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SURVEY OF FAKE NEWS DETECTION TECHNIQUES

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Abstract

Fake News Detection is a long-standing problem most of us face through online or offline news sources. Large numbers of tools are present worldwide to detect fake news. However, for full success, detection of fake news requires lots of research on existing tools, an add-on to the browser, etc. Fake news could be in any form, half fake, satire, mostly fake in text or any multimedia format. Here the paper presents a detailed study of fake news with its types, variations, and detailed discussion of each fake news category along with tools and existing methods used. In this paper, we will discuss some widely used false news detection methods. Further, we analyze different features and drawbacks of Fake news detection methods and tools. There are many issues, and challenges still exist with many existing methods that are discussed in this work. Fake news detection is an evolving research problem that needs to be addressed using proper techniques and methods to achieve efficiency and accuracy.

I. Introduction

Social media, like Twitter and Facebook, have facilitated the distribution of real information among users worldwide. With characteristics like ease-to-use, low cost, and rapid rate, it has become a significant platform for online interaction. However, it also has the potential for negative impacts on individuals and society. Therefore, detecting fake news on social media is essential and a technically challenging problem these days. Using tools, content is easily generated and quickly spread, leading to a large volume of material to analyze. Online information is very diverse, covering many subjects, which contributes complexity to this task. The truth and intent of any statement often cannot be assessed by computers alone, so efforts must depend on collaboration between humans and technology. Multiple researchers have looked at fake news problems from various perspectives. Includes social science [8][9]having the impact of fake news on society and technology research try to automate the system of detection by analyzing the content and using various machine learning algorithms and forensics techniques[7]. Now a day's fake news is created and distributed with the intention of political, economic, and social benefits. The impact has an adverse effect, not only limited to one's reputation and social life.

Recently users have identified information that is valuable and has done extensive research to develop an automated framework for fake news detection. Finding credible sources through thousands of messages manually is a time-consuming job. Considering data online is heterogeneous in structure and not static. As fake news is intentionally written to mislead readers, finding their truthfulness online is a challenging job[11]. Techniques like linguistic-based feature extraction were not much useful in distributed like fake news detection [10]. There are many aspects to look into fake news detection problems, but finding the credibility of the source and author along with spreading pattern of news are most important. Challenge with social media is it is very time-sensitive; only trending topics and events are discussed. Hence a need for a real-time system detecting, exploring, and interpreting fake news is needed.

II. Defining Fake News

Fake news or misinformation refers to false information or propaganda published under the guise of being trustworthy news. Fake news websites and channels push their fake news content to mislead consumers of the content and spread information via social networks and word of mouth. It is often found in traditional news, social media, or fake news websites, which has no facts. To keep a few issues unsolved fake news are used to distract people.

A. Fake News: who, why and for whom

There are two modes of spreading fake news either by automated Robots or humans.

1. **Automated Robots**: A computer algorithm design to behave like humans to create fake news and fake content are called social bots. They also interact with humans on online media [26]. These bots are programmed to be posting tweets and participating in social communities after being registered [20]. Similarly, to bots cyborg accounts that are malicious can exploit social media users by spreading false information, which may result in damaging the trust of ordinary people.

2. **Humans:** Humans are the one who programs both, bots or cyborgs, so the brain behind these machines is the mislead minds who spread misinformation intentionally. Social bots and cyborgs are only the carriers of fake news. The ultimate creator is the one who spoils the social balance. As to make it difficult to distinguish between fake and true news, fake content is intentionally created [10].

Fake news is created for a different purpose to be given to different targets. It could be just an opinion projected harshly about an event or a person. It could be to manipulate the voting behavior of citizens or also could be shaping parent's decisions about their children's career options though fake news in political aspects have always been targeted.

B. *Types of Fake News*

Many people now get news from social media sites and networks, and often it can be difficult to tell whether stories are credible or not. Information overload and a general lack of understanding about how the internet works by people have also contributed to an increase in fake news or hoax stories. Social media sites can play a big part in increasing the reach of these types of stories. There are differing opinions when it comes to identifying types of fake news. However, when it comes to evaluating content online, we need to be aware of various kinds of fake or misleading news. These include:

1. Clickbait: These are the stories that are deliberately fabricated to gain more website visitors and increase advertising revenue for websites. Clickbait stories use sensationalist headlines to grab attention and drive click-through to the publisher's website, generally at the expense of truth or accuracy.

2. Propaganda: Stories that are created to deliberately mislead audiences, promote a biased point of view or political cause or agenda.

3. Satire/parody: Many websites and social media accounts publish fake news stories for entertainment and parody.

4. Sloppy journalism: Sometimes reporters or journalists may publish a story with unreliable information or ignore all the facts which can mislead audiences. For example, during the US elections, fashion retailer Urban Outfitters published an Election Day Guide, the guide contained incorrect information telling voters that they needed a 'voter registration card'. Any state does not require this in the US for voting.

5. Misleading headings: Stories that are not false can be distorted using misleading or sensationalist headlines. These news types can spread quickly on social media sites where only headlines and small snippets of the full article are displayed on audience newsfeeds.

6. Biased or slanted news: Many people are drawn to news or stories that confirm their own beliefs or biases, and fake news can prey on these biases. Based on our personalized searches, social media news feeds tend to display news and articles that they think we will like.

C. *The Motivation Behind the Project*

The explosive growth in fake news and its erosion to democracy, justice, and public trust has increased the demand for fake news analysis, detection, and intervention. They can also have significant impacts because information shapes our world view: we make critical decisions based on information. We form an idea about people or a situation by obtaining information. So, if the information we saw on the Web was invented, false, exaggerated, or distorted, we won't make the right decisions. Fake data not only harms the news industry but also has its impact in other areas too.

1. Fake News in the tourism industry [21]: If considered in broader terms, 'fake news' in tourism can manifest in different forms. In 2017, the Lithuanian national tourism agency was responsible for using images unrelated to the country to promote the Baltic state as part of an online marketing campaign.

2. A lot of spam detection needs to be done on popular online social networks(OSN) like Twitter and Facebook.

3. False medical information and news make patients scared unnecessarily and can often delay necessary medical care and attention.

4. Sharing fake news on online media is not even considered as a Fault.

5. The presence of fake news indirectly affects behavioral intentions toward brand advertising.

6. Fake News in the stock market industry makes investors make incorrect decisions and may face huge losses.

III. DATASET

A fundamental factor behind a successful supervised learning model is a useful dataset. Assessing the quality of datasets through various evaluation metrics has been a common practice in machine learning. The best way to collect data is by crawling through twitter. But to have supervised data, we need to work with existing datasets. The LIAR dataset is generally used for research purposes is the LIAR dataset works on a 6 class classification of almost 12800 manually sorted. Short statements. It does give information about the URL and source of news data. Benjamin Political News Dataset works on satire type of fake news, which includes 75real and fake stories and compared them with real sources like business Inside. Burfoot dataset also works with satire types of news compares with gig word corpus. Buzzfeed news, which is data collected from Facebook, also has a multiclass classification of data for more than 2000 news collected. It also provides lots of relevant data with it. Twitter data collected in Credbank has over 60 million tweets that work on real-world events. Kaggle's challenge in the year 2017 does provide a dataset called Fake News Challenge, which worked on stance level analysis is an excellent dataset for reference. PHEME, a very famous rumor dataset collected from tweeter during breaking news, is a good dataset to study rumor as a type of fake news.

Datasets are not limited to the above listed, but still, much work has been done in fake news detection. Online datasets can be used to train models and predict parameters affecting target attribute. Online repositories like Kaggle provide a wide range of datasets. Ahmed used datasets for opinion analysis and deceptive reviews in 2017, which was further reviewed in 2011, and 2014.various parameters are considered necessary in datasets like size labels, source, author, URL, timestamp, content, and a wide range of evaluation parameters too. But few datasets contain only content information. It's very challenging to build a useful model with such limited data. The main challenge of creating a dataset is labeling news. In a supervised learning algorithm environment, it is essential to have labeled class with a balanced dataset. For using a machine learning algorithm, having a useful dataset is a bottleneck problem for real-world applications.

IV. LITERATURE SURVEY

The author Young Kyung Seo[13] has focused on an unreliable answering system with CNN technique, a fake news detection for media reliability applying a modified deep learning model, three image datasets used with 15,000 entries, and classifying it into three classes, true, false and neutral. Results were less accurate, and hence data argumentation and a batch size of 64.the output gave 3 % better result than statistical models. The comparison experiment of 3 data sets gave good results while they wish to extend their work in a distributed parallel environment for fast streaming. One of the primary reasons for spreading fake news is the competitive nature of the media industry[25]. Two dynamic periods of 100 days. The author Veronica Perez-Rosas[10] used two datasets Fake News ATM (Amazon Mechanical Turk) and celebrity with 480 entries and almost 65,000 words each. Dataset mainly focused on six domains (sports, business, entertainment, politics, technology, and education).crowdsourcing was used to find legitimate and fake news, and worked on features like Ngram, Punctuation. Psycholinguistic features, readability, and syntax. A Linear SVM for classification and performance parameters like accuracy, precision, recall, and F-score were computed. The developed system's performance is comparable to that of humans, with an accuracy of up to 76%. The paper cannot build automated news detection without manual interference.

Malicious social bots [26] have also been used to disseminate false information, resulting in real-world consequences. Humans activate the automated procedure for semi-social boats; also, subsequent actions are automatically performed by boats. The author concentrates on operations related to the primary task of malicious blot and not fake news detection, as they can spread fake news at a far higher speed than humans. Experiments showed that transition probability between user clickstreams based on the social situation analytics could be used to detect malicious social bots in online social platforms accurately. The author Liqiang Wang[12] have worked on finer shades of untruth instead of just labeling them as authentic or fake news. The paper

divided broad classes into six classes, namely true, mostly, half true, mostly false, false,pants-on-fire, and later collaborating in 4 classes as factual, incomplete, manipulating, and hoax. Data Collected from social media, experiments lacking on parameters where less data is found on twitter.

Dividing news into subcategories gives a different dimension for research. A new approach can be applied to such experiments. In [14], the author tried not only analyzing news but also user credibility (limited only to Twitter users). It tried to compare the statistical emotions of the user by looking for emoji and hashtags used while commenting or posting news. A score is generated by using algorithms for news authenticity and also user score, mutually if they pass the threshold value news is considered to be true. The paper is very well managed by explaining acceptance criteria and other details but only limited to twitter data. Newspapers and other sources of social media are missing. In [15] effectively detect deliberate spread (cognitive psychology)of false information, users can make informed decisions while spreading information in social networks. Algorithms use the collaborative filtering property of social networks to measure the credibility of information sources as well as the quality of news items. The validation of the proposed methodology has been done on the online social network 'Twitter'. The experiment contains only retweet data and DATA about users. He tries to understand the physiology of a user while spreading misinformation. In[16] Author tries to understand the impact of fake news on the stock market and how enterprises release fake news to attain benefits. The author suggested that investors should pay more attention to the truth of the media. For experiment purposes, data were taken from the Taiwan stock market and for media coverage from the CMoney data set. Auto Regression method was used to investigate impulse response. A good result for this domain was obtained.

For more information on TIFF files, please gLike text, much work has been done on image authentication. In [17] author tried to present a semi-automated Approach for news in hypertext articles using metadata and feature analysis of the image in the materials for text clustering was used, and for the image, Google reverse image tool was explored. Accuracy reached 88%, but the data set was limited to 50 images. Research may not be so accurate for large data and less clear images. In [23], the author worked on a network consisting of the news article, creator, and the subject detection problem. The experiment used a GDU model that accepts multiple inputs from different sources simultaneously and can effectively fuse these inputs for output generation with content "forget" and "adjust" gates. An automated system was built, which learned the deep network to output the result. The output generated was a 6-class label instead of typical bi-class detection.[18] Ricky J. Sethi1 countering the spread of fake news on social networks by leveraging crowds to instead help verify alternative facts. A very different approach was proposed in this paper. A web-based approach where the user can upload his version of news along with evidence he and the algorithm try to detect with the existing database how accurate the news is. It's an open question-answer system where other users can also upload their opinion. In [19], the author scans news from news websites and collects it into a database. The algorithm performs a linguist approach and a neural network to find fact-checking. The paper does not believe the algorithm alone; the output is reconfirmed with manual checking performs quality assurance. Later a grade is generated for the news input. The database also keeps track of news rated until now for future analysis. The challenge is to keep all news databases updated and very time-consuming in double cross-checking of news. In [3] author coined a question, "Can people detect photo forgeries?". A detailed survey of images from legal, media, and other domains were taken as input. It performed two experiments in the first one; an image was manipulated. Using six manipulators, and a subject was asked to identify the actual one .this experiment showed good results, but in the second experiment, accuracy decreased as grid number was increased to nine instead of six. The approach was completely subject-based and can give different outputs to a different subject. In [22] author talks about backtracking news shared by third party news sites. It's the same news, but the Reverse-Tracking helps to find out different routes. The paper assumes that fake news has one news producer and many shares, while accurate news has lots of sources and can have many shares. The author does not consider accurate news with individual posts, i.e., based on journalist philosophy. In [24], the problem of key linguistic characters is used while sharing stories on social media is addressed. The author used Text Blob natural language and SciPy Toolkit to develop an automated fake news detector. The experiment used a combined Score, which is calculated using Special Linguist characters; the accuracy obtained is 69.4%. The concept of retweets and Tweets given as an input to a machine learning model [5] and analyze the result through GUI. The typical follower -followee relationship on twitter facilitates quick information flow over social networks. Crawling data from Web and app-ling natural language processing is given to a classifier and evaluated on a single parameter for efficiency. It was output on four label classes instead of a typical bi label.

Researchers performed various methods and have used many tools for fake news detection so far. It may be on social media or traditional media. But still, it remains a problem which needs lots of attention. A lot of research has been done on image tampering and misusing images with improper text and headings. Text fake news has been done using various algorithms like SVM, CNN, neural networks, but many other algorithms. Twitter remains the primary source of collecting data online (due to API readily available). Choosing bias words from dataset to examine in a news article News articles along with linguist features are essential to investigate fake news. Using parts of speech (POS) tagging helps in measuring how adjectives are used in news articles.

v. General Fake News Detection Techniques

Political news has always been a topic of interest in fake news detection. The sentiment, along with content, polarizes news to consumers. various solutions have been thought to get trusted news or fact-checked. [2]. Facebook has come up with an approach to poll users about the news. [3]. One criticism of such top-down approaches is that they restrict user choice and is tantamount to censorship [4] since the user should be able to decide what kind of news articles they wish to read. Data Collection is often the first and primary phase in any real-time problem. Existing datasets can also be used for training purposes. We have started collecting data on Twitter using twitter's API on COVID-19 issues. Attributes like name, ID, Screen-name, location Tweet, Retweets, Retweet_count, URL,account_verification are used to create a dataset for keyword depending on current issues. The next step is preprocessing. Raw data collected has lots of redundant and incomplete data. Preprocessing plays a vital role in making the dataset usable for machine learning. Preprocessing steps involve removing extra Whitespace, HTML Tags, special Characters, stopwords. Text processing mainly concerned with tokenization, Normalization, Stemming, Lemmatization. Fake news prediction is a classification problem, having some pre-defined labels like fake, true, mostly true, mostly fake, etc. In [29]used the Politifact dataset, which has Six labels for target class, these different Labels were converted in Bi label classification for experiment Simplicity and later dividing it into their respective labels.

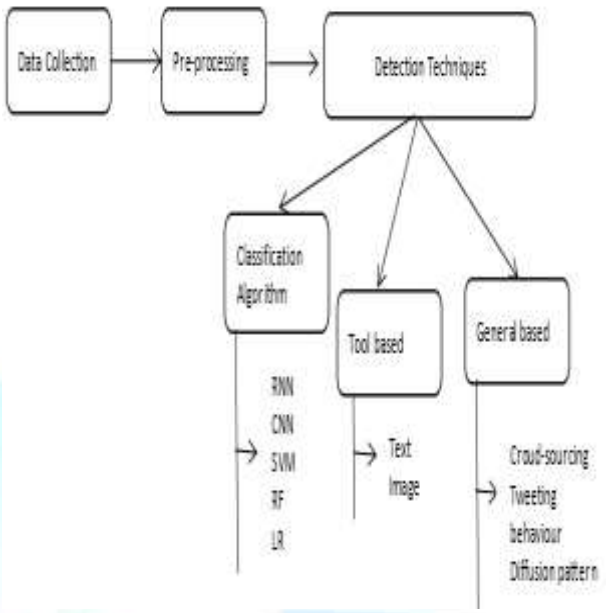

Fig 1: Fake news detection techniques.

Machine learning models like SVM, RF, LR, neural networks, and RNN are widely used and compared. Crowdsourcing is also an excellent way of analyzing data through public opinion. While using twitter data, only tweets with high retweet counts can give better results as the spread of that data is much higher. One more challenge faced while collecting data is bots acting like humans and trying to spread misinformation. Using Botometer[30], we can filter out bots accounts following a typical setting filter out those users who has a score higher than0.5.Tools also play a vital role and the easiest way for fake news detection. Most web browsers do have detection techniques like BS Detector, which, when feed by the news, gives an appropriate result. Later part of the paper compares various tools available for text and images along with its pros and cons.

A. *Tools for fake news detection for text data*

Fact-checking is a resource that checks facts for online media organizations. News is never entirely fake, so a bi labeled classification like real or fake news does not solve the problem. So, multiclass labels, evaluation criteria, or visualization techniques are used to determine the truthfulness of online social media. By labeling news with multi labels like mostly true, half true, etc. is a better feature of fact-checking sites, few are listed and compared below.

1. **BS Detector:** BS Detector is a browser extension that alerts users to unreliable news sources. The tool has been nominated for a Golden Kitty from Product Hunt for Chrome Extension of the year. It is a browser extension for both Mozilla and Chrome-based browsers. It works by searching all links on a

given web page for references to unreliable sources. It checks against a manually compiled list of domains, and it provides visual warnings about the presence of questionable links or about the browsing of suspicious websites.

Name of Tool	Analysis
B.S.Detector	-check against manually compiled lists of domains. - Rating is biased, especially in closely associated classes.
Fact-Checker	- Rating is biased, especially in the closely associated class - determine the veracity and correctness of the factual statements in the text.
Factmata	-works only with US news articles -Scores content on eight signals.
Hoaxy.iuni.iu.edu	-visualize the distribution of fake claims and the corresponding fact-checking information. - works only on twitter data
PolitiFact	-works on Facebook posts -classify news on categories like healthcare, education. -.has 58% accuracy in most cases.
FIB	-Labeled data as "not verified" if traffic is too high -posts are visually tagged on the top right corner.
Hoax-Slyer	-detect scam on FB, WhatsApp, emails, and news articles. - cannot work on the video format of data
Snopes	-selects news content for verification. -difficult to submit new news.

2. **FackChecker.in** is a profit free "consumer advocate" webpage mainly used to reduce complexity and confusion, primarily in political streams. Their main plan is to find if statements made by Indian political players are true or false. Such statements are generally picked up through debates or talk shows given to TV channels like interviews mainly from social media. The site works heavily during elections and other presidential activities. With continuous efforts of the team inside and outside the organization, the truthfulness of news is finally analyzed and reported for the public's benefit. Sci check is a science-based fact-checking website that works on a similar aspect. Fact-check, org is a US-based fact-checking website. These are initiatives taken by Facebook to reduce fake news.

3. **Factmata.com** Is a Google fully funded project for statistical fact-checking and claim detection (Factmata). The tool uses AI (Artificial Intelligence) and MLA (Machine Learning Algorithm) and advanced Natural language processing for checking claims. The main agenda of this project is to reduce the misinformation spread and also help advertising companies not to promote their products on such websites having biased speech and extremist content.

4. **Hoaxy.iuni.iu.edu** Is a framework for detecting misinformation through various chains of the process right from collection to detection. (Shao, Ciampaglia, Flammini, & Menczer, 2016).The process works as follows; it collects public tweets and also fact analysis of an event or a topic which is obtained either through interactions or interview or some other visualization techniques. It gives a GUI where an issue or a function of interest can be searched and visualize the spreading of fake claims.

5. **Hoax-Slayer.com** This website takes a particular interest in mail types of fake news and also educates web users about internet security. Creating awareness about unlawful activities, publishing information about internet scams, sharing useful tips about email and computer usage security is the primary agenda of this website. The research uses reputed sources, press releases, and other government publications about consumer alerts and benefits. They do confirm news through government trusted sources.

Table1: Comparative analysis of Tools for text data

6., **PolitiFact.com** Rating claims made by the US politically and socially active people like columnists, pandits, media, etc. Rating is done on the truthfulness of claims ranging from real, mostly true, half true, mostly false, false, and pants on fire, mainly on political news. The team examines the language used in context and claims made by carefully analyzing the news. Users can use API to get the full text, statements, and claims made, which are verified—explaining the story. Users

can use API to get the complete version, comments, and claims made, verified.

7. FIB: It is the chrome extension for Facebook on a given web page for references to unreliable sources. It checks against a manually compiled list of domains, providing visual warnings about the presence of questionable links or the browsing of suspicious websites.

8. Snopes.com Is an ancient and first online fact-checking website for authenticating urban news and stories in American columns. It is not only limited to political news but also a wide range of areas like automobiles, computers, history, etc. It includes input from experts of various domains and organizations. It also provides a summary of online resources and finding facts in it. It gets its information and verifications from well-known news organizations like CNN, NEW YORK times.

9. The list of fake news detection websites does not end here; there are still lots of online resources available like opensecret.org, which tracks money-related news in US politics and its effects. Updating the database on fake news is done by opensource, which is a professional online resource.

Name of Tool	**Analysis**
Google Reverse Image	-No standard metadata with images. -verify What's app and Photographs source file. -searches for the existing photos in the filename of the image or the URL pointing to the image. -the image needs to be download before using
TinEye	-It does not recognize an object in an image, it considered images as a whole, cannot show similar images. -upload limit size 20 MB
Foto Forensics	-Error Level analysis -accepts only JPEG, PNG cannot work with TIFF, GIF, or BMP format
Forensically	-Tampering of image -it's a digital Forensic tool and needs lots of evidence to be proved.
VID(video) Verification Plugin	-works on video as an input -list down where all the content of news are displayed on social media -input has to be explicitly given to the tool t does not extract from social media

Tracking down suspicious online reviews to help consumers on famous sites like amazon.com is done by sites like fakespot.com,reviewmeta.com, which also uses some statistics to review from millions of feedbacks.

B. ***Tools for fake news detection for image and video data***

Picture Speaks a thousand words, and that is true with fake images, too. Table 2 shows various tools that can be used to detect the authenticity of multimedia formats.

1. Google Reverse Image Search: most widely used for image verification tool. They are finding similar images on the internet provided by users. Helps journalists access a wide range of images and modified images. Finding the original image is a major application of this tool. Considering google as a primary search engine in most cases, it has a huge database and a good place for investigation.

2. TinEye: Having a similar application as Google reverse search engine is TinEye. They are having a huge dataset of over 37 billion images with a constantly updating dataset. It has extensions for other search engines like safari, firefox, Opera that allow users to search for any web image by simply right-clicking on images in a web browser.

3. FotoForensics: Uses a technique called ELA(Error Level Analysis) to identify areas in the image which are tampered using the difference in compression level .e.g in a JPEG format where the whole picture should be in a single error level if not it becomes easy that it has tampered.

4. Forensically: used mainly for forensics in digital images. Apart from being a free tool, it used some good techniques like extracting of metadata error detection, clone detections, noise analysis, and more. To represent inconsistencies in an image, it uses a very user-friendly method of a magnifying glass. Other techniques like clone detection use highlighters for showing tampering in the image. Other forms of tampering like airbrushing, deformations, warping, and perspective corrections are shown using noise analysis.

Table2 Comparative analysis of Tools for multimedia data

VI ISSUES AND CHALLENGES

Based on the literature survey for fake news detection, it has been observed that many tools and techniques have been developed to detect fake news. In 2018, Google News launched a program to train 8000 journalists in seven official.

Indian languages, including English. The program, Google's largest training initiative in the world, would spread awareness of fake news and anti-misinformation practices such as fact-checking. The following are issues that are required to be resolved by experts and researchers who work in this critical field.

- Not just social media but traditional media also give away lots of fake news.
- Lots and lots of news are generated on social media as everybody has a right to comment. Hardly any verification is done for this data before posting.
- Sharing fake news is more common, and that generates fake news.
- Twitter is the primary source of news data, but every news may not be posted on twitter.
- Catchy headlines: headlines that have not much to do with the actual content of data.
- A lot of work has been done on model-oriented fake news detection like supervised, unsupervised, but data-oriented fake news detection such as benchmark data collection, Psychological validation also need to be focused.
- Author Credibility needs to be checked along with news before sharing data online.
- Fake News in the tourism industry has the potential to impact the opinion, expectation, and behavior of tourism consumers. But not much research has been done in this area,
- The image alone is not a complete data; image with captions together should be considered for detection.

VII. CONCLUSION AND FUTURE WORK

The paper discusses different types of fake news, followed by various tools and techniques used for fake news detection. We have also presented details and the importance of detection of fake news in various technical and social areas. The number of methods under each category is discussed with their pros and cons. While performing this survey, we analyzed that there are still many issues in fake news detection that must be resolved to improve the correctness and accuracy. As it is widely said by google that "If you do not have time to fact-check something right away, then certainly do not share it online."

Finally, the issues are mentioned for the practical implementation of fake news detection on various parameters. Source detection across interconnected social networks.The issue in real-time news data collection. There are issues in identifying fake users on social media Website authentication Examining sentiment analysis and bias score to calculate a more composite score. The issue in detecting fraud in the writing style of an author online

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