Analysis of Heat-Wave Related Health Impacts on The People of India

Twitter Analysis using Nodexl

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***Abstract*—Heat waves have a huge influence on health, agriculture, and water availability, all of which are intricately linked. Even if the incidence of deaths in India due to heat waves has reduced over time, research suggests that excessive temperatures have an impact on people's general physical and emotional well-being. Agricultural yields, on the other hand, are affected. Twitter is one of the social media which is being used to address several issues. One such issue is heatwave. Previously they have utilized socioeconomic vulnerabilities and temperature statistics to analyze the risk of hazards of heatwaves. Spatial distribution frequency and trend of heatwaves across the country were also investigated. We use social media and Node XL to analyze and visualize the data retrieved from twitter. . We used data from the Indian meteorological service to investigate the impact of heat waves on different Indian states.**

Keywords—Heatwaves; social media; twitter; hashtags;

I. INTRODUCTION

According to the Indian Meteorological Department's definition of a heatwave, "A heatwave is a sudden increase in air temperature that is fatal to the human body. It is determined by the temperature thresholds exceeded. In terms of actual temperature or deviation from normal, a region"[7]. Heat waves are not only uncomfortable but also dangerous. Increase in the temperature of a region by several degrees while also causing serious health problems. Twitter assists in the analysis of data. India's areas are hit by the heatwaves. We've talked about it in this paper using the hashtags and comments on India's heatwaves, the Indian meteorological service state reports from the department.

II. LITERATURE REVIEW

Many recent studies have focused on the issue of heatwaves. Previously heat waves were predicted to worsen due to the climate changes. Heat waves generally occurs over plains of North-west India. From March through June, heat waves are common in the plains of northwest India [1], Central, East, and north Peninsular India. In India, a heat wave in 2010 produced a 41% rise in mortality. In India, high temperatures have been more often since then. A heatwave is defined as a single day of extremely high temperatures, according to the IMD. In more traditional academic literature, a heat wave is defined as two and more consecutive days. The research [1] examines how different heatwave definitions affect people's perceptions of the health effects of heat waves. The research area considered in the paper [1] had a greater baseline temperature than the majority of prior studies on temperature and health.

Furthermore, utilizing socioeconomic vulnerability and temperature statistics, the risk of hazards and risk for the existing and future scenario had to be assessed. Under the current context, the study [2] identified the most dangerous, vulnerable, and risk-prone places as the south-eastern coast and Indo-Gangetic plains, as well as some populated districts with metropolitan regions (Mumbai, Delhi, and Kolkata). The report [2] also stated that, as a result of global warming, heatwaves will become substantially worse in the future, affecting mostly the eastern and central Indo-Gangetic plains, as well as the Malabar Coast. Pre-existing medical issues such as heart disease and cardio vascular disease worsen during heat waves. The heatwave risk and hazard were compared to the observations. ROM was used to assess future changes and risk.

The spatial distribution, frequency, and trend of heat waves across the country were investigated in a study [3]. The study [3] looked at the statistical properties of heat waves in India. The spatial distribution indicates greater values in May, with the core hot zone extending from central India to the northwest, with temperatures above 40 °C. In the years 2003, 2013, and 2015, 1425, 1393, and 2500 people died in India, respectively. Using gridded temperature data from 1951 to 2019, the study [3] attempted to depict the statistical properties of heat waves over India (69 years). The investigation also revealed the spatial distributions of statistical features such the arithmetic mean, variability, and temperature trends and heat wave days.

[4] Heat waves have become more common in India over the last fifty years, and so has the rate of heat-related death. Under a range of climate change scenarios, estimated rise in

global mean temperatures are expected to continue these trends.

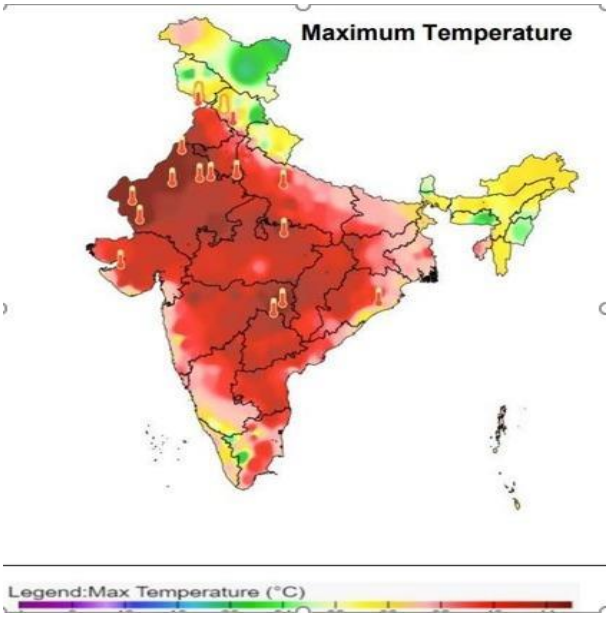
The notion that social media mining may be used to identify heat wave mortality was created and confirmed [5]. Researchers discovered that the frequency of heat-related tweets linked with heat-related mortality considerably better than standard climate-based measures in India, especially at larger scales. This study [5] uses Twitter messages (tweets) containing heat wave-related phrases to identify heat waves in India.

III. METHODOLOGY

We analyze the impact of heat waves using social media application- twitter hashtags and use NodeXl to simplify the data and visualize the graph. The information was gathered from the Indian meteorological service in order to determine which states in India are prone to heat. The heat wave sweeps across the plains of northwest India, Central, East, and north Peninsular India from March to June. The states covered are Punjab, Haryana, Delhi, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, and Telangana.

A. Data Collection

Heat waves have a negative impact on human and animal life. In the month of May, maximum temperatures of more than 45°C were recorded in Rajasthan and Vidarbha. Most of West Rajasthan is experiencing severe heat wave conditions. Isolated regions of Vidarbha and East Madhya Pradesh are also experiencing heat waves. Maximum temperatures in most portions of Rajasthan, Vidarbha, Telangana, Haryana-Delhi, and West Madhya Pradesh were 43-47°C on May 1, 2012. In isolated pockets of northern Odisha and coastal Andhra Pradesh, temperatures reached 40-42°C. From the 4th to the 6th of May, isolated areas of north Madhya Pradesh and Maharashtra will experience heat waves.



State	Number of heat wave days
Gujarat	19
Goa	2
Rajasthan	25
Himachal Pradesh	21
Uttarakhand	4
Maharashtra	6
Madhya Pradesh	25
Odisha	1
Jammu and Kashmir	16
Haryana	15
Delhi NCR	15
Uttar Pradesh	11
Jharkhand	11
Bihar	2
Punjab	7

Fig (i): Number of heat wave days in each state

B. Impacts of heat waves on health

In Maharashtra, heat stroke has claimed 25 lives this year, the most in six years. In March and April, the health authorities reported over 374 cases of heatstroke, while experts believe the true figure is likely higher. With 15 deaths, Vidarbha has the largest number of heat stroke deaths, followed by Marathwada with six deaths. Four people from north Maharashtra were arrested in Jalgaon. Nagpur has recorded eleven deaths in Vidarbha. Maharashtra's Akola three. Amaravati [AP] has the largest number of heat stroke cases, with 295.

C. Analysis of twitter post using #heatwaveinindia in NodeXl

We used Node XL to import and analyze 50 tweets. There are 66 edges in total (Unique edges are 64 and duplicate edges are 2). There are 74 vertices in all. Using Node XL, we investigated In-degree, Out-degree, Betweenness Centrality, Closeness Centrality, and Eigen Vector Centrality. The overall graph matrix that we discovered is displayed below.

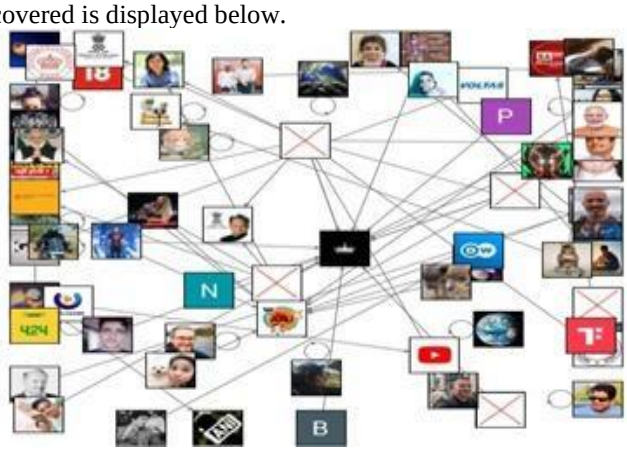


Fig (ii): Graph from NodeXl

Graph Metric	Value
Graph Type	Directed
Vertices	74
Unique Edges	64
Edges With Duplicates	2
Total Edges	66
Self-Loops	14
Reciprocated Vertex Pair Ratio	0
Reciprocated Edge Ratio	0
Connected Components	26
Single-Vertex Connected Components	12
Maximum Vertices in a Connected Component	26
Maximum Edges in a Connected Component	29
Maximum Geodesic Distance (Diameter)	6
Average Geodesic Distance	2.29078
Graph Density	0.009440948

Table 1: Tabular representation of the graph

	In Degree	Out Degree
Minimum	0	0
Maximum	13	9

Fig(iii): In-degree and out-degree analysis

According to our analysis the user @ harsh_000000 has the maximum Betweenness Centrality, the user as the maximum influence over the flow of information in a graph. User name @ devendr00707472 has the maximum Closeness Centrality ,the user is directly connected and he has one hop distance between the other users. User name @harsh_000000 has the maximum Eigen Vector Centrality, the user has the high influence of users in the network.

D. Analysis of twitter hashtag #heatwaveinindia using "trackmyhashtag"

For our study to consider real-time data we have used the application "track my hashtag" and we have obtained the analysis from the same. Considering 100 tweets, we see that there are 94 contributors and 9,558,552 potential impressions.

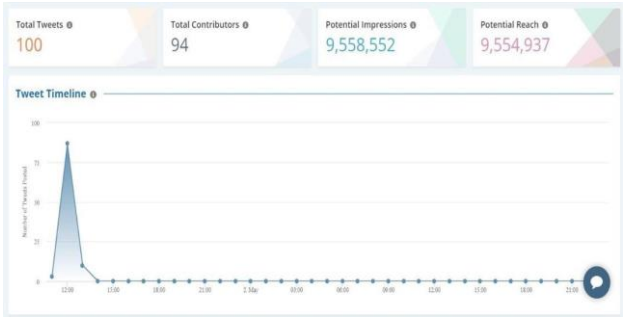


Fig (iv): Tweet timeline

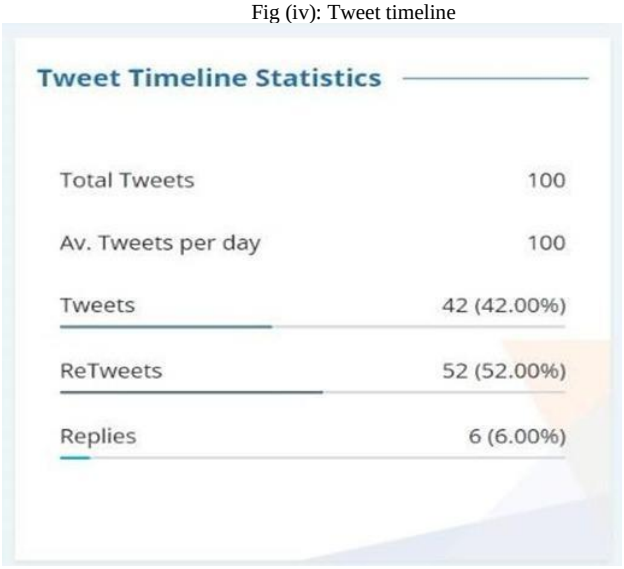


Fig (v): Tweet timeline statistics

Fig (vi): Top influencers in the network

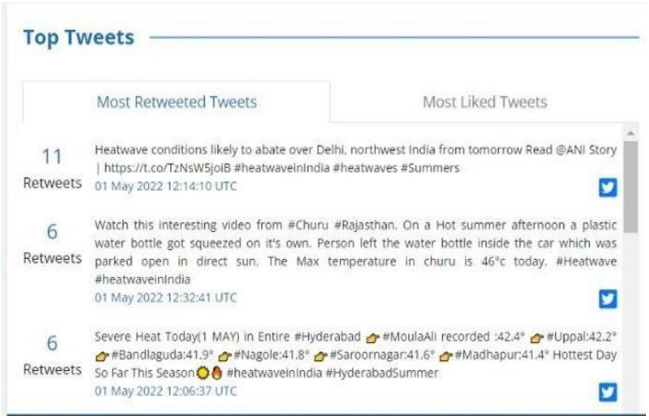


Fig (vii): Most retweeted tweets in the network

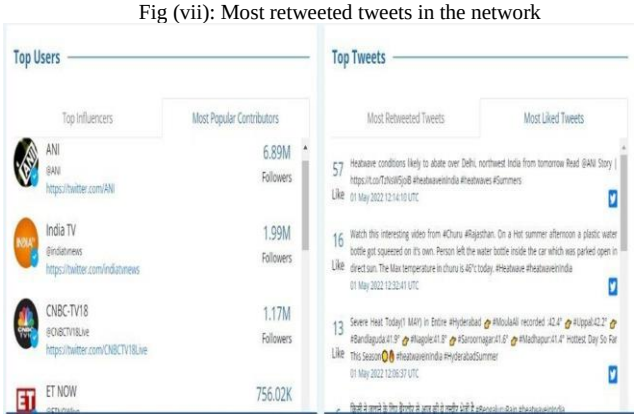


Fig (viii): Most popular contributors and most liked tweets

IV. CONCLUSION

In general, social media networks are the most influential. The network that we used in this case is Twitter. We used the hashtag #heatwaveinIndia on Twitter. As of May 1, 2022, this hashtag was trending with 5485 tweets. The hashtags #climatecrisis, #powercut, and #powercrisis were also used in the posts. To analyze the twitter posts, we used Node XL. CNN News, Hindustan Times, and India Television were the most influential actors. The majority of the tweets came from Northern India, with only two messages from Pakistan and Canada. We used data from the Indian meteorological service to investigate the impact of heat waves on different Indian states. We based our findings on health-related data published by the Times of India.

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