	103	Fake	207
10	Good	89	Crisis	190

Furthermore, this study examined the sentiment of each network to discover users' emotional messages through the levels of positivity and negativity in tweets of infodemic network (Table 4).

### 3 | CONCLUSION

The characteristics of information sources, such as the top domains and URLs, and the implied messages, including the top words and sentiments, in the infodemic Twitter network supported the claim that Twitter as a channel for infodemic. Examining nature and types of information distributed and shared on Twitter regarding the COVID-19 pandemic is important because any

disinformation or misinformation could exacerbate this public health crisis.

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### REFERENCES

- Bessi, A., & Ferrara, E. (2016). Social bots distort the 2016 US Presidential election online discussion.
- Hansen, D., Shneiderman, B., & Smith, M. A. (2010). Analyzing social media networks with NodeXL: Insights from a connected world. Morgan Kaufmann.
- Hern, A. (2020, March 4). Fake coronavirus tweets spread as other sites take harder stance. Retrieved from <https://www.theguardian.com/world/2020/mar/04/fake-coronavirus-tweets-spread-as-other-sites-take-harder-stance>
- Hern, A., & Sabbagh, D. (2020, March 10). NHS announces plan to combat coronavirus fake news. Retrieved from <https://www.theguardian.com/world/2020/mar/10/nhs-plan-combat-coronavirus-fake-news>
- Smith, M. (2015). Catalyzing social media scholarship with open tools and data. *Journal of Contemporary Eastern Asia*, 14(2), 87–96.
- Smith, M. A., Rainie, L., Shneiderman, B., & Himelboim, I. (2014). Mapping twitter topic networks: From polarized crowds to community clusters. *Pew Research Center*, 20, 1–56.

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