

TRENDS AND PATTERNS OF FAKE NEWS ON SOCIAL MEDIA AND ONLINE NEWS: TEXT MINING APPROACH

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ABSTRACT -

The study focuses on understanding the popularity of the Fake News term in social media and its associated terms. This study also explores the role of social media in producing fake news and the rise of fact-checking websites as an alternative to fake news. Various research methods were used to understand the trends and patterns of Fake News. Tweets that used #fakenews were collected from Twitter using Twitter API. Data were collected from Twitter's social media using the term #fakenews from 10th January-1st April 2021. A total of 4,34,600 tweets were collected during the period. So this research study used only small datasets from Twitter and News headlines to gain insightful information about public views and posts on fake news. Google Trends was used to understand the popularity of several keywords related to Fake News. Google Trends was used to find the trending keywords in the last five years. News Headlines were collected from Google News along with its publisher. Text analysis and data visualization software were used to derive insightful information from unstructured text data. The keywords that trended or were popular during these years are fake news, false news, credible news, misinformation, disinformation, fake news sites, fake news stories, deep-fake, fact-checking, inflation, paid news, paid editorial, post-truth and post-truth era. The news headlines collected from Google News reveal that news outlets publish fact-checking reports worldwide. The Star Online to be the publisher with the highest publications publishing on fake news around the world.

Keywords: Fake news, post-truth, misinformation, disinformation, deep-fake, information debunking, social media.

INTRODUCTION

News and news-making have undergone drastic changes with the advancement of technology. News consumption today is no longer restricted to traditional sources like newspapers, radio, television.

Due to its several advantages, the Internet is a new addition to generating and disseminating news. Fake News is not a new phenomenon. Before the Internet days, Yellow Journalism was a popular term used for reporting that merely wanted to sensationalize content, grab readers' attention, and gain profits (McQueen, 2018; Mourao & Robertson, 2019). This continues even in the 21st century; only the popular medium used is social media sites. Any layperson can create news on social media that can go viral. People primarily use social media platforms to express themselves. Anybody can create news and content, and they can be shared without anyone checking the validity and credibility of the news being circulated. Fake News stories are stripped of relevant facts, engaging and captures people's attention (Kaushal & Vemuri, 2021). It instils curiosity in people and targets an audience who align or follow a set of beliefs. They rise along with some popular or important events happening in a country or even worldwide. These news stories may not come from credible sources. The headlines are designed to deceive people easily and create confusion among them (Leeder, 2019; Spradling, Straub, & Strong, 2021). Big Tech companies like Facebook, Twitter, and Google have recently been held responsible for displaying and spreading fake news on their platforms by U.S. lawmakers. This has not happened for the first time. The use of these platforms to spread fake news heightens, especially during elections, to try and influence the outcome of the election results (MacCarthaigh & McKeown, 2021).

Fake News and Social Media

Social Media sites amplify the spread of fake news simply by providing a favourable

environment for it. Firstly, they are free. People can create free accounts on social media, connect with people and start creating content. Secondly, unlike what we see in traditional media, no journalistic principles or ethics are being followed on these platforms. This means the content creator does not have to be a professional reporter. Another vital role that social media plays are in the creation of Echo Chambers and Filter Bubbles. Echo chambers are situations where only certain kinds of information or content are shared. According to Dubois and Blank (2018), this occurs when people with shared interests and views interact and seek information that complies with their already existing beliefs. Another closely associated terminology related to the Echo chamber is Filter Bubbles. Filter Bubbles are 'algorithmic filtering' that meet an individual user's information requirements on social media (Zimmer et al., 2019). Every time a user clicks or likes something on social media, the algorithm keeps track of it. Websites use these algorithms to show similar content that might be of interest to the users. Allcott and Gentzkow (2017) have pointed to two motivations behind fake news production. The first one is to gain monetary benefits. Fake news stories that go viral generate advertising revenue whenever users view these articles on their original site. The second reason for producing fake news is ideological. It might be produced to support famous political figures during elections.

The Emergence of Fact-Checking Sites

Social Media sites, under pressure, are taking various measures to fight fake news. One of them is fact-checking websites and fact-checkers to clarify whether any news is fake or authentic.

Fact-checkers use a variety of technologies to determine and verify the nature of the news (Carlson, 2020). Major news organizations like Washington Post, BBC, Forbes, New York Times, Guardian, Huffpost and CNN have also started fact-checking news stories. An International Fact-Checking Network (IFCN) has been developed, which has stated several codes of principles for fact-checkers. It also identifies fact-checking signatories around the world that follow these codes of principles. In India, Alt News, BOOM, Factly have been verified as IFCN signatories. A limitation, however, is that Fact-checkers debunk fake news only after it has gone viral and impacted a significant number of people. Further, the amount of information online is enormous, and it is not easy to verify each one of them. Thus, there are delays in the process of fact-checking.

REVIEW OF LITERATURE

As pointed out by many scholars, fake news is not a new phenomenon. It garnered attention mainly due to the 2016 U.S. Presidential elections, and many researchers have discussed fake news from this perspective, primarily spread through social media (Di Domenico et al., 2021; Colliander, 2019). There have been many studies on fake news from multiple perspectives- journalistic, psychological, creating datasets and using Artificial Intelligence (AI) to detect and counter fake news.

There have been no specific definitions of Fake News as it has been used to spread hate, fear, entertain, and in recent years is being used as a tool by politicians to attack the media (Morgan, 2018; Garrett, 2019; Tsfati et al., 2020). Both fake and real news co-exist on the Internet, and it

is increasingly becoming difficult to distinguish between the two. Thus, it is a little problematic to come up with a precise definition for the term. Still, some researchers have tried to define fake news for better clarification.

A brief background of fake news is covered by Burkhardt (2017) in the history of fake news. The author begins by identifying the prevalence of fake news even before the Printing Press was invented. After the invention of the printing press, leaders took control of the kind of information reaching the mass audience and seeking talented writers who could manipulate and sensationalize news stories for profit. Further, new technologies like radio and television helped political leaders influence the public. Subsequently, the introduction of the Internet helped spread fake news at a faster rate and reach many people in a much shorter time. The Internet has provided a conducive environment for Fake News to grow, and it has been acknowledged as a global problem by Lazer et al. (2018) in *The Science of Fake News*. They have defined fake news as fabricated content that imitates news media organizations only in form and somewhat related to misinformation and disinformation. The authors ask scientific questions like the prevalence of fake news and its impact on people.

Disinformation, a form of fake news, is studied by Humprecht (2019). The researcher compares and analyses the content republished by fact-checking organizations on disinformation in four countries – the U.S., U.K., Germany, and Austria. In the U.S. and the U.K., online disinformation targeted politicians and political organizations. In Austria and Germany, disinformation was spread against immigrants, linking them to criminal activities. The prevalence of sensational news is

more in Austria and Germany. Most of the studies define fake news from a scholarly perspective. Media outlets, journalists, academicians are the ones who have been framing the definition of the term. However, in the study, Nielsen and Graves (2017) have tried to understand the audiences' viewpoint on fake news. The study was conducted in four countries – the U.S., U.K., Spain, Finland. The data was collected using two methods – from 8 focus groups and a survey of people who read news online. Participants in the focus groups were asked to define the term fake news. Most of the participants responded by saying that the term was being used as a weapon to attack the media and critics. Unlike scholarly definitions, most participants thought fake news to have several meanings. Poor journalism, political propaganda and advertising are what constitutes fake news for the participants.

Social media platforms like Facebook and Twitter act as a breeding ground for fake news stories. An online survey was conducted by Flintham et al. (2018) to understand the participants' awareness about the reliability of the news, their encounter with fake news, and their reaction to it. The results indicate that participants use multiple ways to judge the credibility of a news source on social media. Source, content, prior experiences were some ways that participants depended upon to know the reliability of an article. The interest of the participant in knowing about the news also played an important role. If the participants showed any disinterest, they skipped reading the post and did not care to check the article's credibility.

Singh et al. (2021) used a different approach to detect fake news articles tried to figure out what

features help determine them – visual or textual or both. Kaggle Fake News Dataset containing 12,999 news articles collected from 244 websites were used. All three approaches were tested for accuracy, and the results proved that a combination of both text and images performed better than only text or visual. Many fake news detection datasets have been built to detect fake news. Shu et al. (2020) built a data repository named FakeNewsNet, which comprises two datasets comprising all three features like news content, social context, and spatiotemporal information. Data Analysis was done to understand what kind of topics these data sets dealt with. Articles from PolitiFact mostly contained political news.

RESEARCH QUESTIONS

1. What are public perspectives on fake news on social media?
2. What are the associated terms used with fake news?
3. What are the trends and patterns of fake news terms appearance in social media?

OBJECTIVES OF THE STUDY

1. To understand the trending keywords associated with Fake News topic in Google Trends worldwide for the past five years.
2. To understand the days with the highest number of tweets with the hashtag fake news.
3. To identify the publishers publishing articles covering topics like fake news around the world.

METHODOLOGY

There were various methods used in this study. Firstly, News Headlines were collected for the content analysis. Content analysis analyzes and examines textual data to understand the patterns and characteristics of the text. Data can be collected from books, newspapers, magazines, interview transcripts, speech transcripts, content posted on the Web etc. The occurrence of words and phrases are quantified in content analysis. For content analysis, news headlines discussing the problem of fake news were collected from Google News. Google News is a news aggregator platform. It distributes news from multiple sources. All titles on fake news were collected worldwide, and after proper screening, unrelated headlines were excluded. Access to some websites was forbidden, had a subscription or showed error (404). A total of 942 news headlines were collected from around the world. This includes 242 news headlines exclusively from India. The headlines were available from 3rd January 2021 to 30th March 2021.

The second method used was collecting Twitter data via Twitter API. The tweets were collected using the term #fakenews from 10th January 2021 until 1st April 2021. A total of 4,34,600 tweets were collected for the analysis. The third method used was to search for keywords in Google Trends and analyze the term's popularity or trend for the past five years (2016-2021). It helps to analyze the popularity of the keywords. The values typically range from 0-100. A value of 50 indicates that the term is half-popular, whereas a value of 100 means it has reached peak popularity. Therefore, additional words can be

added and compared to see which terms are more trending. All the headlines were collected in Microsoft Excel. Repetitive and duplicate news headlines were excluded. Data was collected on – the date, source, and headline. The Twitter data was collected in Google Spreadsheets. Data for popular keywords were already available in Google Trends. Tableau was used for data visualization. Voyant-tools was used to generate a word cloud.

DATA ANALYSIS AND DISCUSSION

Figure 1 is a heatmap showing the number of tweets with the hashtag fake news tweeted on a given day of months January, February, and March 2021. Heatmap is a visualization technique that uses colour to distinguish between higher and lower values. In the below figure, the darker the colour, the higher the value means the maximum number of fake news headlines. The highest number of tweets was reported on Wednesdays for January, with 32,172 tweets being tweeted related to fake news. Sundays also have a high number of tweets related to fake news, with the number being 29,142. The lowest number of tweets for this month was on Tuesday, with the number being 20,420. For February, Wednesday again has the highest number of tweets on fake news at 36,728. The lowest number of tweets on this topic for this month is on Saturday at 16,466. The month of March reports the highest number of tweets on fake news on Tuesday, which is 31,680. The number of tweets for Monday is 29,196. The number of tweets on Wednesday for March is not significantly low and is 28,579. The lowest number of tweets for this month is on Sunday, 19,723 (Figure 1).

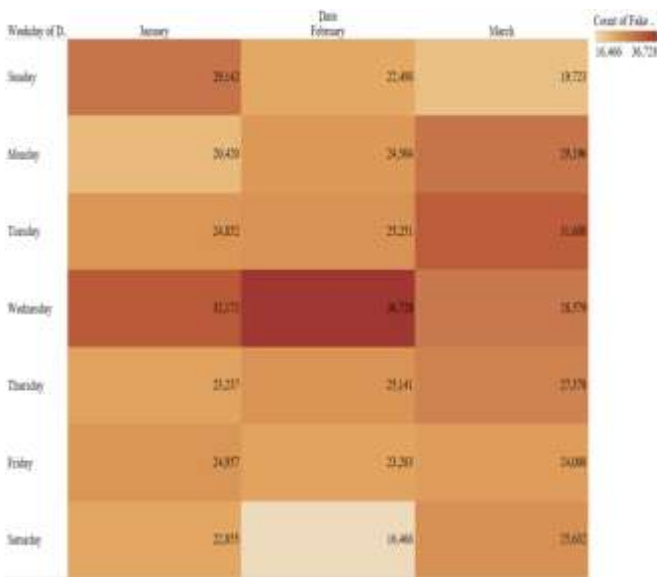


Figure 1: Popular days for tweeting

The public used many other popular keywords along with hashtag (#) with fake news on social media Twitter. The public used various named entities while Tweeting, such as person name, location, political parties, city name, name of news media outlets, country name, celebrities, etc. The researchers mentioning only a few essential key terms, and these are as follows:

#FakeHunter, #stopphate, #knowledge, #racist, #systemicracism, #satire, #comedy, #factMatters, #FreedomOnTheNet, #FakeTrade, #disinformation, #misinformation, #ViralNews, #FactCheck, #Misleading, #infodemics, #falsepromises, #Communications, #alternativefacts, #falsenarrative, #partialtruths, #alternativemedia, #biglie, #falsefacts, #mistrust, #polarization, #politics, #AlternativeFact, #StopFundingHate, #LegacyMedia, #TrustTheProcess, #ReliableNews, #ProTruthPledge, #alternativefacts, #truth, #factsmatter, #FakePress, #Myths, #HateSpeech, #truthfulness, #post-truths, #FakeFunk,

#propaganda, #stoppropaganda, #Facts, #TheTruth, #InformationDebunking #Coverup, #proof, #pressfreedom, #viral, #fakemedia, #SystematicLier, #MachineLearning, #DeepLearning, #DeepFakes, #NeverAgain, #NeverForget, #Exposed, #alert, #Caught, #CyberSecurity, #AI, #MachineLearning, #BotArmy

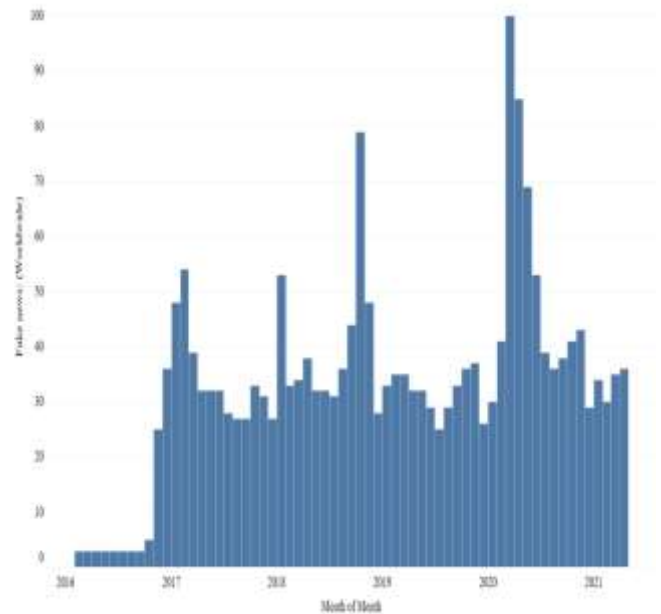


Figure 2: Trend analysis of the term fake news

Data Source: Google

Trends(<https://www.google.com/trends>)

Figure 2 depicts the trend of the keyword Fake News on the Web from 2016 till 2021 across the world. The term has not been widespread enough, starting from February 2016 till October 2016. However, the term’s value rose to 25 in November 2016 and kept rising till the value reached 54 in February 2017. The value or popularity of the term decreases till 27 in December 2017. However, it rose again to 53 in January 2018. The next spike is seen in the same year, in October where the value increases to 79. The next few years witnessed a reduction in the

value of the keyword until again in March 2020. There is a breakout in the popularity of the term which reaches the value 100. The term continues to remain popular until July 2020. Some important events that took place during these months initiated a spike. An observation made was that fake news was always used with some popular political figure or news organization.

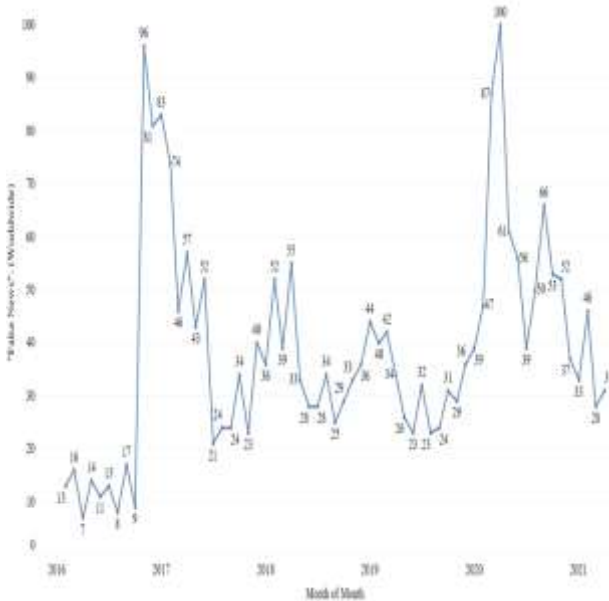


Figure 3: Trend analysis of the term fake news

Figure 3 shows the trend analysis for the term False News across the world for the past five years. There was no significant rise in the value of the term until November 2016. The term False News reached 96 in November 2016 from a value of 9 in October 2016. The term continued to trend till a sudden dip in March 2017 where the value reached 46. There is no significant rise in the term's popularity until March 2020 where there is a spike in value to 87 and reaches a breakout or peak popularity to 100 in April 2020. The figure shows that the term witnessed a spike twice in the last five years.

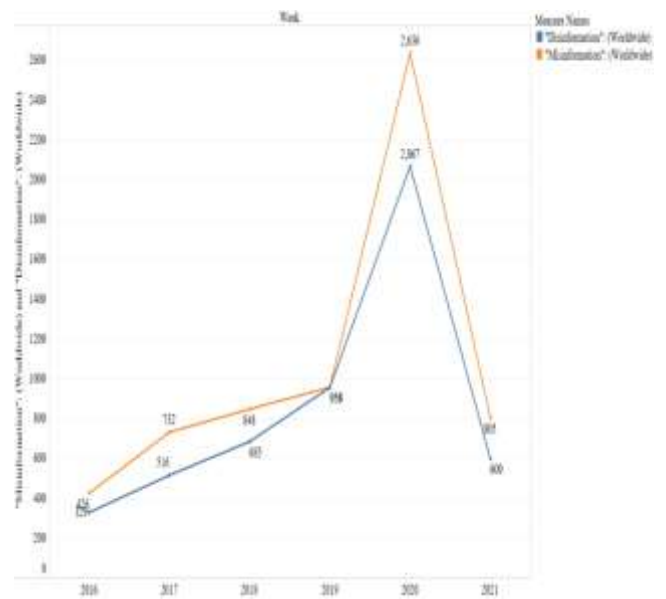


Figure 4: Trend analysis of the term Misinformation and Disinformation

Figure 4 shows a trend analysis of the terms Misinformation and Disinformation worldwide for the past five years. Since 2016, the value for misinformation has been 426, and disinformation has been 329. It rises to 732 for misinformation and 516 for disinformation in the year 2017. 2018 also witnesses a rise in the value to 848 and 685 for Misinformation and Disinformation, respectively. In 2019, the terms almost had an equal value. There is a sharp rise in the value to 2,636 for misinformation and 2,067 for disinformation in 2020. The value for both the term decreases again in the year 2021. One more word became popular recently that is related to fake news, e.g. infodemic. No trend data was available on Infodemic from 2016 till 2019, as the term became popular recently in 2020. An initial rise was in January 2020 where the value stood at 102. This further rises to 184 in February and reaches peak popularity in March 2020.

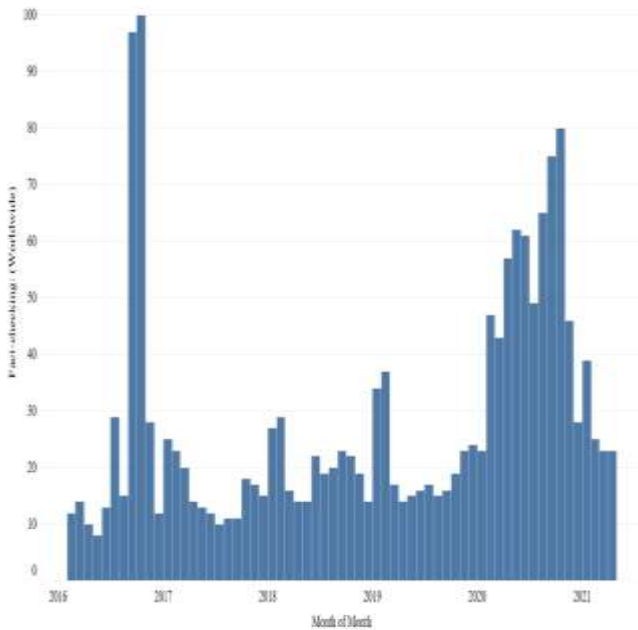


Figure 5: Trend analysis of the term Fact-checking

Figure 5 shows the trend for keyword Fact-checking across the world for the past five years. The term Fact-checking saw a sharp rise in September 2016, with the value being 97 and further reaching peak popularity in October 2016 when the value reached 100. There was a sharp dip in November 2016. The value further decreased to 12 in December 2016. January 2017 and February 2017 are the only months where the values are 25 and 23, respectively, a little higher than the other months of the year. Similarly, in the year 2018 months, January and February report a high value of 27 and 29, respectively. This is repeated in 2019, where January and February again report higher 34 and 37 respectively than the other months. The values for the term Fact-checking are higher for most of the months in 2020. The highest value, which is 80, is in October 2020.

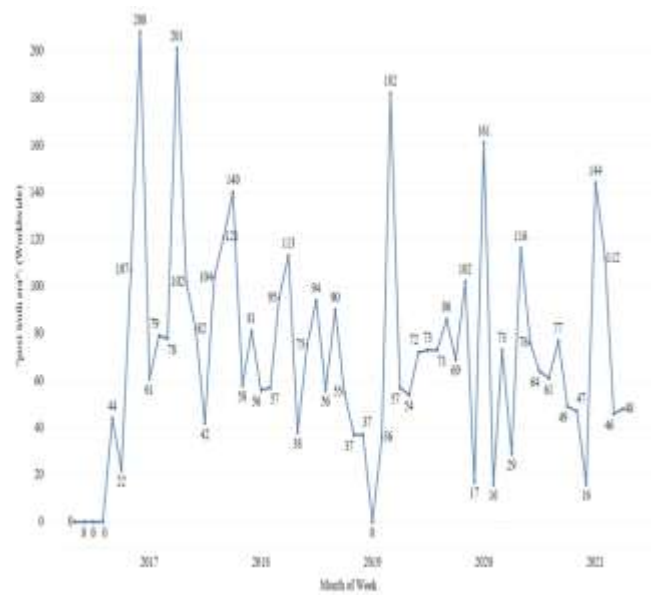


Figure 6: Trend analysis of the term post-truth era

It is evident from Figure 6 that the value of the term shot from 0 to 44 in September 2016. There was a decline in the value to 22 in October 2016 but a dramatic increase in November 2016 to 107 and a further increase to 208 in December 2016. The value for the keyword dropped to 61 in January 2017 but increased slightly to 79 and 78 in February and March 2017. The figure shows a dramatic rise and fall in the value of the keyword post-truth era from 2016-21.

News publications on Fake News across the World

Figure 7 below shows the top 20 publishers publishing on the topic of fake news across the world. Malaysia Kini and The Star Online have the highest number of publications on the topic. They have published 12 articles on the topic of

fake news. At least one article has been published by Washington Times and Politifact. The top 20 publishers publishing on the topic of fake news around the World are The Star Online, Malaysia Kini, Khmer Times, The Guardian, Manila Bulletin, Eyewitness News, The Straits Times, Free Malaysia Today, BBC News, UrduPoint News, The Sun Daily, The Jerusalem Post, South China Morning Post, News18, Morocco World News, Mirage News, Irish Examiner, INQUIRER.net, Hungary Today and Politico.

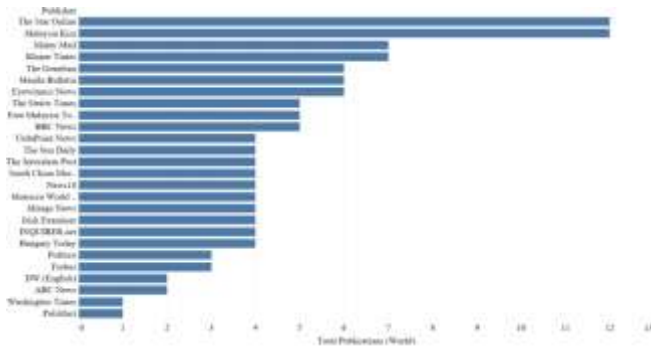


Figure 7: Publishers with highest publications on Fake News across the World

Publications across the World on the topic Fake News

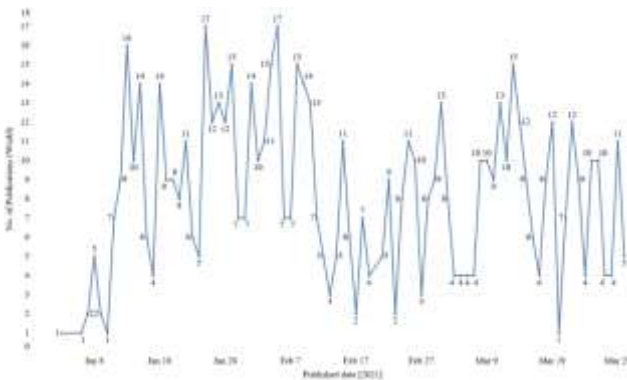


Figure 8: Publications across the world on the topic Fake News

The above Figure 8 shows the total number of publications on fake news worldwide and the

published date. The number of publications was stable on 3rd January and 6th January. It gradually increased to 2 and 5 on 7th and 8th January and decreased again. There is a spike from one publication on 10th January to 7 publications on 11th January. This number increases slightly from 9 on 12th January to 16 on 13th January. There is a fluctuation seen from 15th January where the number slips to 6 on 16th January and 4 on 17th January. There is a dramatic rise, however, to 14 publications on 18th January. Again, there is a dip in the number of counts, and the count decreased to 5 on 24th January. However, there is a dramatic rise seen on 25th January where the count reaches 17. This kind of rise is seen next on 5th February. This rise has happened gradually from 10 publications on 2nd February to 11 on 3rd February, to 15 on 4th February. 6th and 7th February report a stable number of publications which rises to 15 on 8th February. This decreases gradually to 14 on 9th February and eventually to 3 on 13th February. The number of publications keep rising and falling with no significant rises seen after 5th February. On two days, the number of publications was highest at 17. There were many days on which the publication count was only 1.



Figure 9: Frequently used terms in news headlines

A Word Cloud helps in identifying the most frequently used words in a text. The most significant words have been used more frequently. Similarly, some of the most frequently used terms in the news headlines were news (958), fake (945), covid (114), media (89) and vaccine (66). Other frequent words were social, spreading, spread, buster, misinformation, vaccines, Facebook, Twitter, viral, health, vaccination, coronavirus, combat, spot, tackle, curb, debunk.

CONCLUSION

The results by analyzing the Twitter data show that users tweeted actively on some days of the week than others. Wednesday had the highest number of tweets on the topic of fake news for both January and February months. Tuesday was the popular day with the highest number of tweets for March. This points out some significant events that might have occurred on these days or the day before that caused people to tweet and retweet about the event. The trend analysis for the term fake news shows a dramatic rise in some months over the years. The term reached half-popularity in February 2017 and January 2018. A sudden spike occurred in October 2018 and March 2020.

Similarly, the term False News was trending in November 2016 and in April 2020. Another observation is those terms that became popular due to their impact upon the entire world. One such word is Infodemic which trended for a few months in 2020. This instance shows how any event affecting the entire world can give rise to

popular terms or keywords. Other terms like Fake News stories and Fake News sites were trending in 2017 but have dropped to significantly low levels in recent years. Keywords Misinformation and Disinformation were compared, which revealed misinformation to be trending than disinformation.

Likewise, a comparison between Credible News and Reliable News shows that Credible News is more trending than Reliable News. The trend analysis of the term Fact-checking shows that it had an impressive start in the beginning. However, it is disappointing to note that it failed to reach the same levels as the years went by, indicating a decrease in the term's popularity. The results by analyzing the headlines from various publishers reveal top publishers in both India and World. It also revealed the specific dates on which the publications on fake news topics were high for Indian and World Publishers.

To conclude, the term Fake News or even the terms associated with it see dramatic rises whenever some significant events are happening in a country or even an event impacting the entire world. A similar pattern can be seen in the results when the data from Twitter was analyzed. Some days were popular for tweeting than others. Likewise, there were some dates where the total number of publications in India and the World were higher than the other dates when news headlines were analyzed. Fake News circulation can be tackled effectively with the awareness that it goes viral during some particular event.

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