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Sentiment Analysis of Users' Reactions to Deadly Disasters Posts in Turkey: Facebook Data

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Abstract – The use of online social networks (OSNs) platforms has increased in recent years. There are some popular OSNs platforms such as Facebook, Instagram, YouTube, and Twitter. In those platforms, the numbers of active users are over millions in a day. Understanding OSNs' users' opinions therefore is a trend subject. Researchers can use sentiment analysis techniques to deduce OSNs users' opinions from a shared post. This work analyses Facebook users' opinions on deadly disasters happened in Turkey during July and August in 2021. We hypothesized that Facebook users should have reacted to posts by giving "Like, Love Care, Sad, Wow, and Upset" but not "Haha" because this research have analyzed posts, which include sad news about disasters. Our findings show that the deadly disaster posts had substantial negative sentiments. This may mean that some Facebook users were happy to see deadly disasters in Turkey.

Keywords –Sentiment analysis, online social networks posts, information retrieval, Facebook, sentiment index

I. INTRODUCTION

Online social networks (OSNs) have been one of the most important channels of global communication since they allow users to communicate with others all over the world. OSNs platforms therefore have changed the way of communication among individuals and communities. OSNs can guide users, organizations, and governments to have ideas about what others think on a subject [1,2]. To do so, users' reactions and emoticons on posts are used as indicative expressions in OSNs platforms. Today most of sentences have two parts; text and emoticon. Emoticons are quite popular and they can very beneficial for identifying sentiment of sentence.

There is a recent trend in measuring users' emojis and reactions by using various analysis techniques, sentiment analysis is one of those methods [3]. It is used to analyze OSNs users' opinions, sentiments, evaluations, appraisals, attitudes, and emotions towards entities such as products, services, organizations, individuals, social issues, events, topics, and their attributes [4].

Facebook is one of the social media platforms that is used by people live in Turkey, statistical data has shown that almost the half of Turkey's population uses Facebook [5]. Because of this many national newspapers have pages on Facebook to announce daily news to their readers, Facebook users can react to updated news from the newspapers they followed. There were various big disasters such as, floods, fires and traffic accidents happened in Turkey during July and August in 2021. We interested in to know how Turkish people reacted to those deadly disasters. We also hypothesized that Turkish people may have reacted by giving "*Like, Love Care, Sad, Wow, and Upset*" but not "*Haha*" since the contents of posts are about sad and hurtful news. Therefore, the aim of this research is to investigate the sentiment orientation of the emojis-based features of Turkish news posted on Facebook, during the deadly disasters in Turkey in 2021 by five well-known Turkish newspapers.

The structure of the rest of the paper is as follows. Section 2 discusses works in literature related to our approach. Section 3 introduces the methodological steps, where we explain data model, mathematical models and results of our analysis. In Section 4, we present a discussion that compares this work with similar works in the scope of sentiment analysis on emoticons. Finally, in Section 5, we conclude the paper and discuss avenues for future research.

II. RELATED WORKS

Describe in detail the materials and methods used when conducting the study. The citations you make from different sources must be given and referenced in references. OSNs platforms have provided an environment to people where they can freely express their opinions and reactions [6]. Understanding online users' perspectives on trend issues has gained researchers attentions. Sentiment analysis is the most common technique applied on online platforms to deduce users' expressions.

Oh and Kumar applied sentiment analysis to analyse the role of social media on United States' political election [7]. Their work proved that social media has a power to understand users' opinions on trend subjects. The impact of users emotions on online posts was analysed by *Sandavol and Valle* [8], they compared real election results and users reaction on political posts on Facebook. The work showed that the result of sentiment analysis reflect the real election outcomes in Mexico. *Bossetta et al.* analysed social media posts to understand people, who live in United Kingdom, attitudes toward Brexit referendum [9]. The sentiment analysis on social media improves our knowledge about users and/or citizens [10,11].

The level of support comes from social media on posts reflect users' real reactions on the subject [12]. *Samuel-Azran et al*. analysed negative comments on political parties during Israel's political election in 2013, their study proved the correlation between online posts and actual result [13]. *Vashisht et al* proposed a study, they proved that Facebook users' emoticons/reactions has a strong link to understand users' mood [14].

With the respect to above research papers, this study analyses how users react to Turkey's deadly disasters during in July and August by analysing users' emoticons/reactions on five popular newspapers' Facebook pages.

III. METHODS

Analysing users' reactions on Facebook posts has been introduced in [15]. It then has been used to analyse the possible results of political elections [7, 8].Given research works have proven that it is possible to understand the sentiment and the impact of Facebook posts, which are about the real life events, in OSNs users. With the respect of above research works, this work applied sentiment analysis on Facebook data, which was related to hurtful disasters in Turkey. Figure 1 shows adopted method to achieve our aim in this work.

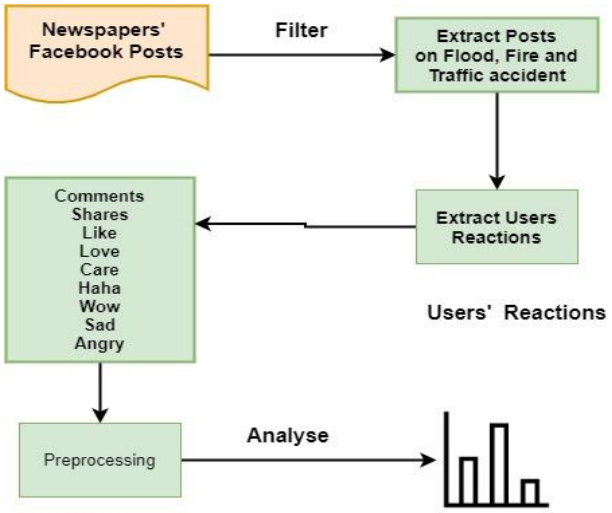

Figure 1: Adopted Method

A. Data Sample

We collected data from five popular Turkish newspapers' Facebook pages ([16]). Posts which are related to flood, fire and traffic accident during July and August were taken into consideration, other posts on the newspapers pages were not used in this work. The reason for choosing July and August is that disasters in Turkey happened one after another during these two months.

We collected 166 posts from Sabah, 120 posts from Hurriyet, 136 posts from Sozcu, 149 posts from Milliyet, and 55 posts from HaberTurk (see Figure 2), this is because of the fact that the number of available posts on those newspapers' Facebook pages. Table 1 gives the numerical details about reactions for each newspapers. Figures and Tables

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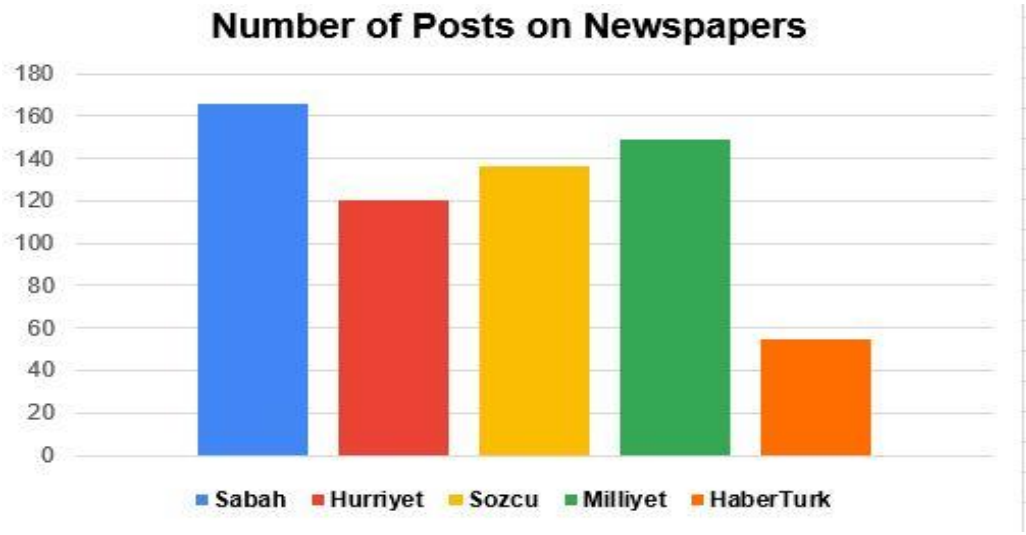

Fig. 2: Number of Posts on Each Newspapers' Facebook Pages

An example of the related table is given below.

Table 1. The number of Facebook Posts and Users' Reactions

	Sabah	**Hurriyet**	**Sozcu**	**Milliyet**	**HaberTurk**	**Total**
Comments	3045	5256	29826	14660	4851	57638
Shares	3428	1984	29090	12437	1414	48353
Likes	20984	18487	87847	31992	9887	217550
Loves	698	876	13491	3157	354	18576
Cares	411	1052	5722	1532	186	8903
Haha	43	202	508	201	63	1017
Wow	471	132	3874	302	94	4873
Sad	6935	5885	61407	18407	5532	98166
Angry	140	175	15826	2692	431	19264

B. Sentiment Impacts

Emojis and/or reactions depends on contents of posts are mainly classified into three classes, namely positive, negative and neutral [17, 18]. With respect to that this work polarised the Facebook emojis on the related posts as; "Like", "Love" and "Care" are placed in the positive emotions class. "Sad" and "Angry" are placed in the negative emotions class. Finally, "Haha" and "Wow" are placed in the neutral emotions class.

OSNs users leave a "Like" on a post when they feel positive about the post, however, they leave a "Love" when they have very strong emotions about it ."Care" emoji is available on Facebook which is used by users when they users care about contents of Facebook posts. As the scope of this work is to analyse Turkey's disasters posts on Facebook, the "Care" emoji has an indicative of positive expression on related posts. The "Love" and the "Care" reactions have more indicative and stronger expressions than the "Like" reaction on Facebook therefore one "Love" or one "Care" reaction are two times of a "Like" reaction [8]. With this way, we give more importance to a "Love" reaction and a "Care" reaction than a "Like" reaction and also calculation of the positive polarity gain more precise value on Facebook. The same calculation method is applied to "Sad" and "Angry" reactions, where an "Angry" expression is weighted two times stronger than a "Sad" one in the polarisation scale for the calculations in this work. A "Wow" and a "Haha" emoji can be considered as either a funny or a sarcastic reaction depending on the content of a post. A post which gives a bad news about a disaster might have "Haha" reaction, in this case "Haha" is considered as a sarcastic polarity. It is on the other hand considered as a joy reaction when the post includes a good news about disasters. A "Wow" emoji is known as a surprised expression, it is quite difficult to define whether it points a positive polarity or a negative polarity. Therefore, a "Wow" emoji is considered as a neutral polarity depending on contents of posts on Facebook.

In the data collection process of this study, we realised the "Haha" emoji are indicative of a negative polarity, when the posts give a bad news about disasters. Therefore, we evaluated thus kind of expressions as negative polarity.

Table 2: Weighting Sentiments

Reaction	**Weight**(ω)
Like	ω_p
Love	$2\omega_p$
Care	$4\omega_p$
Sad	ω_n
Angry	$2\omega_n$
Haha	$4\omega_n$

$$Sp = \sum_{n=1}^{\infty} (\omega * \mathrm{n}) \qquad \textit{Equation 1}$$

$$Sn = \sum_{m=1}^{\infty} (\omega * \mathrm{m})$$

Table 2 presents weight for reactions. Equation 1 is used to calculate positive polarity (Sp) and negative polarity (Sn) for each newspaper in terms of their posts about deadly disasters on their Facebook pages. n and m are the number of the related emoji and ω is the expression of weight.

Table 3: Total Positive and Negative Sentiment: Calculation with Equation1

Newspaper	**Positive Sentiments S_p**	**Negative Sentiments S_n**	**Neutral Sentiments S_{nt}**
Sabah	24024	7387	471
Hurriyet	24447	7043	132
Sozcu	136517	24595	3874
Milliyet	44434	6646	302
HaberTurk	11339	140762	94

Table 3 presents the number of the positive sentiments, negative sentiments and neutral sentiments. Results show that the proportion of positive sentiment for Sabah, Hurriyet, Sozcu, and Millet is more than negative sentiment. However, the proportion of negative sentiment is more than positive sentiment for HaberTurk.

After calculating the positive and negative polarity, we can now compare Table 1 and Table 3 to understand whether the newspaper with most posts has the highest positive or negative polarity. The newspaper with the most Sabah, Milliyet followed it, Sozcu was in third place, then Hurriyet followed, and HaberTurk is in the last place. However, the sorting changes with results on Table 3 in terms of the number of positive and negative sentiments. Sozcu is the first with the result of positive sentiment. And HaberTurk has the highest value for the negative sentiment.

In order to measure the impact of positive and negative sentiments, we developed Equation 2. In this way, we calculate the impacts of positive and negative sentiments depending on Sp, Sn and Snt values. Table 4 indicates the positive and negative impacts for each newspapers.

$$\text{PositiveSentimentImpact} = \frac{Sp}{Sp + Sn + Snt} \qquad \textbf{Equation 2}$$

$$\text{NegativeSentimentImpact} = \frac{Sn}{Sp + Sn + Snt}$$

Table 4: Positive and Negative Sentiment Impacts of Newspapers

Newspaper	Positive Sentiment Impact	Negative Sentiment Impact
Sabah	0.75	0.23
Hurriyet	0.77	0.22
Sozcu	0.82	0.14
Milliyet	0.86	0.12
HaberTurk	0.07	0.92

We also calculate the percentage of comments and shares for each newspapers. In order to calculate the percentage of comments, total number of comments is divided by total number of reactions. The percentage of shares is calculated by dividing total number of shares with total number of reactions. Figure 3 indicates the results of percentage calculation.

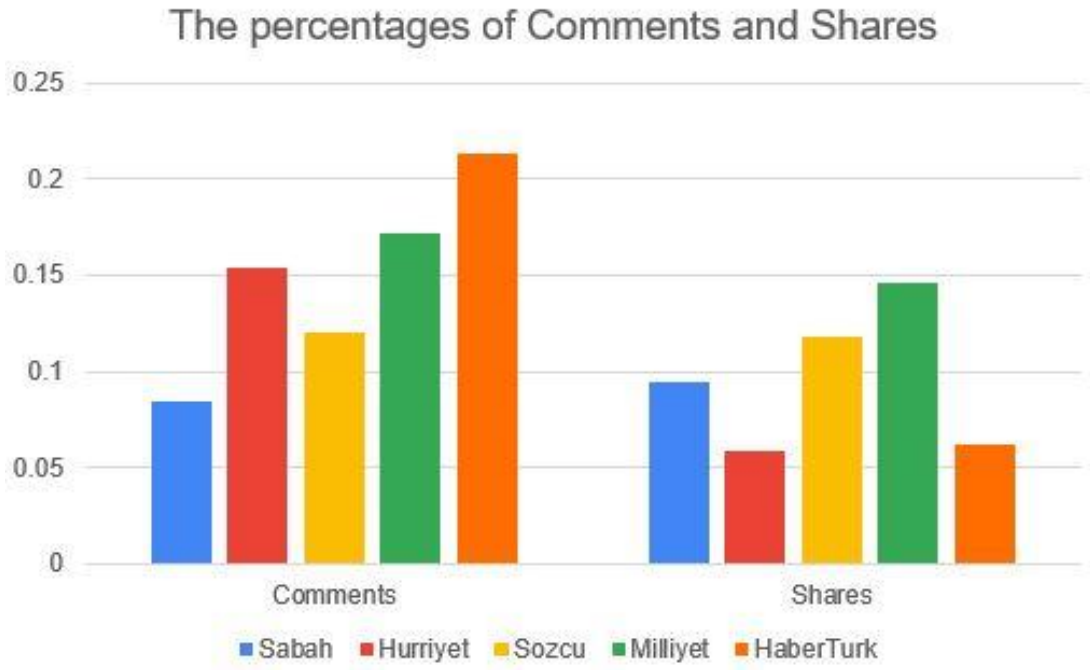

Figure 3: Facebook Comments and Shares in Turkey's most hurtful disasters in 2021

C. Sentiment Index

The model to calculate sentiment index on Facebook was developed by Oh and Kumar [7]. Their proposed model is as follows;

$$Sentiment = In\left[\frac{1 + TOTAL^{positive}}{1 + TOTAL^{negative}}\right]$$

In this Work, sentiment index provides a measurement on not only the impact of newspapers' posts but also gives the sentiment of Facebook users towards to each newspaper during hurtful disasters in Turkey (July and August in 2021). Figure 4 presents sentiment the index for each newspaper on their disaster posts.

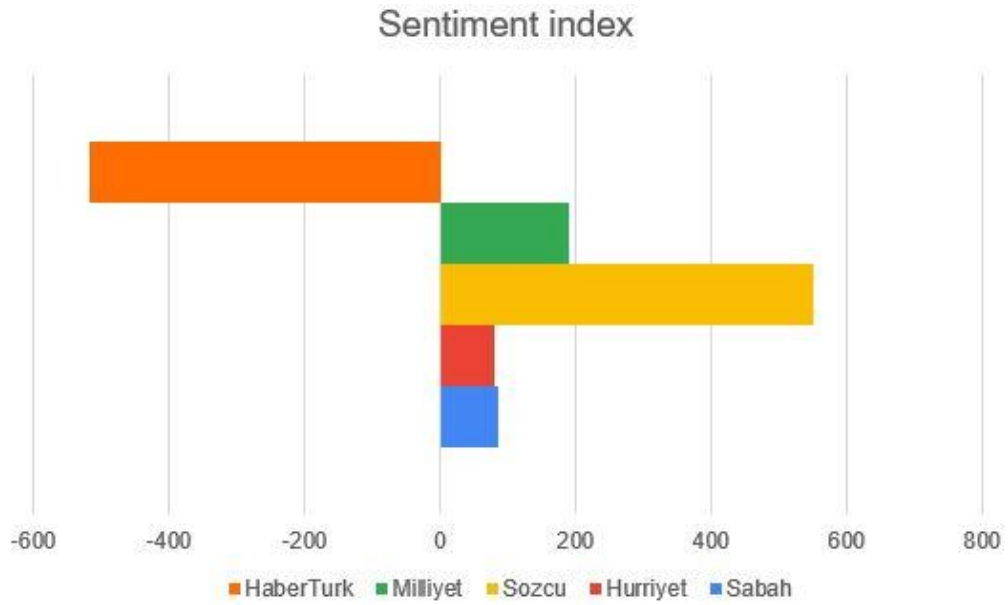

Figure 3: Sentiment index in the hurtful disasters in TURKEY

IV. Discussion

Facebook emoticons/reactions are used to assess the feelings of users on a post, there are few studies have focused to analyse the effects of emoticons [19,20,21,8]. similar studies in the literature mostly analyse the emoticons of online posts regarding electoral contexts. Different from research works exist in the literature, this work context is not political elections for sentiment analysis of emoticons. This study used the sentiment analysis to understand Turkish citizens' attitudes on issues happened in their country during months of July and August in 2021.

Our assumption is that the sentiment analysis of Facebook emoticons/reactions will reflect the emotion of users, specifically we expected to see that users' reactions would not be "Haha" on the posts, which include hurtful news such as the number of dead people, the area of burned areas and/or damaged buildings and areas. The result unfortunately disproved our assumption. There were 1017 "Haha" emotions on posts although the content of posts included sad news.

This research has a limitation: Facebook users' reactions to related posts could be superficial and be deceptive reflection of user behaviour. There is no clear information and deduction whether emoticons reflect the actual views of users yet.

V. Conclusion

Emojis indicate explicitly the sentiment orientation of someone if it were positive, negative or neutral. This supports the research question stated earlier that emojis work in hand with the text in identifying people's feelings and emotions. This work indicates that Facebook data can be used to understand users' opinions on a subject by applying sentiment analysis. We observed that some of Turkish Facebook users react to the deadly disasters with joyful emojis although there were material and non-material lost.

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