The Role of Twitter in Media Coverage during Humanitarian Crises. Data mining from International News Agencies

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Abstract. This study examines the use of Twitter during humanitarian crises and its impact on public opinion. The study analyzed over 3262 tweets related to crisis, war, tragedy, violence, riot, uprising, revolt, destruction, bombing, migration, and refugees from February 2021 to February 2023 from International News Agencies. The study found that Twitter, reveals the fragmentation of news consumption patterns on social media, which are influenced by the sources of information followed and strengthened by the platforms' algorithms. Furthermore, the study shows that news agencies' coverage of humanitarian crises is detectably fragmented, and governments and related organizations have an impact on them and use them for various purposes. The study concludes by recommending future research to expand the analysis to other social media and news agencies, as well as incorporate more advanced techniques for handling misinformation and analyzing the impact of social media on public opinion.

Keywords: Twitter · Humanitarian Crises · Data Mining · News Agencies · Tokenization · Python

1 Introduction

Social networks have revolutionised the way people communicate and exchange information worldwide. The progressive irruption of digital technologies affects the space where citizens inform themselves and debate issues of personal or collective interest, leading to normative and theoretical changes in the public sphere.

Social network users, being part of an open space together with an online community, influence and are influenced. The ongoing development of tools for advertising and propaganda within social platforms allows for mass or personalised targeting, based on people's online behaviour [1], with the potential for direct conscious or unconscious influence.

The role that social networks play in social capital and the determination of information acquisition through their use by users is relevant and allows us to understand the

J. Maldonado-Mahauad et al. (Eds.): TICEC 2023, CCIS 1885, pp. 83–94, 2023.
https://doi.org/10.1007/978-3-031-45438-7_6

levels of retention and impact of the information that is disseminated, both positively and negatively [2].

Social networks play a fundamental role in the current life of society, with a direct impact on almost all aspects of its development. Therefore, platforms often have an impact on complex social processes, such as humanitarian crises, natural disasters, armed conflicts or other emergencies, where the rapid dissemination of information plays a crucial role, as well as misinformation and the spread of unverified data. Some empirically based studies have shown how fast, easy and widespread the dissemination of false, unverified or messy information is, and how its main means of dissemination is social media [3] and [4].

The negative effects and impact of this phenomenon are widely studied with the aim of mitigating or diminishing the collateral effects that harm social development; however, the strategies recognized by mass application by both the media and platform owners (identification, labelling, penalization, restriction, etc.) have not been effective, an argument supported by several research studies that demonstrate the permanence of disinformation even when false news has been restricted or discredited [5] and [6].

In the face of the various humanitarian crises that society is facing, social platforms have played a predominant role in the dissemination of information in real time, especially in relation to the aftermath of situations, the updating of information, the organization of efforts and the presentation of needs in order to request aid.

Understanding the needs of mitigating misinformation through social networks, it is essential to consider media literacy as a tool for this purpose. Several studies point to the need to incorporate this training into educational curricula so that users are equipped with the necessary knowledge to develop the ability to recognize and deal with fake news [7].

International news agencies play a key role in covering humanitarian crises, providing information globally. In the age of social media, these agencies have adapted their coverage strategies and used Twitter as a tool for gathering information, disseminating news and interacting with users.

Today, there are new elements that the digital environment has introduced into mass communication, which affect or socially influence this context. “New media question the role of professional journalists as the primary source of politically relevant information” [8].

This evokes a digital scenario with increased competition in news production and dissemination due to the proliferation of new, mainly digital media with unlimited access to audiences. This was not possible two decades ago because the media market was characterised by being restricted, more than anything else, in terms of the actors involved in it [9]. The present situation reveals unlimited possibilities for displaying information and informants, and therefore, the competition for attention and credibility is constantly growing.

With respect to Twitter, several authors, understanding the importance of the impact that the social network has on social phenomena and its users, have identified indicators to measure its influence on global political and social debates, with the challenge of finding measures to correctly calculate the impact and allow users to be classified according to relevance criteria that are very close to reality [10] and [11]. However, according

to Casero-Ripollés [9] There is a lack of research on the use of Twitter indicators in the media system, so his study provides data on Spanish media and their impact on the political conversation on Twitter. He argues that these "come to play a key role in the digital context. They obtain the highest values in popularity and, above all, in authority on Twitter", for two reasons: (1) the agencies are primary producers of news for mass dissemination, so they have pre-eminence in information flows by volume of production; (2) a possible neutrality and their numerous users, which places them as privileged generators of connections with other relevant users on the network.

Meanwhile, studied the structure of news media networks in Indonesia, Malaysia and Singapore, where they found that the media in these countries have dispersed structures, so that "low density values indicate that the audience of each media outlet on Twitter does not massively overlap with each other", i.e. news consumption patterns on social networks are fragmented according to the sources of information that are followed [12]. Their results are consistent of news consumption patterns on Facebook. In closing, they indicate that social networks strengthen the fragmentation of news consumption patterns by encouraging users with similar preferences and overlapping opinions to establish contact.

Fragmentation at the news agency level is visible and detectable, much more so when humanitarian crises are unleashed, and just as official media accounts disperse information in line with the public agenda of the moment, governments and related organisations also have an impact on them and use them for various purposes. Boatwright & Pyle [13] in their study, indicate that "the official Twitter accounts of Ukraine and Kiev leveraged their online platforms to win the war of public opinion by broadcasting war atrocities in real time, engaging with other countries as a form of digital public diplomacy", with particular interests "related" to nationalism. Talabi, et al. [14] examined the use of storytelling for aid specifically for Nigerian refugees displaced as a result of the Russia-Ukraine war. The results showed a positive correlation between storytelling on social media and receiving aid.

1.1 The role of Twitter within complex social situations

Twitter, Facebook and Instagram are platforms that present the highest amount of interaction with respect to the issues addressed above, as well as being considerably more analyzed by academics due to their exposure of content in image and text, which facilitates the analysis and comparison of shared information. Likewise, these platforms are the ones that generate the most doubts when it comes to handling misinformation in complex social situations where their crowdsourcing methods and algorithms address the problem in a partial way and with almost unknown dynamics [15].

Twitter could be categorized as a convincing source for content analysis in social networks, mainly because its content is presented, for most users, in text, tagged by hashtags, with unique possibilities such as retweeting or sharing a tweet [2].

Twitter is one of the platforms that shows the most debate on global social phenomena. The public intellectual warfare from the Russia-Ukraine confrontation, which fights against physical, social and cyber systems, is an important example that needs to be addressed because of its current and future effects, not only on the current war landscape but also because of its effects on people's lives globally.

Wadhwani et al. [16] use the Twitter API and keywords to build a dataset that by applying TextBlog lexicon-based techniques searches for polarity and subjectivity of tweets related to the Russia-Ukraine conflict. Their results show the testing and development of models for understanding the phenomenon with engineering and machine learning techniques, with an important contribution to the current and future understanding of the exchange of information on the topic among users of the platform.

Mainych et al. [17] analyze the twitter discourse on the Russia-Ukraine war, considering the rhythms and changes that occur around the topic. They used a set of hashtags to study a cluster of popular tweets, where the majority of hashtags corresponded to #Ukraine, in second place #NATO and in third place #UkarinerussiaWar. The first week of the war was marked by a record 4 000 000 news formats on Twitter about the situation in Ukraine, but the second week the trend changes drastically and the number of mentions about the situation drops (during the 50 days since the beginning of the invasion the number decreases to 500 000). Finally, the study indicates that the cluster analysis shows a global focus on Ukraine as a victim of war and Russia as an aggressor.

Twitter has become a central platform for real-time information dissemination during humanitarian crises. Its unique features, such as the brevity of tweets, the ability to use hashtags to categorize content, and spread of messages through retweets, have made Twitter a popular channel for sharing news and reports related to emergency situations. It will examine how Twitter's immediacy and global reach allow critical information to reach a wide audience during humanitarian crises.

The profiles of users involved in the construction of public digital opinion debated on Twitter regarding the Ukraine-Russia conflict are a source of information that should be considered when analysing the issues within the network. Donofrio et al. [18] carried out a study of the audiences of the profiles of the Government of the Russian Federation (@GovernmentRF) and the Office of the President of Ukraine (@APUkraine). It is determined that followers show a recurrent use of the words "no war" or "reject" in their published tweets and the predominant hashtags are related to cities affected by the war:

Firstly, the predominance of the male gender among the followers of the Government of the Russian Federation and the Office of the President of Ukraine; secondly, a certain generational similarity also stands out, in the sense that the followers of both profiles have similar ages; and, thirdly, regarding the biographical descriptions, as demonstrated in the analysis, the audience of the two profiles share "interests", that is, taking into account the words most followed by the followers of both accounts, we can highlight the interest in values and areas such as love, peace and life. Turning to the differences, the most marked ones are in terms of the nationality and city of residence of the followers. In contrast to the considerable geographical dispersion of the social audience of the Russian government profile - which shows very high percentages in the USA and India among others - more than 80% of the followers of the profile of the Ukrainian President's Office are Ukrainian. Similar behaviour with respect to place of residence, data in which the territorial dispersion is maintained in the case of the followers of the Russian account and the preponderance of users from the largest cities in Ukrainian territory for the official Ukrainian account.

The above theoretical overview provides key parameters for identifying the impact of social media on public opinion, on the establishment of the media agenda and specifically, in humanitarian crises, its effects and possibilities. During humanitarian crises, social networks have proven to be a powerful tool for disseminating information and mobilising aid quickly and effectively. Previous studies have highlighted the capacity of social media to facilitate citizen participation, collaboration and response in emergency situations. In the context of this study, it will explore how Twitter, one of the main social networks, plays a crucial role in the dissemination of information during humanitarian crises. Therefore, the following research questions are established: How do different news sources cover humanitarian crises on Twitter, and what factors influence the fragmentation of news consumption patterns on social networks? What are the most effective strategies for managing misinformation on Twitter during humanitarian crises, and how can these strategies be applied to maximize citizen engagement and collaboration? How can social media platforms such as Twitter be leveraged to mobilize aid quickly and effectively during humanitarian crises, and what are the key challenges that need to be addressed to achieve this goal?

2 Methodology

The general objective of this research was to analyse the media coverage of international news agencies on Twitter. To do so, the specific objectives were to semantically categorise the news presented by the international news agencies and to review the discursive connection of the news presented in the agencies.

In order to achieve the aforementioned objectives, an exploratory study was conducted on lexical combinations to approach the metatextual properties and characteristics of the news [19 20], in which Twitter API and the Tweepy library were used to capture data presented in the following 31 international news agencies (Table 1):

Tweets from February 2022 to February 2023 referring to word families linked to crisis, war, tragedy, fight, violence, riot, uprising, revolt, destruction, bombing, migration and refugees were downloaded and stored in a PostgreSQL database, then Python programming language was applied for the selection process, in which data pre-processing was carried out to remove irrelevant mentions, links and hashtags. A text cleaning and tokenisation function was applied in which punctuation marks were removed, transforming all text to lowercase, suppressing web pages within tweets, multiple white spaces, numbers and special characters. Resulting in a total of 3262 tweets analysed on this research. The SQL query written in PostgreSQL language shows first the countries in humanitarian crises followed by the words linked to the crisis situations.

The programming code for the research was the following (Table 2):

It is worth mentioning that the Context library was used in the methodological process to carry out the analysis of word frequency in the tweets. The most common words in the tweets were identified and their distribution and variation over time were analysed. The most frequent and differentiating words for each agency were identified, i.e. those that are more common in certain groups of tweets and less common in others. The Context library to review the sentiments expressed in tweets. Tweets with positive, negative and neutral sentiment were identified. We analysed the distribution of sentiments expressed

Table 1. News Agency and country

News agency	Country
1. Ethiopia News Agency	Ethiopia
2. Polish Press Agency	Poland
3. Khaama Press	Afghanistan
4. Armenpress News	Armenia
5. 'Agência Lusa'	Portugal
6. Catholic News Agency	United States
7. Ukrainian News	Ukraine
8. Sky News	United Kingdom
9. Agencia Bolivariana de Información	Venezuela
10. Philippine News Agency	Phillipines
11. Qatar News Agency	Qatar
12. Bloomberg	United States
13. Agência Brasil'	Brazil
14. FARS News Agency	Syria
15. CTK_news	Czech Republic
16. 'Press Trust of India'	India
17. 'News Agency Nigeria	Nigeria
18. 'South Sudan News Agency'	South Sudan
19. 'Slovene Press Agency'	Slovenia
20. 'BBC News Mundo'	United Kingdom
21. 'EFE Noticias'	Spain
22. 'Australian Associated Press	Australia
23. Reuters	United Kingdom
24. Agence France-Presse	France
25. 'African News Agency'	South Africa

in tweets over time and in relation to the main themes identified in the word frequency analysis. The correlation between bigrams and trigrams was analysed. Identifying the most common word combinations in the tweets and their relationship to the main themes in the word frequency analysis.

The results obtained in the different analyses are detailed below. The relationships between the main themes identified and the sentiments expressed in the tweets were analyzed. In addition, the main trends and patterns in the data were identified and their implications discussed. Using the Context library allowed the analyses of word clouds, word frequency, bigraphs, scatter plots, and concurrence plots.

Table 2. Programming code for SQL query

```
SELECT * FROM public.tweets AS tn
WHERE
(LOWER(tn."Text") SIMILAR TO '%ukraine%|%afghanistan%|%syria%|%yemen%|%venezuela%|%ethiopia%|%myanmar%|%central african republic%|%iraq%|%south sudan%'
AND (LOWER(tn."Text") SIMILAR TO '%displaced ukrain%|%displaced afghanistan%|%displaced syria%|%displaced yemen%|%displaced venezuela%|%displaced ethiopia%|%displaced myanmar%|%displaced central african republic%|%displaced iraq%|%displaced south sudan%'
OR LOWER(tn."Text") SIMILAR TO '%refugee%|%displaced people%|%displaced person%|%refugee%|%asylum seek%|%exile%|%stateless people%'
OR LOWER(tn."Text") SIMILAR TO '%crisis%|%war%|%conflict%|%tragedy%|%fight%|%violence%|%unrest%|%uprising%|%destruction%|%bombing%|%migration%|%adlib%|%aleppo%')) OR
(LOWER(tn."Text") SIMILAR TO '%ucrania%|%afghanistán%|%siria%|%etiopía%|%etiopia%|%república centroafricana%|%republica centroafricana%|%irak%|%sudán del sur%|%sudan del sur%'
AND (LOWER(tn."Text") SIMILAR TO '%displaced ukrain%|%displaced afghanistan%|%displaced syria%|%displaced yemen%|%displaced venezuela%|%displaced ethiopia%|%displaced myanmar%|%displaced central african republic%|%displaced iraq%|%displaced south sudan%'
OR LOWER(tn."Text") SIMILAR TO '%refigiad%|%población desplazada%|%personas desplazadas%|%solicitud de asilo%|%solicitante de asilo%|%solicitantes de asilo%|%exilio%|%personas sin estado%|%exilia%|%apátridas%'
OR LOWER(tn."Text") SIMILAR TO '%guerra%|%tragedia%|%pelea%|%violencia%|%disturbios%|%sublevación%|%sublevacion%|%revuelta%|%destrucción%|%destruccion%|%bombardeo%|%bombardeando%|%migración%|%migracion%'))
```

3 Results

The most frequent words found in the content from the analysis of the information from the tweets of the international agencies. In which we can see that the most frequent words are Ukraine, referring to the humanitarian crisis that the country is experiencing due to the Russian invasion, we can also observe the terms Sudan and Poland, which do not show that they have not been as frequently published as Ukraine. In short, from the data obtained, it was evident that the 5 most repeated monograms were: Ukraine with 1158 times, followed by war with 897 times, Russia which has been repeated 348 times, Sudan 206 times and conflict with 165 times (Fig. 1).

Figure 2 below on bigrams shows a word cloud on the most common bigrams. A bigram consists of two words that appear together frequently in the captured tweets. The most repeated have been war Ukraine (313 times), South Sudan (164 times), Ukraine

Fig. 1. Word cloud of most common monograms.

war (116 times), prime minister (82 times), Russia Ukraine (56 times), Ukraine Russia (54 times), Russia war (45 times).

Fig. 2. Word cloud of most common bigrams.

The trigram is a sequence of three words that appear together frequently in a specific text or corpus of data. In the trigram three words are re-presented on the horizontal axis, while the frequency of occurrence of the trigram is represented on the vertical axis, being mainly monopolized by terms related to the Russia-Ukraine war, among them are: “Ukraine Russia Attack”, Russia War Ukraine” “Polish Prime Minister”, “Prime Minister said”, “President Vladimir Putin”, “War torn Ukraine” (Table 3).

Table 3. Trigram Tweets in Humanitarian Crises

Trigram	Frequency
"Ukraine Russia Attack"	32 tweets
, Russia War Ukraine"	29 tweets
"Polish Prime Minister",	28 tweets
"Prime Minister said",	24 tweets
"President Vladimir Putin",	22 tweets
"War torn Ukraine	19 tweets
Russia Ukraine war	19 tweets
Morawiecki Polish Prime	18 tweets
Russia invasion Ukraine	16 tweets
Russia Ukraine Conflict	13 tweets

In the Fig. 3 on the dispersion of the frequency of Tweets, it can be observed that, although all international agencies address the issue of war, not all of them do so with the same frequency. A comparison of the terms "Ukraine" and "Sudan" clearly shows the different level of interest that international agencies have in each of these terms. This analysis demonstrates the dynamics and varied attention that international agencies pay to different global events, which can be of great relevance for understanding media coverage of these issues in international contexts.

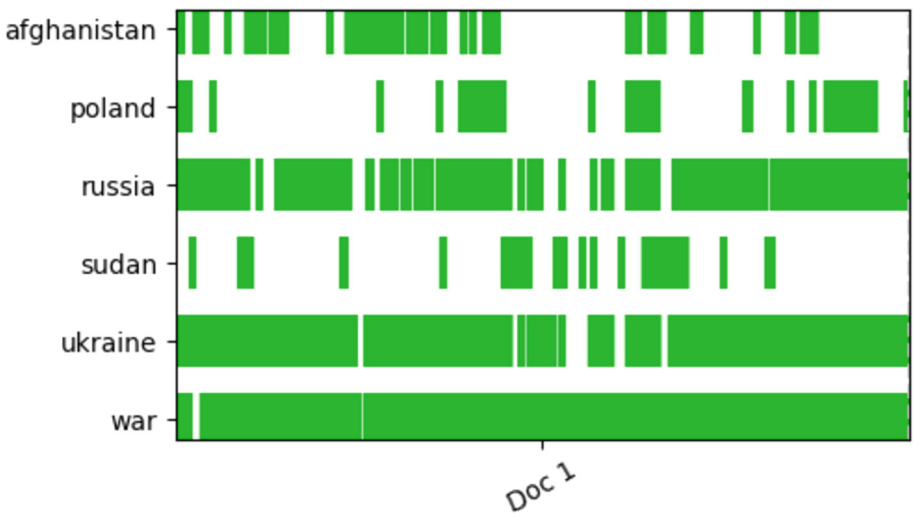

Fig.3. Graph of terms dispersion in news agencies.

Continuing with the presentation of results, a map shows the interconnection of the main keywords in a complex web (Fig. 4). In this map, it can be clearly seen that the words "Russia" and "Ukraine" are two of the main keywords at the center of the network, standing out as fundamental nodes in the represented connections. This visual approach allows to visualize in a striking way the relevance and prominence of these two keywords in the analyzed context, highlighting the importance they have in the identified connections. This graphical representation provides a deeper and more visual understanding of the relationship and interaction between the keywords.

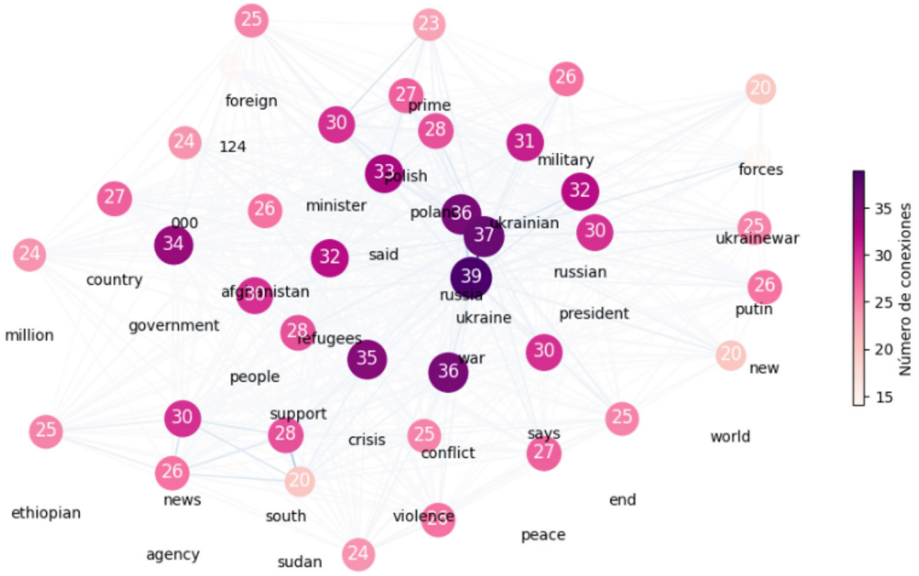

Fig.4. Map of terms' interconnection

4 Conclusions

This study has shed light on the role of social media, particularly Twitter, in the dissemination of information during humanitarian crises and its impact on public opinion. The findings suggest that social media, especially Twitter, have the potential to mobilize aid quickly and effectively, and facilitate citizen participation and collaboration in emergency situations. However, the study also highlights the challenges of handling misinformation in complex social situations, where crowdsourcing methods and algorithms address the problem in a partial way and with almost unknown dynamics. The study also reveals the fragmentation of news consumption patterns on social media, which are influenced by the sources of information followed and strengthened by the platforms' algorithms. Furthermore, the study shows that news agencies' coverage of humanitarian crises is detectably fragmented, and governments and related organizations have an impact on them and use them for various purposes. While 2 years of news coverage

linked to humanitarian crises were covered on this research, Russia-Ukraine war has monopolized media coverage of humanitarian crises, overlapping other types of crises as it happened in Afghanistan, Syria, Yemen, Venezuela, Myanmar, Central African Republic and Iraq which are invisible to international news agencies. Irrespective of the underlying reasons for this trend, it is crucial to underscore that media products may be equally intertwined with the spectacle-driven setting, extensive media dissemination, polarization, and debates they evoke within the global public opinion sphere, thereby contributing to a more profound exploration of their content..

The limitations of this study include the focus on Twitter as the main social media and the limited number of international news agencies analyzed. Future research could expand the analysis to other social networks and news agencies, as well as incorporate more advanced techniques for handling misinformation and analyzing the impact of social media on public opinion. In conclusion, this study contributes to the understanding of the role of social media in humanitarian crises and its impact on public opinion. It highlights the potential of social networks to mobilize aid and facilitate citizen participation, but also the challenges of handling misinformation and the fragmentation of news consumption patterns. Future research could build on these findings to develop more effective strategies for handling misinformation and promoting a more accurate and diverse news coverage on social networks.

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