

Modern Techniques for Fake News Detection in Social Media

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Abstract: *We are living in a dynamic universe which is thoroughly information - centric and digitized. In present scenario, where mainstream media laps up everything said or done gets dished out forthwith it from different platforms. And there is nothing sacrosanct about one's privacy; and gone are the days, when newspapers and audio - visual media outlets would hold strong sway on the society. But of late, menacing rise of social media has mercilessly siphoned off sheen surrounding mass media and latter's mojo is out of sync with today's reality. Notwithstanding, it is the social media that calls the shot as its algorithm operates with mindboggling speed in informing, spreading, and connecting people. But it is beset with menace called fake news that triggers distrust, doubts, and hiccups all around, hence, people dither to share even genuine news with others. We know, before fake news gets detected, it causes untold damages. Therefore, it is imperative to evolve some remedial mechanism and our study expounds its raison d'être and delve into few approaches that enervate its viciousness.*

Keyword: Fake News, fake news types, detection, misinformation, disinformation

1. Introduction

The present information - soaked world is intrinsically battling with the obnoxious menace of Fake News from time immemorial. It is causing problems of gargantuan proportion and spreading negativity instantaneously and we just stare at it. It has been there even before the invention of printing press itself. Deleterious effects spawned by its ubiquity got it rechristened as 21st Century's 'Information disorder'. It is also called, misinformation, rumors, hoax, canard, hearsay, scuttlebutt and what not. The fabricated story spread through myriad media channels like print, broadcast, or online platforms and quite often politicians use them to gain political mileage to score a brownie point over their opponents by spreading hatched stories to defame, slander, and malign. Its sole aim is to mislead, dissuade, and distract attention of people from the pressing socio - economic issues. Therefore, it is construed as scandalous which carries with it distorted and slated info accompanied with deceptive images and counterfeit quotes which very often are meant to throw someone under the bus. It causes harm before it gets detected. Innumerable attempts have been made to use certain approaches to detect it but the concurrent results have been disappointing, hence, it necessitates more research in this potential area. Fake News sows seed of descension and negativities in the society with regards to prevailing political ambience, and over the issues like economy, education, media, religion, sex, commerce and what not. We know we cannot eradicate it completely but at the most, we can study about its spiraling corollary and investigate the means to detect before it inflicts potential harm. In this regard, we have identified few approaches like expert fact - checking, crowdsourced, machine - learning, natural language processing, hybrid technique, expert crowdsource, human - machine, graph - based methods, hierarchical graph attention network, deep learning, and recommender system, etc. to detect and contain its malicious

proWess.

Nuances of Fake News

The term Fake News has become diametrically pervasive phenomenon across the world, and in common parlance it has intrinsically acquired the mischievous sobriquet which insinuate at something that lacks truth and integrity. Yes, it comes in the ambit of journalism, but it is far from journalistic errors, satire, calumny, or burlesque. It might be ubiquitous in political, public and media discourse but its sole aim is to deceive, cheat, harm, besmirch or cast aspersions at. In different parts of the world including India, we have been combating with its malevolent impact and many researchers are probing its various aspects and trying to gauge its dominant negative impact on various aspects of life. With world is getting subsumed by the digital media, Fake News has metamorphosed into an unbeknown phenomenon which always tries to influence its selected vulnerable targets. Hence, it becomes researcher's bounden duty to study and evolve a remedial mechanism. Social media firms are often told and pressurised by society and political dispensation to crack down on this real threat which has far - reaching impacts across.

2. Historical Background

Propaganda and misinformation have been the part and parcel of human communication from time immemorial. At the outset, propaganda found its use since Roman era when the Roman politician Mark Antony met Egyptian Queen Cleopatra VII. And during 32 - 30 BC, his arch rival Octavian to settle score with Mark Antony got coins etched with vituperative slogans casting aspersion on his personal integrity by describing him as a womanizer and a drunk. With the invention of Gutenberg printing press in 1493, the dissemination of misinformation got further amplified, which delivered large - scale hoax called - 'The Great Moon

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Hoax' of 1835. The New York Sun had published few articles about discoveries of life on moon with illustration of humanoid bat creatures and bearded blue unicorns, which was never verified. Similarly, with the advent of radio and television in 20th Century, satirical news evolved, was being mistaken as the real thing in consumers' mind. Arrival of internet in late 20th and social media in 21st Century magnified the risks of dissemination of misinformation, propaganda, and hoaxes in such a way that they were mistaken as real source. India with its multilingual cultural ethos and internet penetration (600 million in 2019) by digital illiteracy has resulted in the rise and spread of fake news online. During pandemic in 2019, India witnessed almost 214% rise in cases linked with fake news. Similarly, in 1800, in US, projected racist sentiments given rise to the fictitious news about Afro - American's incompetence and criminal tendencies, that was grabbed and misused by Nazi propaganda machines to flag anti - Semitic fervour. During The Boer War (1899 - 1902) a much - touted propaganda was used to sway the public opinion in favour of British army. A book 'The War that Hitler Won, ' by Edward Herzstein during World War - II between 1939 - 45 was the testament of great propaganda which idolized Hitler's vicious ability to decimate millions of Jews with overwhelming support. We have also witnessed, The Cold War from 1947 to 1991 wherein global broadcasting agencies were used to influence people to take sides. And well - known facts about Brexit, social media showed fudged figure of Brexit supporters on Instagram. During Covid - 19 pandemic, news titled, 'The Scapegoating of Tablighi Jamaat Members, ' as India was battling against spike in Covid - 19 case, gathering of *Tablighis* in New Delhi were blamed for the same using terms such as 'Tablighi Virus' and 'Corona Jihad. ' And of late, in the wake of Chennai cyclone, a fudged digital claim showing video of Myanmar storm as cyclone *Michaung* in Chennai prompted Tamil Nadu government to bust this fake quickly.

Variants of Fake News

Fake news can be classified into different categories such as clickbait, hoax, propaganda, satire and parody, and others.

Clickbait: It is a fictitious story with catchy headline which tempts a reader to click on it, and when someone clicks it, the disseminator of such news get it monetized. A study by one of the researchers finds most clickbait headlines to be enticing and more appealing than the normal news. And such types of clickbait are defined as exaggeration, teasing, inflammatory, graphic, formatting, bait - and - switch, ambiguous, wrong and contend that usually have gossips which are not at all associated with the attractive headlines.

Propaganda: It was intrinsically used during 1st and 2nd World War time to save people from getting into panic and causing more casualties. Especially in political arena, use of propaganda is consequential; it is a political tool very often used with conviction to create a smoke screen before public to conceal wrongdoings and build a narrative which in the long run wipes out all smouldering discontentment of people from their leaders. This type of news can be detected using manual fact - based detection models such as expert - based fact - checkers and crowdsourced techniques.

Satire and Parody: This type of fake news is an exaggerated form of fabricated story reported in the mainstream media in the form of comedy. It employs humorous style to present to audience with news updates; herein, the main difference is that those presenting such news are performer and comedian instead of a journalist, because the audience know that the presenters project such news from the mainstream media in a way that suit and serve their interest.

Hoaxes: Such news are invented to deceive public and audiences. They are produced deliberately and coined in such a way that at times, in the form of mainstream media report and it is construed as true. This kind of news are fabricated on large scale and hoaxing causes huge damage for which it is meant; mostly it is aimed at a public figure.

Name - theft, framing, journalism deception: This variant of fake news basically steals the identity of an authentic news source to make believe the audience that their news is true. It begins with creation of website which mimics already existing credible news website to con the audience; they even display ditto copy of a logo used by the genuine website, they do all these shenanigans to earn the trust of audience and get themselves established in the market.

Proliferation of Fake News

Fake news spreads on social media through two ways i. e., Misinformation and Disinformation. Misinformation represents those who share news or myriad contents incognizant about their veracity, they share it because their friends had been doing it. Here, the echo chamber effects do the work, as we all know, social media algorithm recommends news or information to their customer due to the group he or she belongs to. They probe their prior history and whenever their pals view something, the same gets recommended to their friends. And it will notify the user that such and such news, content or video has been viewed by their friends, thus, indirectly influencing them to like and share it with others. All this sharing goes on without knowing the veracity of shared contents and sharing get faster among those subscribing to the same belief system or are part of the same socio - economic or political dispensation. Disinformation refers to those sharing information are aware about its 'genuineness' but go on sharing and passing on to others to make political or financial gains. They exacerbate things further when they use malicious account called social media bots and trolls which interacts in human forms. Social bots were created by companies to help and assist customers in need but it is being used to spread vicious information. Bots easily tweet, retweets, follow thousands of accounts and equally share shared post on Facebook instantaneously.

3. Review of Literature

Fake News' legitimacy is questioned right from the diffusion of content creation technologies, economic tumult and it ultimately gets scrutinized when entered in public domain where it fails to gain public trust (Carlson, 2020; Tong, 2018). The very fact that multitude started consuming news from social media instead of tradition journalism organizations does erode that sacred ties between the latter

and former wherein the veracity of news they gobble up gets disregarded (Gottfried & Shearer, 2016). Lazer et al., 2018, p.1094, termed, Fake News as the emblem representing the collapse of journalistic sanity, which clearly hints at the eradication of institutional authority to combat misinformation. Now majority of those living in this knowledge - driven era have almost given up on a quest for evidence, consistency, and fact - checking (Lewandowsky, Ecker, & Cook, 2017, p.360).

Gaozhao, 2021, opines that Fake News is inaccurate, false, and fabricated content which gets disseminated as veritable, although it is not. It can be easily get spread on social media and other conventional communication platforms and it does not hold moral compass to talk about its authenticity but it gets quickly spread that contains emotionally loaded languages (Vosoughietal., 2018). It is as old as history itself and effort to detect them has always been rewarded since long, and with the advent of social media, its reach is widened and viciousness multiplied (Allcott & Gentzkow, 2017).

Zimmermann & Kohring, 2020, states that Fake News is unwanted because it impacts and influence people psychologically and socially as it distorts and skew their belief which results in getting drowned into misinformation and wrong decisions. It not only affects person individually but prove to be harmful for the society. It consequently incurs political, economic, social, and cultural repercussions across. And its indiscriminate spread generates distrust among the people (Vaccari & Chadwick, 2020) and news ecosystem equilibrium goes awry. Though, it is significant to ascertain its veracity on social media forum but due to its complexity, it is difficult to debunk its myth, maintains (Hernon, 1995).

Social Media users often have access to produce information without any hiccups or monitoring or editorial interference (Allcott & Gentzkow, 2017) because of this, largely content on this platform might be spontaneous yet thoroughly unethical. Besides, its voluminous content which goes on increasing thus makes it impossible to check its authenticity. Similarly, (Oh et al., 2018) says, fake news is shared by people when they get beguiled to believed that it is genuine and sharing get faster; this very notion which has no foundation, firmly believed to be standing on truth and sincerity.

4. Method of Study

The base of this study has been exploratory in nature wherein we studied and examined several approaches, techniques and methods used by various researchers. The methodological approaches include qualitative approach of available materials and research method for ascertaining the efficacy of tried and tested approaches.

Fake news detection tools & techniques

Expert Fact - checker Approach

Expert Fact - checkers is a small group of interdisciplinary experts and professionals who authenticate the veracity of certain news items and decide whether such information is

fake or genuine. The expert herein suggests that such expert - centric fact - checking method are though small in nature, yet high in accuracy and can be managed. One of the studies accentuates that expert fact - checker is a credible approach to verify fake news. Some professional fact - checkers are associated with some organization which limits their accuracy. It is a manual technique which involves professionals small in numbers, who face challenges when volume of information is high. During 2016, US presidential poll and Brexit referendum, same expert fact - checkers could not detect growing number of fake news which was floating all around. Such fact - checkers are often termed as biased or political for their nexus as it is riddled with limitations. In India Alt News is the prominent fact - checker which debunk rumors which often spiral onto television.

Crowdsourced Approach

This approach often termed as 'wisdom of the crowds' is built on the principal that teamwork will always outshine individual brilliance and this idea has been made credible by Brabham (1982) who sees this online distributed problem - resolving model leverages venture of online intelligent groups to serve the specific organizational goals. The inherent lacunae of expert - based fact - checking prompted many to look for 'wisdom of the crowds' as messiah to resolve fake news' chaos; its efficacy makes it more sought - after approach.

Machine - Learning Method

Granik and Mesyura, 2017, proposed the early machine learning method to detect fake news that are primarily fabricated to make financial gains and acquire political clout. He used Naïve Bayes classifier and classified linguistic features where factors such as word count, syntactic nature involving sentence - level characterization become crucial. In this approach, BuzzFeedNews aggregator datasets are used which contains Facebook post data from different political news agencies like politico, CNN, ABC News, etc. In this approach datasets are categorized into components such as training, validation, and testing of datasets; most Artificial Intelligence (AI) mainly rely on detecting and flagging fake news heavily hinged on Click - Through Rates (CTR). If fake news type as clickbait articles would have huge CTR due its appealing mode, but this approach cannot be used to detect clickbait. Biyani et al. (2016) espouses machine learning model using Gradient Boosted Decision Tress (GBDT) achieves strong classification performance and noted that informality is crucial in 'baity' nature of web pages and can predict whether it is clickbait or not. This approach detects the authenticity as it finds anomaly between content and headline, and secondly its content will be substandard.

Technique of Natural Language Processing

This approach primarily operates within the parameter of automated deception detection technique that revolves around application of lexical and semantic analysis using regression, clustering, and classification methods like binary classification where text is regarded as genuine and not genuine. A two - class problem where detection gets tough while in the third - class news is termed as partially true or not. With Text Vectorization algorithm, sentiment score is calculated and deception cues are identified in the text using

natural language toolkit which is further extracted and clustered. For natural language processing, linguistic features including text and style are key factor; syntactic analyzer such as Stanford parser, grammar and style detector give accurate results.

Hybrid Technique

This technique is said to be an amalgamation of methods arising out of content - based and social context - based model which utilizes auxiliary information from different perspective. The failure of single model compelled scholars to look for an alternative measure to detect fake news more accurately. At present there are techniques like HybridExpert - crowdsource and Hybrid Machine - crowdsource detection method which are blend of some models possessing dynamic processes. Due to complexity and ambiguity of fake news, Hybrid detection techniques is taken as an alternative to several other detection methods, where combination of other methods become imperative.

Expert Crowdsourcing Approach

Due to inadequacies of expert - based and crowdsourced - based fact - checker emerges Expert Crowdsourcing Approach which is comparatively new. This precisely manual technique is driven and totally depend upon human knowledge than that of automatic fact - checking that involve machines. This approach complements the failure of expert approach. Recently, Facebook has announced use of expert - crowdsourcing approach to battle against burgeoning fake news on the network but it is often accused of being not independent, slow, and politically biased. Crowd being unbiased, independent work on large information; therefore, its decision can be shared with the experts as they are cognizant about many aspects of life.

Human Machine - Approach

The heterodox tendency makes most machine learning algorithms' efficacy inapt in detecting the fake news and such algorithms built to authenticate fake news are low in accuracy as we all know those fabricating fake news use such language which bypasses these algorithms. In all this, we can have recourse to crowd's wisdom that is good, allegedly slow, time - consuming that lacks expert understanding because there are lay people at its base. The detection process found to be yielding better results when the automation is spurred by social bots which is driven by the collective endeavour of machine learning algorithm and human efforts. Shabani and Sokhn (2018), propose one hybrid machine crowdsource method using a dataset from the fake against the satire public dataset. This proposed model synthesizes the joint human efforts with that of the machine learning to boost decision - making algorithm to correctly predict whether the news is fake or genuine. Initially, crowdsourcing was used to segregate news from satire and fake news to distinguish them which was difficult with machine. Machine learning technique engages classification algorithm like Logistic Regression (LR), Support Vector Machine (SVM), Random Forest (RF), Gradient Boosting (GB) and Neutral Network (NN); and all these produce an accurate baseline (Naïve Bayes) result.

Graph - based Method

Social network's homogeneity suggests that the connected users on social network tend to have same characteristics unlike same news article; hence, malevolent users often mimic and use same pattern, therefore, any kind of write - ups from such sources can be flagged as fake. This model user investigates content from hetero and homogenous networks to classify whether the news content is fake or fabricated. Graph network uses ground truth datasets in dividing the network into communities, triads, and nodes to spot fake news' authenticity and this method prove to be better as they detect it before it gets proliferated on the network, they add. The random work said to be much more effective in detecting fake accounts on social media, by combating the attack of social bots which spread the fake news.

Deep Learning Approach

This approach detects the authenticity of news article using neutral network. A group of researchers have used an amalgamation of several deep learning algorithms like Convolutional Neural Network (CNN), Long, Short - term Memory network (LSTM), and Bidirectional LSTM (Bi - LSTM) and uses 4 - class label relating to headlines of news articles and proposes 3 - type model which ensures precision in checking legitimacy. While Liu and Wu (2020) examining deep neutral network, addresses the fakeness by delving into the social traits' critical examination of fake news in its early stage before propagation. And having used X and Sina Weibo sites, they have proposed model called FNEED for early detection. On other hand, others using hybrid CNN model has introduced 3 alternative neutral networks i. e., LSTM, LSTM with dropout regulation, and LSTM linked to CNN which he said, are impressive.

5. Recommender System

It is a news recommendation process that removes deceitful people from user's neighborhood – Beta Trust Model which investigates user's credibility. This system uses Explainable Multimodal Content - based Fake News Detection System and Graph Neutral Network. Depending upon textual content and associated image its veracity is ascertained as well as explainable artificial intelligence assistant (XAI) to prevent the propagation and dissemination of fake news and awareness is raised by facilitating personalized alerts using user's profiles. And to probe the veracity, new dataset named FNEWR is constructed and ultimately it is capable to outwit 10 hi - tech fake news detection models.

6. Interpretations and Discussion

When we wade into the swelling discourse on fake news detection models, it becomes amply clear that existing models will not resolve the stalemate. For, we will certainly need more advanced and scientifically proven models. Yes, crowd sourced judgement might have yielded some results, wherein manual investigation implies the use of professionals and experts; and it is replete with limitations like time and involvement of labour because they get bogged down when face with huge information. Automatic fact - checking certainly easily deal with large volume of information in a short span of time but this method too hits

the roadblock as most of the automatic machines learning algorithm detect fake news using lexicon and textual contents and styles. As new techniques and mechanism to check and detect fake news are evolving so does the fabricator and fake news manufacturers are getting shrewd and devising means to obviate every possible assault on their technical jugglery. Of late, graph - based method seems to be yielding better results, but greed for financial gains which fake news creators often gain prevent them in flagging such outrageous contents. In the prevailing environment in India political parties wilfully embarked upon divisive politics are indiscriminately using fake news to outwit political opponents. After 2014, many political parties in India are heavily using social media to expand their reach and to meet their goalcausing irreparable damage to the Constitution. Social bots and trolls account are posing real challenge as they easily spread fake news all around in a short span, hence, future work is required to detect social bots.

7. Conclusion

Fake news is not a novel phenomenon, it does exist in olden times and as the world got metamorphosed into a dynamic entity which has domino effects on everything it encompassed including those engaged in fabricating fake news. Consequently, those fabricators to get acclimatized with the changing milieu started using terminologies and replicating trends liked by all on social media. So fake news techniques have evolved a stratagem to exploits every possible loophole and bypass countermeasures taken to stop them. This way they are duping millions by making them believe into lies circulated by camouflaged information which often carry a semblance of reality that gets debunked but, in the process, damage gets done. Fake news witnessed unprecedented growth during 2016 US Presidential election, says a study by Stanford University, wherein famous fake news sites had 159 million visits which created a seismic tremor in the social media ecosystem. In this paper, we having broadly perused the existence of different varieties of fake news, did an overview of selected approaches and explained about their diverse and actual efficacy. This study to some an extent has unravelled the dynamic nature of fake news which is complex that makes the debate surrounding its detection absolutely challenging. Hence, it is the duty of all stakeholders including social platforms, news agencies, government, politicians, and others to take a collective step to stem the rot.

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