COVID-19 Infodemic: Analysis of the Spread and Reach of Misinformation

Devashree A. Joshi

Abstract: During the COVID-19 pandemic, the circulation of misinformation and fake news has generated lot of fact discrepancies and scientific oversights. Our research aims to comprehensively assess the spread of misinformation regarding COVID-19 and analyze its reach across demographic parameters like age group, gender and country of residence. Data Analysis has been performed using various open-source technologies like Python, Tableau, R Studio by generating diverse visual plots and Word Clouds. For experimental purposes, we considered India and USA as countries of focus and the data was collected accordingly. Furthermore, an independent, original Survey has been designed and conducted to trace the reach of viral, verbatim misinformation articles in both the countries. We studied the misinformation data across parameters like – misinformation types, motives and medium of spread. Our research proved to be of practical relevance, and it is gauged to be beneficial to strategize mitigation measures required to be enforced in not just COVID-19 pandemic like situations but also in various other fields where the misinformation problem persists.

Keywords: misinformation, COVID-19 misinformation, fake news, disinformation, survey analytics, big-data analytics, visual analytics

I. INTRODUCTION

Coronavirus (COVID-19) is an infectious respiratory disease, first identified in December 2019, in Wuhan, the capital of Hubei province in China [1]. Since then, the COVID-19 outbreak has affected more than 219 countries and regions across the globe, with reported 2 million plus deaths and around 97 million confirmed cases as of now (January 2021) [2]. This is the third novel coronavirus and is called as the SARSCoV-2 (COVID-19), the defining global health crisis of this century and the greatest challenge faced by mankind since the World War II. It was declared a global pandemic by the World Health Organization (WHO) on March 11, 2020 [3]. Today, one of the greater risks standing in front of us, scarier than the pandemic itself, is the spread of misinformation across communities. Misinformation means false and inaccurate news. Along with misinformation, there is also a quite large amount of propagation of disinformation articles.

Devashree A. Joshi, Software Developer, Data Analyst and Digital Marketer based in Pune, Maharashtra, India. Email: devashree31198@gmail.com

While misinformation can be spread accidentally or unknowingly, disinformation is information which is deliberately spread. People have been using this pandemic for their own selfish reasons by fulfilling their personal agendas. To summarize, the circulation of misinformation can be defined as an 'infodemic' amidst a pandemic. Misinformation infodemic is a problem of "too much inaccurate information." This 'infodemic of misinformation' is having drastic impacts on the lives of common people as well as obstructing the pandemic mitigation processes adopted by countries globally. Articles right from – fake remedies to cure coronavirus, blame games of xenophobic undertones, to speculations and conspiracies regarding the origin of the pandemic; there's barely any topic left untouched by misinformation. And the serious issue is that when influential people, contribute to the amplification of unverified information and news, the real, authentic information ends up having only marginal impact.

Fig. 1. Attributes of Misinformation

The understanding of various attributes of misinformation is pivotal in any study related to this area of research. Hence, as part of background research, we collated and conceptualized the Fig. 1, a diagram that summarizes the generic and standardized properties of the concept "Misinformation" in terms of its types, motive (motivation) and medium of spread. We have used these attributes as main points of classification and inference, throughout the paper.
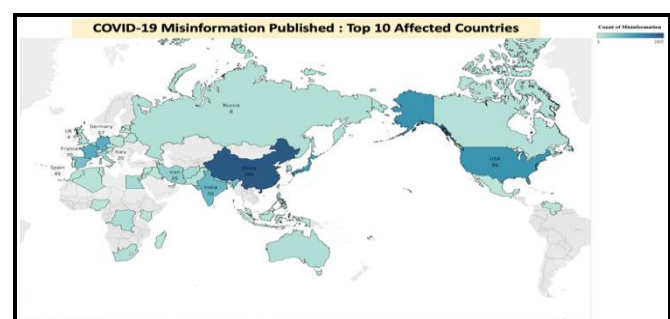

Fig. 2. World Map Visualization highlighting the Count of Published Misinformation Articles

Fig. 2 outlines a World Map Visualization that illustrates the number of misinformation articles published in top 10 most affected countries (as of May 2020) by COVID-19.

COVID-19 Infodemic: Analysis of the Spread and Reach of Misinformation

The data for these published articles was recorded between January 2020 to May 2020. It is observed that China has the highest count (160) of published misinformation articles, USA has 96 articles and India stands with 56 misinformation articles published. To sum up, the misinformation infodemic is widespread and needs to be controlled at the earliest. The goal of this paper is to comprehend and examine the reach of published misinformation related to coronavirus, with the help of statistical and data analytics. The paper aims to become a reference point for recognizing how misinformation circulation can be avoided and controlled during a pandemic or any other infodemic situation.

The remainder of the paper is organized as follows: Sect. 2 outlines the current ongoing research in the domain and highlights some key limitations our paper will address. Sect. 3 portrays our motivation and inspiration behind the conducted research. Further, Sect. 4 describes the data sources and their attributes in-detail. Sect. 5 elaborates upon the analytical methodology implemented and the discussion of the experimental results. Finally, in Sects. 6 and 7, we conclude the research and point out the way forward in the domain.

II. LITERATURE REVIEW

Data Analytics is the science of understanding, examining and investigating raw data to derive inferential outcomes [4]. The problem of fake news is a big data problem and needs to be addressed using data analysis, deep learning and machine learning techniques such as NLP tools, clustering, text classifier models, etc. For implementing such techniques, it is highly important to collect and consider correct, quality data that is relevant to the study [5]. Ahead of the misinformation 'infodemic', even the World Health Organization (WHO) has declared that there is a need for qualitative data collection methods like surveys, that are vital to address the concerns around communication between public health officials and public in general [6]. For this paper, we have conducted a survey which studies the viral news pieces surrounding coronavirus and their influence over masses.

'Misinformation Spread' is a byproduct of enormous requirement of information in a short span, during a humanitarian crisis [7]. The perpetual ubiquity of inaccurate information and the persistent threat of misinformation 'wildfires', poses as a serious hurdle while tackling a public health crisis [8]. During such situations, it is essential to implement 'human – machine' joint efforts to mitigate the impacts of misinformation [7]. The current COVID-19 pandemic has brought forward the impacts of misinformation on a larger magnitude. If fake news denouncements are implemented sooner, there's a great window of opportunity to clear the confusion amongst masses regarding public health and eventually reduce the stigma and fear created around Coronavirus [9]. The authors of [9] checked the online information published regarding Coronavirus for its quality and readability by performing analytics on specific terms. In [10], the authors suggested that misinformation dissemination can be controlled by making use of advanced technologies like Natural Language Processing (NLP) and Text Mining. In a recently published paper by J. Scott Brennen et al. [11], detailed statistical analysis has been conducted through a survey, on the misinformation infodemic, across 6 countries.

To conclude, the current research is focused on discussing the spread of misinformation during similar epidemics and specially the COVID-19 pandemic. However, to the authors knowledge, very few publications and experiments are available that discuss the issue of investigating the 'Reach' aspect of misinformation. Therefore, our experiment aims to cover the major gap of assessing the spread and reach of misinformation in Indian and American populations across demographic parameters. The research also reports how COVID-19 related information is perceived and interpreted by different people.

III. MOTIVATION

Amidst the COVID-19 pandemic, there have been numerous incidents and reports of lives being lost only because of rumors, false news, misinformation and misleading data being disseminated. The 'Misinformation Infodemic' needs to be tackled through completely data driven technical and statistical explorations. Analysis of – Attributes of Misinformation, as outlined in Fig 1, is significant to formulate solutions for infodemic mitigation. The outcomes of this study will be useful for implementing advanced algorithms of text mining and text analytics, to control and prohibit the circulation of false news on the internet and through different types of media.

IV. DATA SOURCES & ATTRIBUTES

This section is classified into 2 sub sections. In the first section, the primary source of data and methods of its collection are elaborated, while the second sub-section discusses the use of secondary source of data.

A. Primary Source of Data

The Primary Data Source consisted of an original survey that was conducted in India and USA for a period of 6 days from May 13 – 18, 2020. Our questionnaire comprised of 10 quantitative as well as qualitative questions and utilized the Random Sampling Method. It was developed on Survey Monkey, an online survey development cloud-based software. The survey questions aimed to collect data regarding various aspects of misinformation like 1) Sources of Information, 2) Awareness and Basic Knowledge regarding Coronavirus, 3) Perception of people about Misinformation, 4) Inclination of common man towards sources of information concerning the COVID-19 pandemic. As can be seen from Fig. 3, the question and response types used in the survey were 1) Multiple Choice, 2) Checkboxes, 3) Matrix / Rating Scale and 4) Open Ended / Comment Box Questions. The survey was specifically designed to find out the outreach of COVID-19 related misinformation. Hence, verbatim coronavirus misinformation articles which were trending and broadly shared in India and USA, were shortlisted and were included in the survey. The questions were framed with a goal to extract information from respondents about their knowledge and awareness of Coronavirus. The respondent demographics taken into consideration were age, gender and country of residence.

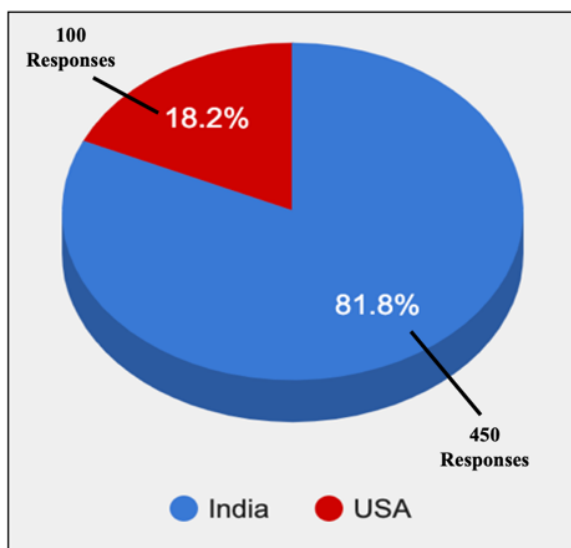**Fig. 3. Survey Questionnaire Screenshots**

Fig. 4. Survey Questionnaire Responses

Within a span of 6 days, our survey received 550 survey responses, out of which responses recorded from India and USA were 450 (81.8%) and 100 (18.2%) respectively. The respondents were instructed that the survey was intended to study and evaluate the reach of misinformation regarding COVID-19. Appropriate guidance to read, understand and answer the questions was also provided. Out of the 10 questions, 9 questions were mandatory to answer while only one question, an open-ended question, was optional in nature. The responses were not discarded even if the respondent skipped the optional question. The typical time spent by a single respondent on the survey was 4 minutes. The data collected from the survey was segregated as per countries – India, USA and then was used for the analytics. Response-wise data was retrieved using pandas library in Python, to calculate the Trust Factor on Preferred Information Sources. Out of the 550 total responses, 389 respondents chose to answer the optional, open-ended question whereas 161 respondents skipped the question. Based on the 389 open-ended responses, a Word Cloud was generated.

B. Secondary Source of Data

For Secondary Data Source, an open-source dataset was used. The Empirical Studies of Conflict Project (ESOC) [14], works towards compiling micro-level data related to global issues. On March 16, 2020, ESOC, in collaboration with Microsoft Research, published a dataset upon misinformation and disinformation articles being spread around the COVID-19 pandemic. The dataset has records of misinformation efforts from around the world, sorted according to sources, languages, keywords, narratives along with many more parameters and even direct links to such stories have been provided.

The ESOC dataset consists of 900+ published misinformation and disinformation articles worldwide, recorded since January 2020. The dataset consists of 18 parameters like, date of misinformation publication, primary language, narrative, misinformation type, amongst others. For this study, feature selection of the dataset was done and only 5 parameters which were most relevant to the study, were considered. They are – Publication Date, Country, Motive, Medium of Spread, Misinformation Type.

As a part of the data cleaning procedure, all the missing and null values were removed. To avoid data discrepancies, inappropriate and repetitive values were normalized. For instance, the countries column in the database had multiple entries for the same country as "USA", "U.S.A", "United States of America" and "US"; or "United Arab Emirates", "Emirates" and "UAE". A single country name was considered for such records.

Some misinformation pieces in the dataset were designated with multiple countries in which the articles were published. For analysis purposes, only one country was considered, corresponding to the language in which the article was written / published. Specifically, if an article was written in "Mandarin", but the countries it was published in were mentioned as "China", "France", "India", "Sri Lanka"; then China was selected as the country of publication, owing to the language-country reference.

V. ANALYTICAL METHODOLOGY

The analytical section is categorized into 2 sub sections. In the first section, analysis and insights extracted from the ESOC Dataset have been elaborated, while the second sub-section discusses the analytics performed on the survey responses.

A. Analytics on the ESOC Dataset

People around the world are spending more time on social media due to the social distancing norms imposed by respective countries to tackle the COVID-19 pandemic. This has in turn led to an overall increase in the likelihood of exposure to misinformation and fake news. As a result, people are putting themselves and their contacts at risk with unscientific, superficial COVID-19 remedies, cures and facts.

The resultant graph in Fig. 5 also concurs that 'Social Media' is the most commonly used medium of misinformation propagation in both the countries. 'Friends / Family' and 'Radio / Podcasts' are two sources which even though are insignificant compared to the count of other sources, are present in USA but are not being used at all in India, as means of information propagation. One of the reasons for 'Radios / Podcasts' not being the sources of misinformation spread could be the efforts taken by Community Radio Stations in India, to air shows like 'Break the Fake News Chain' [12].

Fig. 5. Medium of Published Misinformation Articles in India & USA

In Fig. 6, we can clearly see that 'Fear' is the main motive behind spread of misinformation in both India and USA and that all misinformation pieces with the intent of spreading fake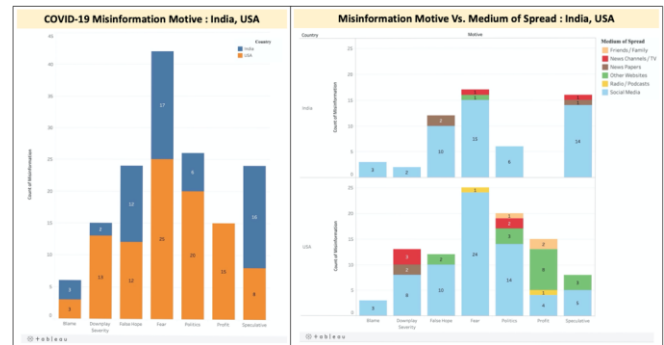 news are largely spread via 'Social Media'. Reasons for this could be that fear opens doors to profitable outcomes like desperate purchasing of remedies, generating business models out of a pandemic, leveraging emotions of millions and the fact that we are living in a society of fear. Also, 'Profit' is one motive which is not present in the misinformation that has been published in India whereas a good amount of it can be seen in USA. 'Politically driven misinformation pieces' are spread in USA in larger chunks compared to India, mainly due to the right-leaning media coverage of COVID-19 in America [13]. When it comes to the type of misinformation, it is proof enough that 'False Reporting' is highly responsible for the misinformation being published across India and USA. 'Conspiracy' theories regarding COVID-19 have been trending for a while now and the data shows that such articles are being published in USA almost 4 times more than they are being published in India. This is evident as survey results show that 55% of the population of USA cannot identify whether a conspiracy theory article is a fake news or a fact [11]. Fig. 7 indicates that news which is 'Falsely Reported' has the highest share of spread through 'Social Media' platforms in India and USA and that, 'Fake Remedies' in India are only circulated on 'Social Media'.

Fig. 6. Motive of Published Misinformation Articles in India & USA

Fig. 7. Type of Published Misinformation Articles in India & USA

B. Analytics on Survey

Medium of Spread Vs. Preferred Source

Fig. 5, presents that 'Social Media' is the most used medium of misinformation propagation. Inference from survey results is that respondents (550) across India and USA prefer 'News Channels / TV' over 'Social Media', when it comes to reading / listening any information related to COVID-19.

As per Fig. 8, the difference between 'Social Media' and 'News Channels / TV' in India is quite drastic as almost 82% of the 450 respondents prefer 'News Channels / TV' while 56% respondents prefer 'Social Media'. On the other hand, difference between 'Social Media' and 'News Channels / TV' in USA shows that 56% of the 100 respondents prefer 'Social Media' while 61% respondents prefer 'News Channels / TV' as their sources of information. Referring to Fig. 5, even though the misinformation published via 'News Channels / TV' is quite less in comparison to 'Social Media', there should be absolutely zero propagation of misinformation via these channels. These news reporting channels should take this into consideration and make sure that the medium preferred by millions is not becoming the one that is feeding them rumors and false news and is responsible for generating chaos.

Fig. 8. Preferred Sources of COVID-19 Information in India & USA

To conclude, it is an evident fact that 'Top 3 Sources' preferred by people in both countries are 'News Channels / TV', 'Social Media' and 'Official Government Websites'.

Trust Factor of COVID-19 Information Sources

The survey collected population demographics like age, gender and country of residence. Correlating the data collected from these demographics with the top preferred sources of information regarding COVID-19 (shortlisted from Fig 8), we calculated Trust Factor (TF) that a single respondent has on information sources. To summarize, it can be considered as a rating scale for the trust people have on the top preferred information sources. The trust factor analysis has been classified into 4 parts, in coordination with the 4 age groups used in the Survey.

Country	Gender	Age Group (in years)	News Channels / TV	Official Government Websites	Social Media
🇮🇳	Female	16 – 25	72%	75%	69%
🇺🇸	Female	16 – 25	66%	70%	59%
🇮🇳	Male	16 – 25	75%	76%	74%
🇺🇸	Male	16 – 25	63%	73%	63%

Fig. 9. Trust on Information Sources in the Age Group : 16 – 25 years

Fig. 9 shows that females and males in the age group 16 – 25 years in India and USA trust 'Official Government Websites' the most, with trust factors being 75%, 70%, 76% and 73% respectively. Fig. 10 demonstrates that females and males in the age group 26 – 25 years in India and USA trust 'Official Government Websites' the most, with trust factors being 69%, 67%, 70% and 75% respectively.

Country	Gender	Age Group (in years)	News Channels / TV	Official Government Websites	Social Media
🇮🇳	Female	26 – 35	68%	69%	67%
🇺🇸	Female	26 – 35	63%	67%	64%
🇮🇳	Male	26 – 35	69%	70%	69%
🇺🇸	Male	26 - 35	71%	75%	66%

Fig. 10. Trust on Information Sources in the Age Group : 26 – 35 years

As a result, we see that the younger population demographic (16 – 35 years) per se is more inclined to trust 'Official Government Websites' more than any other sources, which is an ideal scenario. But if trust factors of other sources are considered, there is hardly any margin between them and the trust factors of 'Official Government Websites'. 'Social Media', which has been attributed to be the medium of maximum misinformation spread, has a sufficient amount of trust factor. This indicates that governments should work towards generating trustworthy mediums of information propagation when it comes to public health crises like the Coronavirus pandemic. This will not only benefit the government, but also to the people, who won't get misled by the false news that circulate on other media platforms.

Country	Gender	Age Group (in years)	News Channels / TV	Official Government Websites	Social Media
🇮🇳	Female	36 - 55	64%	67%	58%
🇺🇸	Female	36 - 55	69%	79%	75%
🇮🇳	Male	36 - 55	69%	73%	65%
🇺🇸	Male	36 - 55	69%	84%	65%

Fig. 11. Trust on Information Sources in the Age Group : 36 – 55 years

Fig. 11 also lies in alignment with the observations noted from Fig. 9 and 10. It leaves us with Fig. 12. which discusses the trust factor of the older population demographic of 56+ years.

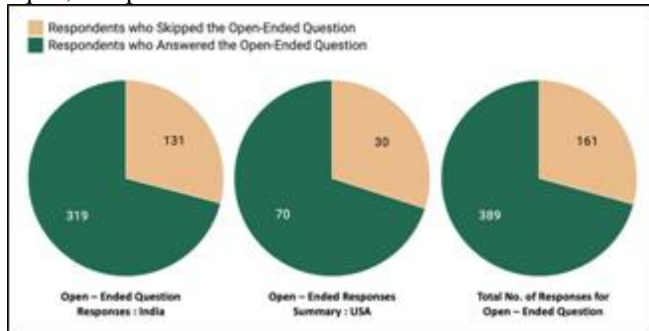| Country	Gender	Age Group (in years)	News Channels / TV	Official Government Websites	Social Media
🇮🇳	Female	56+	64%	66%	60%
🇺🇸	Female	56+	75%	73%	73%
🇮🇳	Male	56+	58%	71%	56%
🇺🇸	Male	56+	40%	50%	40%

Fig. 12. Trust on Information Sources in the Age Group : 56+ years

Except females in America, the highest trust is upon Official Government Websites, whereas women in USA are slightly more inclined towards information received from News Channels / TV. This needs to be taken seriously by news broadcasting companies and independent channels that they are responsible for putting out accurate content when it comes to public welfare issues. Authentic and responsible journalism should be encouraged and practiced. In conclusion, strong and powerful efforts need to be made to make sure that people trust and follow only one, single most authentic source of information and that should ideally be the government of the country.

Word Cloud

To record the general public opinion on 'Misinformation about COVID-19', the survey questionnaire consisted of an optional, open ended question. The following question was included in the survey with an intention to find out, who a commoner holds responsible for the infodemic of misinformation and what could be the mindset of people spreading fake news.

The question quotes as – "What according to you is the main reason for spread of misinformation and why do people create it?" Out of the total 550 survey responses (India – 450; USA – 100), 389 respondents chose to answer the optional, open-ended question whereas 161 respondents skipped the question. Fig 13. showcases a summary of the Open – Ended Responses and as per the pie-charts, the ratio of the people who have answered the open-ended question, to the people who have skipped the open-ended question, is approximately equal, irrespective of the countries.

Fig. 13. Summary of Responses for the Optional, Open – Ended Question

Using the 389 open-ended responses, a Word Cloud was generated. A word cloud is a visual representation of words, arranged in a certain spaced-out manner and the words form a cluster of the summary of the text in consideration [15]. Word Clouds can be used as the first step towards a profound analysis of the subject of study [16]. For example, in [17], the author used Word Cloud representations to holistically understand large number of speech transcripts.   Fig. 14 illustrates a Word Cloud obtained from the responses of the open-ended question from the survey. In the Word Cloud, the font size of the words indicates the occurrence frequency of words used in the open-ended responses [15]. According to the generated Word Cloud, the perception of misinformation amongst the masses can be used as a starting point to delve deeper into understanding the infodemic of misinformation surrounding the COVID-19 pandemic.

Fig. 14. Word Cloud from Open-Ended Responses

The responses to our open-ended question had multiple people talking about how "fear" and "panic" have been one of the foremost reasons for the spread of misinformation. After studying Fig. 14, it can be seen that the prominently visible words and phrases are – 'lack awareness', 'WhatsApp', 'Anxiety', 'Politics', 'forward', 'publicity', 'Social media', 'fear', 'WhatsApp forwards', 'create panic', 'Ignorance', 'Lack knowledge' and 'news channels'. These words depict that, in this digital age where "Social Media" has a very distinguished place in everyone's daily life, the masses seem to have opined that "WhatsApp Forwards" might have been the strongest mediums used for fake news circulation. Creating panic, anxiety and fear due to the stigma around the virus, are some other reasons attributed with misinformation spread.

VI. CONCLUSION

Along with the fear and life uncertainty surrounding COVID-19, there is an immense amount of information available about the virus which has given birth to a lot of unrest, confusion and miscommunication amongst people across the world. There have been numerous incidents and reports of human deaths and damages done, only because of rumors, false news, misinformation and misleading data being disseminated. Therefore, making people aware of the difference between legitimate and fake news is the need of the hour. In this paper, we have proposed our main research objective to be – the assessment of 'Spread' and 'Reach' of broadcasted misinformation in reference to COVID-19. In our research, we performed analytics to derive the actual reach and influence of fake news articles about coronavirus. We also evaluated the different notions that people have about the 'Misinformation Infodemic'. According to the findings of our research:

- 'Social Media' concludes to be the most used medium of misinformation propagation, across all age groups. Primary reason for this can be that along with the younger generations, the older generations are also trying to get acclimatized to consuming information from social media platforms such as WhatsApp, Facebook, Twitter, etc. Thus, information available over such platforms, is influencing people's decisions and opinions regarding COVID19.
- 'Fake Remedies' for coronavirus are being hugely propagated through media platforms. This could be attributed to the fact that people are feeling desperate and helpless due to the prolonged pandemic, which has no definitive cure in sight.
- 'False Reporting', one of the main types of misinformation, has been on the rise since the inception of the disease. Since the media is flooded with information coming in from different sources, maybe, with the fast-paced nature of the industry, it becomes difficult to validate each report for its trustworthiness.

To sum up, we conclude that scientific and technical methods of data collection and analytics with a back of strong statistics can be used to assess the misinformation spread and reach. Also, our findings are of direct practical relevance and the approach can be implemented to solve problems from various domains or fields that face the threat of misinformation infodemic.

FUTURE SCOPE

The methodology proposed in this paper can be further expanded in multiple directions of research such as:

• Acquiring datasets on a broader level, considering aspects like continent wise data, population size wise data, etc., to help achieve more accurate results.

• Predictive analytics models can be implemented. Training such models with ample amount of data and adequate statistical evidence to back up the results, will help set up a strategy to combat and mitigate the impacts caused by misinformation during global crises.

• More population demographic parameters can be introduced, such as caste, income groups, literacy levels, etc. This might prove significant for deriving potential results.

• Periodically conducting research on real time, trending, viral articles will help narrow down the issues of concern and will help governments to focus on tackling them.

• Developing and utilizing intelligent fact-checker systems before news channels publish the news will help media houses to broadcast only authentic content.

• Topic Modelling algorithms like Latent Dirichlet Allocation (LDA) could be used to identify topics from large textual open-ended responses. This concept was demonstrated in [18] to analyze political speech transcripts comprising of large texts.

Efforts can be directed towards identifying predatory news channels and sources that promote the publication of any kind of news for viewership. All this will not only encourage healthy reportage but will also increase public awareness and boost citizen journalism.

REFERENCES

1. Coronavirus Disease, https://en.wikipedia.org/wiki/Coronavirus_disease, 2020
2. Worldometers.info, https://www.worldometers.info/coronavirus/, 2020
3. World Health Organization (WHO), Who director-general's opening remarks at the media briefing on covid-19 - 11 march 2020, https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-atthe-media-briefing-on-covid-19---11-march-2020.
4. Chen, J., Jiang, Q., Wang, Y., Tang, J.: Study of data analysis model based on big data technology. In: IEEE International Conference on Big Data Analysis (ICBDA), pp. 1–6. IEEE, (March 2016)
5. Torabi Asr, F., & Taboada, M.: Big Data and quality data for fake news and misinformation detection. *Big Data and Society,6*(1), 1–14, (2019).
6. World Health Organization (WHO), A Coordinated Global Research Roadmap, https://www.who.int/publications/m/item/a-coordinated-global-research-roadmap (2020)
7. Tran T., Rad. P., et. al.: Misinformation Harms During Crises: When The Human And Machine Loops Interact, In: 2019 IEEE International Conference on Big Data (Big Data), Los Angeles, CA, USA, 2019, pp. 4644-4646, (2019).
8. Ghenai A., Mejova Y.: Catching Zika fever: application of crowdsourcing and machine learning for tracking health misinformation on Twitter, (2017).
9. Cuan-Baltazar, J. Y., Muñoz-Perez, M. J., Robledo-Vega, C., Pérez-Zepeda, M. F., & Soto-Vega, E.: Misinformation of COVID-19 on the internet: infodemiology study. *JMIR Public Health Surveill,6*(2), e18444, (2020).
10. Tasnim S. C., Hossain M., Mazumder H.: Impact of Rumors and Misinformation on COVID-19 in Social Media, In: Journal of Preventive Medicine and Public Health vol.53, pp.171-174, (2020)
11. Neilson R. K., Fletcher R., et.al.: Navigating the 'infodemic': how people in six countries access and rate news and information about coronavirus, In: Misinformation, science, and media. The Reuters Institute for the Study of Journalism and University of Oxford, pp. 2020-04, (2020)
12. Outlook India, Tune in--Community radio stations aid fight against coronavirus with local touch, https://www.outlookindia.com/newsscroll/tune-incommunity-radiostations-aid-fight-against-coronavirus-with-local-touch/1815082.
13. Motta, M., Stecula, D., & Farhart, C.: How Right-Leaning Media Coverage of COVID19 Facilitated the Spread of Misinformation in the Early Stages of the Pandemic in the U.S. Canadian Journal of Political Science, vol. 53, no. 2, 335-342, (2020)
14. Shapiro J. N. and Oledan J.: ESOC COVID-19 Disinformation Tracking Report. In: Empirical Studies of Conflict. https://esoc.princeton.edu/publications/esoc-covid-19disinformation-tracking-report, (2020)
15. Burch, M., Lohmann, S., Beck, F., Rodriguez, N., Di Silvestro, L., Weiskopf, D.: Radcloud: visualizing multiple texts with merged word clouds. In: 2014 18th International Conference on Information Visualisation (IV), pp. 108–113. IEEE, (2014)
16. Heimerl, F., Lohmann, S., Lange, S., Ertl, T.: Word cloud explorer: text analytics based on word clouds. In: 2014 47th Hawaii International Conference on System Sciences (HICSS), pp. 1833–1842. IEEE (2014)
17. Katre. P.: NLP Based Text Analytics and Visualization of Political Speeches. In: International Journal of Recent Technology and Engineering (IJRTE), vol. 8(3), pp. 8574-8579, (2019).
18. Kate. P.: Text Mining and Comparative Visual Analytics on Large Collection of Speeches to Trace Socio-Political Issues. In: 2019 IEEE 9th International Conference on Advanced Computing (IACC), pp. 108-114, IEEE, (2019)

AUTHORS PROFILE

Devashree A. Joshi is currently working as a Software Developer in Pune, Maharashtra, India. She has done her bachelor's degree in Computer Science and has done post-graduation in Data Analytics. Her areas of interest are Big-Data Analytics, Business Analysis, Data Mining and Visualizations and Information Systems.