

Fake News Detection Model Using Machine Learning

Aman Jatain¹, Priyanka Vashisht²

^{1,2}Dept. of Computer Science and Engineering, Amity University, Haryana Email: amanjatainsingh@gmail.com,
Priyanka.vashisht@gmail.com

*Corresponding Author: amanjatainsingh@gmail.com

Abstract Fake news has been around since before the World Wide Web appeared, but with the availability of technology and internet, it has increased ten times. As the number of internet users increases, people exchange billions of posts and articles on various social websites e.g Facebook, twitter, WhatsApp and Instagram by which fake news quickly among millions of people and everyone started believing on it, stopping which is need of the current time. This fake news is meant for readership as a part of phycology warfare and their goal is profiting through clickbait. It can be propaganda against a particular society or an individual or political party. For a human being detecting whether news is fake or real is very difficult so we are in need of deep learning techniques through which we can find fake news automatically with the help of different classification methods. We highlight the detailed contributions of the researchers and the overall architecture and various evaluation parameters used by them to evaluate their model. The purpose of this article is to review past studies and offer ideas for enhancing the work and use efficient technology on this subject.

Keywords:

Artificial intelligence, Classification, Fake news, Generation, fake news Detection, Machine Learning, Random Forest,

1. Introduction

The emergence of the information server and the growing popularity of social networks (Meta, WhatsApp, and Twitter) is accessible at one's fingertips which paved the way for data spreading that has never before seen in history. Through continuous use of social networking site (SNS), users share, upload and create more content than ever before, the only question that pops into people's mind is whether any given news or information is true or fake, some of which are misleading and irrelevant. Automatically classify written articles as misinformation is an exigent job, Many and unique strategies include investigating the spread of fake news in an interesting way with real news. Even experts in a particular domain should review several aspects before adjudicating the veracity of an article.[1]

Fake news has quickly become a social issue and this growing interest, finding the truth of fake news is of paramount importance to prevent the negative impact of fake news on individual and society that is being used to propagate false or rumour records to change the one's way of thinking. The definition of fake news compromise of basically two main parts: authenticity and intent. Authentic means to describe 'real' rather than 'real and 'real', meaning that most conspiracy theories are not included in fake news because it is difficult to determine whether they are true or false. The next part, Purpose, means that the misinformation is intended to deceive the reader for some personal purpose and to find a stable stage to attract the interests of the parties and the extensive crowd.

Fake news or information is more and more becoming a threat to our society. Therefore, many data scientists in the past have suggested using data mining models, machine learning, deep learning methods to analyse, whether the news is fake or real, text mining by separating the data, which is an important part of evaluating text, into trains and test sets. Textual statistics that support the legitimacy of the story. Meta and other online media sources have started to explore a variety of tactics for spotting false news and preventing its spread after Meta CEO Mark Zuckerberg publicly denied Meta influenced the outcome of the election. To process massive amounts of data, deep learning and machine learning models outperform traditional text mining method and machine learning methods. Current work is relates to several research areas, such as text classification and sentiment analysis.

Identification of fake news can be done using the classification method of machine learning algorithms. The key points of model detection basically rely upon textual properties which distinguish fake contents from real with the help of algorithms. For building the detection model accurately, check if the words and tokens in a news articles have a significant impact on news determination real or fake, can be achieved by TF-IDF Vectorization [2]. This study examines the principle, techniques and algorithms to detect the fake news articles, videos, text, news creators and topics in social networks on the internet and uses various methods that help to study specific methods later on their performance aims to evaluate. This method works for specific problems on manually labelled dataset and it supports that machine learning plays a significant role to detect the fake news articles. Also a useful application should be there so people can verify whether the news was real or fake [3].

1.1 Generation of Fake News

Fake news is a multi-step process that involves the manipulation of the content or information and spreading it off as real news, and capitalising on social platforms for attention. It is a remarkably easy task to generate fake news stories to just let someone down or for some revenge purpose or just for the sake of money. Most of the times the fake news are the results of errors or misinterpretations. The spreading of the false information's is as simple as generating them. Advances in high tech and the rise of social network platforms are driving the expansion of the false information. Users are the ones to blame for this spread, as they share with others and sometimes get engaged with posts containing misinformation. This process did not end as other news outlets reported misinformation and the cycle continued.

2. RELATED WORK

Rosas et al. [11] worked on datafiles contains two novel data on detection of dummy information and covered all the major seven fields. Their contribution is twofold. First, they analyse the data to identify the semantic contrast between dummy and actual information. Second, they built fake news detectors using a computational model. Here they used a Linear SVM (LSVM) classifier along with 5-fold cross-validation. Further, they tested their fake news detector with humans and compared the accuracy and they found humans are better at detecting fake news. Hence here the model outperforms.

Zhou et al. [12] intends to create a theory-based false news detection algorithm that concentrates on early content detection before it is spread on social media sites. They used these qualities to create a machine learning model utilising supervised learning that depicts news using feature sets spanning both structured and style languages. The experimental outcome, which was based on a real-world dataset, was 88% accurate. Ahmad et al, [13] proposed an ensemble machine learning approach for the classifying news articles. They used various machine learning algorithms: -Logistic Regression, SVM, MLP, KNN, Ensemble Learners (Random Forest, Bagging, Boosting and Voting Ensemble Classifiers) and Benchmark Algorithm (Perez-LSVM, CNN, Bi-LSTM Networks) on all four datasets and concluded that Ensemble Learners have shown better performance compared to individual learners .

Khanam et al, Alwasel et al, Sirafi et al and Rahid et al, estimated various supervised machine learning algorithms and made research on the accuracy and the performance matrix of the predictions. The accuracy of the model was derived using NLP (textual analysis) and performed tokenization and feature extraction of the given text data. They used six machine algorithms (XGBoost, Random Forest, Naive Bayes, KNN, Decision Tree, SVM). The result shows the XGBoost and Random Forest got the same accuracy but the Random Forest performance matrix i.e. confusion matrix resulted in more false negatives than XGBoost [14].

Sharma et al, Saran et al and Patil et al, performed a binary classification of various news items found on the web. Here, they compared the four major algorithms based on the accuracy, and confusion (performance) chart. Also, they used two approaches: static and dynamic approach. In the static approach, the implementation was performed using a vector-based ML algorithms and logistic regression was found to provide higher accuracy (65%) and higher precision, recall and f1 score. Also, their study shows that the accuracy of Logistic Regression can be increased by grid search parameter optimization. Whereas in the dynamic approach we used Passive Aggressive and yielded 92% accuracy [15].

Aldwani et al. have developed tools to detect and remove online sites that contain false and misleading information. The tool will look upon various features of the sites like syntactical structure, several words related to phrases used in the site tiles track punctuation and also look into site-related factors such as bonus percentages. The higher the bonus rate, the more classified as a source of fake news. For this, this paper used four popular algorithms (Bayes-Net, Logistic Regression, Random Forest, Naive Bayes) Based on the experimental results they achieved 99.4% accuracy yield by Logistic Regression. The logistic classifier has the best classification score with an accuracy of 99.4% and therefore the best classification quality [16].

Shu et al. [17], their paper on fake news detection in social media gives a data mining viewpoint that describes fake news in terms of psychology and social theory. Naive realism and confirmation bias are the two main causes of users' broad acceptance of fraudulent messages. For modelling, data set analysis, and false news identification, they suggest a general two-step data mining approach that consists of 1) feature extraction and 2) confusion matrices. Gahirwal et al [18] their article proposes a system to classify fake news into different categories after calculating the F-score. They analyse the data using two methods, first stance detection is an important part of NLP which divides the article in various categories having some weights which later help in the conclusion. Second Document similarity is also known as id-if -it checks the similarity of documents and search results. They then used a random forest to classify news into four classes (true, false, mostly true, mostly false) as true or false based on their F-score values.

Rubin et al. [19] suggested that a machine learning model utilising the SVM algorithm and five prediction features—absurdity, grammatical humour, negative influence, and punctuation—has been suggested in a number of news articles. The thesis result was a predictive translation of the thesis of humour, irony and satire, achieving a relatively high accuracy of 87%.

Kudari et al [20], designed a project that easily understands the difference between real and fake news. For this they performed a comparative analysis of features that differentiate the fake news. The classifiers used in this research are naïve Bayes and passive-aggressive classifiers using TF-IDF Vectorizer and count vectorizer. The result shows that passive-aggressive and TF-IDF vectorizers performed well with an accuracy of 90% for this model.

3. Detecting Fake News

To detect fake news, different approaches were suggested following the implementation of this threat. The classifier classifies the manipulated and real news in a binary classification of machine learning algorithms. Such a detection process requires a dataset containing real and fake news. There is a lot of fake news available online. We pre-process the dataset, extract all the meaningful content, For detection part classification algorithms are used such as Logistic Regression, Decision Tree, Random Forest, SVM(Support Vector Machine). Further we calculate the accuracy and the prediction using these algorithms even evaluate their performance creating confusion matrix and classification report .

3.1 Detection Method

The adoption of social media platforms globally has opened the door for the unprecedented spread of false information. With its abundance of enormous, varied, and fragmented information—both true and false—the media network is having a negative impact on the entire planet. For that reason, many researchers, data scientist and other technologists, everyone together looking for fake news on social networking sites. Automated rumor detection methods were based on manual features that did not provide good accuracy but with the advent of larger objects we saw a reposition towards deeper functionality. This section discusses various modern aspects of false news detection in a broader context of content and social context.

3.1.1 Content Based

The content-based data is utilised to identify false news attempts in order to identify news articles[3] by analysing the content. A news story may contain both graphics and written content of any kind. To automatically identify fake news, researchers usually use hidden [4], [5], [6], [7], [8], or manually made content elements [10].

3.1.2 Knowledge Based

A knowledge-based method focusses on facts and check these facts, this checking of facts verifies the originality of a given assert by comparing it to a foreign source. The checking of facts can be done manually and can be automatic.

Manual fact-checking: It is divided into two types.

- **Expert-Based:** The expert method uses an expert-focused approach and make decisions based on the experience of people working in specific domains to make decisions. Although this technology is dependable, the vast amount of content that is visible on social platforms does not work well with it because it has been around for a while.
- **Crowd Sourced:** The Crowd-sourced method helps us to check the accuracy of news articles. Crowd- sourced little hard to manage, it is biased and inconsistent annotations, less secure also it has a much better than expert-based authentication.

Automatic Fact-Checking: The physical checking of facts viewpoints is hard to scale because of enormous amount of information particularly produced from online social platform. As a result, automated checking of facts technology was introduced to solve this problem. These solutions rely more on network/graph theory, deep learning, machine learning, NLP, and data mining approaches than they do on human ingenuity.

Automatic fact-checking is split into two parts:

- Extraction of facts or information: In this, facts are collected and establishment of a Knowledge Base
- Checking of facts or fact analysis- it checks the accuracy of information items by matching those facts with a knowledge base. To determine whether a certain article is true or false, it makes use of an online browser and data/graph base. Automatic detection can be challenging since the true sources of fake news are typically untidy, unstructured, unlabeled, fragmentary, and unorganised.

3.1.3 Style Based

Just like knowledge based, style based follows the same approach on detecting the fake news by analysing the news content but differs in determining the originality of the piece of information or content. This method evaluates the author's or publishers' intention to delude people and nation. A style-based approach that uses capitalized words to make headlines memorable, uses far more proper nouns, and uses fewer stop words is a style-based approach between legitimate users and anomalous accounts to detect the rumour or false information by considering the unique characteristics of writing style.

3.1.4 Linguistic Based

It comprises contextual and statistical data examination as analytical methods that identify standard distinction between dummy news and the actual news in the matter of determining and matching features along important semantic characteristics i.e., vocabulary, grammar and syntax and manually assigned new contents.

3.1.5 Visual Based

Since visual content material is frequently considered as affirmation which can expand the trustworthiness of broadcast report [2] and hence the dummy information creator leans to utilise provoking visual content to entice and delude the public.

3.1.6 Social Context Based

There are three major aspects i.e.: profile of a user, post of a user and feedback of a user, and structure of a network. It explains how information outspread through the years and gives neat and valuable details to decide the authenticity and structure of informational content.

3.1.7 Network Based

To detect fake news, explore various social networking sites like Facebook, tweeter and follow tweet-retweet and posting reposting networks to build more linkage. Firstly, it figures out who is spreading the fake news, the relationships among the broadcaster and how faux news procreate on social networking sites. Users prefer to form huge networks on online media structures on the subject of common pursuits and similarities, and these networks serve as conduits for records dissemination.

3.1.8 Temporal Based

News on the Internet is not static and mostly unreal; it is constantly evolving day by day, adding new information or distorting facts. This is obvious when the rumors are repeated several times after the original news article get published. A lifecycle analysis of rumours helps to understand this particular circumstance.

3.2 Dataset on Detection of Fake News

Various analyst and data scientists operating in this domain having several data file available for fake news on online sites, but some of them set benchmarks as official data file for fake news and are released publicly. Here are some publicly accessible data files and their descriptions. The following table outlines the available data sets on fake news.

Table 3.1 List of Fake News Datasets

Dataset	Source / Author	Explanation
Fake and Real News Dataset	Kaggle (Clement Bisailon)	Dataset includes two files: correct news and dummy news files having 8 attributes and nearly 40,000 values
Fake news detection	Kaggle (jruvika)	Dataset has four attributes with nearly 3500 values.
Source Based Fake News Detection	Kaggle (Ruchi Bhatia)	Dataset has twelve columns having 2096 values
News Aggregator Data Set	UCI	Dataset having five attributes and 422937 instances
Spambase Dataset	UCI	Dataset having 57 attributes and 4601 instances
Getting Real about fake news	Kaggle (Meg Risdal)	Dataset consists of 20 unique columns having 12999 values.
Fake News Net	Fact checking website (PolitiFact and gossip cop.)	PolitiFact collects 447 true and 336 fake news, and Gossip Cop extracts 16,767 true and 1650 fake news.
Fake News Dataset	Kaggle (Mohamad Alhasan)	Dataset has one csv file having 7 columns and 804 articles labelled as true (1) or fake (0)

3.3 Fake News Diagnosis Techniques

Recognition of hoax news has been done by applying various techniques to extract the informative data or features to predict the news article. Few Techniques are mentioned below:

3.3.1 Removing The Stop-Words

Mainly some Languages use these words to connect words, it makes us know about the tense or indicate the tense of sentences. In addition, using these words in a sentence does not add much to the context of the sentence so even if we remove them, we can still understand the context.

3.3.2 Tokenization

The action of breaking text into smaller pieces is called tokenization. NLP can represent words, special characters, and numbers in sentences as tokens.

3.3.3 Vectorization

Vectorization is the mapping of words to their corresponding real vectors, which is used for word prediction and word similarity/meaning finding.

The most used vectorizers are:

- **Count Vectorizer:** Count the number of times the token appears in the document and use that value as the weight. It is the most straightforward one.
- **Hash Vectorizer:** It is made to use memory as effectively as possible. The vectorizers use the hashing techniques to encode tokens as numeric indices rather than storing them as strings. This method's disadvantage is that after

vectorization, the feature names cannot be recovered.

- **TF-IDF Vectorizer:** TF-IDF refers for Term Frequency-Inverse Document Frequency In other words, rather than merely considering the frequency of the phrase within the document, the load allocated to each token now optimally considers how frequently the term occurs across the corpus.

4. Natural Language Processing

NLP is the computational branch of computer literacy that includes comprehension, analysis, deception, and the ability to generate human language. Its purpose is to create system that understand the text and can automatically perform tasks such as translation, spell checking, and subject line hyphenation. To assist computers with understanding text, Natural Language Processing (NLP) employs two techniques: syntactic analysis and semantic analysis.

- Syntactic Analysis: The syntactic analysis or parsing of text uses grammatical rules to identify the structure of sentences, how words are constructed, and how words connect with each other.
- Semantic Analysis: Semantic analysis attempts to understand the meaning of words by first studying their meanings as individuals (lexical semantics). Then, it considers the meanings of words in combination and the context in which they occur (contextual semantics).

5. Machine Learning

Machine Learning is making huge change in the world by transforming every segments. It is a data analysis method that automatically creates an analysis model. Embark on the idea that a system can learn from data/information and recognize patterns, build decision and as well as resolve them with minimal human intervention. For that use machine learning algorithms and make data-informed predictions in real-time.

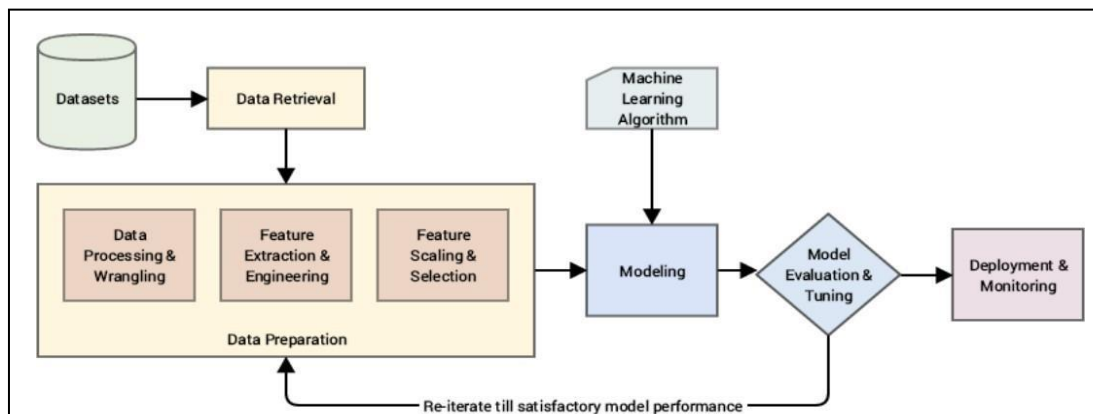


Fig 1 Machine Learning Workflow: The basic workflow/flow of Machine Learning Model used for a classification problem.

Machine Learning workflow has the following steps as shown in Fig 1 and described below.

- Dataset- For detection, we need real-time data to work on and calculate actual predictions.
- Data Pre-processing – In this step we clean and processes the data, and extract the useful information before fitting the model.
- Modelling- After the extraction part, fit the data into machine learning algorithms.
- Model Evaluation- This step acknowledges our model accuracy and its prediction performance using performance evaluating parameters.
- Deployment- The last step is to deploy the model for users to use.

Types of Machine Learning: -

- Supervised Learning- An artificial intelligence (AI) creation approach is what a computer rule set is trained based on categorized input statistics for selected results.
- Unsupervised Learning- Basically it refers to using artificial intelligence (AI) algorithms to find patterns in large data files that contain information which are not segmented or labelled.
- Semi-supervised Learning- A combination of unsupervised and supervised learning. It makes use of a small amount of labelled information and a large number of unlabelled records, which includes the advantages of each unsupervised and supervised getting to know without the demanding situations of finding big quantities of labelled facts.
- Reinforcement Learning- Machine learning training methods based on rewarding desirable behaviour and/or demanding undesirable behaviour.

5.1 Machine Learning Algorithms

- Decision Tree-Decision tree classifier is a supervised machine learning that can solve both regression-based and classification-based problems. It takes the form of a tree like structure in which the dataset is successively divided into smaller subsets based on certain parameters. In a tree like structure, inner nodes represent the attributes of data, branches represent the conditions under which decisions are made, and leaf nodes are the results. It is a graphical representation that generates all the possible outcomes for a given problem based on the certain conditions or rules. These conditions or rules are taken from the data already provided (training data).
- Random Forest - Also known as a random decision forest, the Random Forest Classifier is a supervised machine learning technique that can be used to solve classification and regression problems. methods employed in random forests, which produce a large number of decision trees. Each decision tree is built using a subset of features. Before bootstrapping the results, each decision tree creates classes to increase vote accuracy from the Random Forest technique.

Working

- To implement a random forest, take n random records out of k0 records of data.
- A decision tree is now created for each record and its output is observed.
- All results from all decision trees are majority-obtained and become the final output of the classification problem. For regression, we take the average of the results obtained from the decision tree.

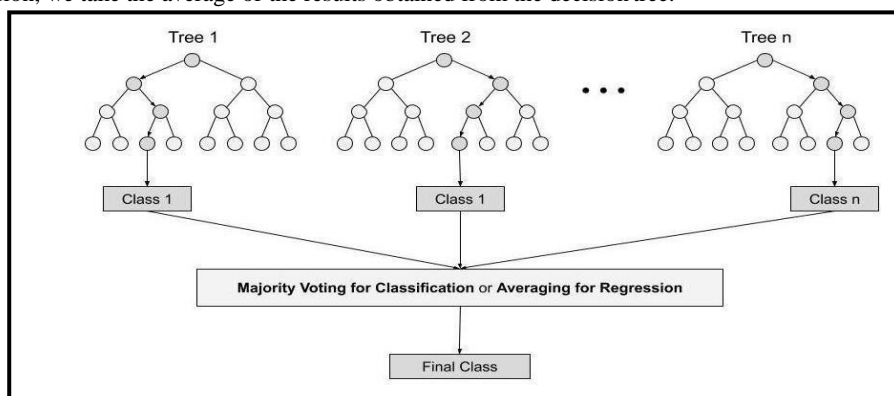


Fig 2 Working of Random Forest

Logistic Regression predicts the probability of the output. In this the output can have mostly only two possibilities (binary values) like 0 or 1 (or) yes or no (or) success or failure etc. The model of logistic regression uses sigmoid function i.e. $z = \frac{1}{1 + e^{-z}}$

The predicted response for an outcome is known as hypothesis. Then the hypothesis for logistic regression classification is

$$h(x_i) = g(\beta^T x_i) = \frac{1}{1 + e^{-\beta^T x_i}}$$

where $\beta = \{\beta_0, \beta_1, \beta_2, \dots, \beta_p\}$ which are the regression coefficients

$h(x_i)$ = hypothesis i.e., the predicted response for i^{th} observation i.e., x_i

- Support Vector Machine (SVM)- It is a supervised machine learning algorithm that may be applied to classification and regression issues, though it is more frequently employed for the former. The data items are plotted in an n-dimensional space in this algorithm, where n is the number of attributes present and each data item's value is based on the value of an attribute. Then the datapoints are divided into two different classes after finding the hyperplane. However, this hyperplane must be perfect to give more accurate outcomes. The higher the margin the perfect will be the hyper-plane. Margin is the maximum distance between the datapoints of two different classes. Hence, maximum the distance, maximum will be the accuracy. In the implementation of SVM, first it generates multiple hyperplanes repeatedly which separates the classes in the best possible ways and then a perfect hyperplane among them is selected which separates the classes correctly.
- K-Nearest Neighbor- It is a supervised machine learning algorithm used for classification problems. This algorithm's fundamental premise is that "similar objects exist in close proximity," or that comparable things are nearby to one another.

The data items of training set are first plotted in the plane which are then divided into different groups considering certain parameters. Then the data items of testing set are also plotted in the same plane. Then based on the value of 'K' or based on the distance between points, the datapoints are divided into different clusters and then depending on the cluster to which the testing data items belong, the similar value as those data items will be predicted to the testing datapoint.

6. Conclusion

Social media has become more widely used in recent years, and an increasing number of readers now prefer reading news

on social media than traditional news sources like newspapers and television. In light of this, a lot of publishers typically exploit social media for their own self-serving purposes as a hub for the quick spread of propaganda and rumours that have a major detrimental impact on the entire community. We have covered a number of freely accessible false information detection technologies in this text that should be utilised to forward only reliable and authentic information. The following report provides an overview of how to detect the mislead information over the past decade. Here we looked upon various studies and found that classification of fake and real news using machine learning algorithms and their execution and achievement on various data files available. We can see how the model to detect the hoax information is a need of time and the importance of determine the false information which is now the biggest threat to democracy and for freedom of expression, the artificial technology, the machine learning algorithms are considered to be an important pillar of classification problems that can be integrated with NLP and various other approaches for better performance. According to our findings, in fake news detection accuracy and performance can be increased by using TF-IDF and count vectorizer.

References

- [1] A Jain, H khatte, A Shakya, "A Smart System for Fake News Detections Using Machine Learning," vol. 1,2019.
- [2] K Agarwalla, S Nandan, V.A Nail, D.D Hema, "Fake News Using Machine Learning and Natural Language Processing", vol. 7,2019.
- [3] X. Z. B, J. Wu, and R. Zafarani, "SAFE: Similarity-Aware Multi-modal Fake." vol. 1, 2020, [Online], Available 10.48550/arXiv.2003.04981
- [4] J. Zeng, Y. Zhang, and X. Ma, "Fake news detection for epidemic emergencies via deep correlations between text and images," vol. 66, 2020.
- [5] M. H. Goldani, S. Momtazi, and R. Safabakhsh, "Detecting fake news with capsule neural networks," vol. 101, 2021.
- [6] D. Khattar, M. Gupta, J. S. Goud, and V. Varma, "MvaE: Multimodal variational autoencoder for fake news detection," vol 1,2019.
- [7] S. Yoon et al., "Detecting incongruity between news headline and body text via a deep hierarchical encoder," vol. 2,2019.
- [8] Z. Jin, J. Cao, Y. Zhang, J. Zhou, and Q. Tian, "Novel Visual and Statistical Image Features for Microblogs News Verification," vol. 19,2017.
- [9] W. Y. Wang, "Liar, liar pants on fire: A new benchmark dataset." vol.1, 2017.
- [10] V. Perez-Rosas, B. Kleinberg, A. Lefevre and R. Mihalcea. "Automatic Detection of Fake News." vol.1, 2017.
- [11] X. Zhou, A. Jain, V. V. Phoha, and R. Zafarani. "Fake News Early Detection: A Theory-driven Model." vol. 1, 2020.
- [12] I. Ahmad, M. Yousaf, S. Yousaf, M. O. Ahmad and S. Yousaf. "Fake News Detection Using Machine Learning Ensemble Methods." vol. 1,2020.
- [13] Z. Khanam, B N. Alwasel, H. Sirafi and M Rashid. "Fake News Detection Using Machine Learning Approaches." vol. 1099, 2021.
- [14] K.Shu, A. Sliva, S. Wang, J. Tang and H. Liu. "Fake News Detection on Social Media: A Data Mining Perspective". vol. 3, 2017.
- [15] M. Gahirwal, S. Moghe, T. Kulkarni, D. Khakhar and J. Bhatia. "Fake News Detection". vol. 4, 2018.
- [16] V. L. Rubin, N. J. Conroy, Y. Chen, and S. Cornwell, "Fake News or Truth? Using Satirical Cues to Detect Potentially Misleading News." vol. 1, 2016.
- [17] J. M Kudari, V. V, M. BG, A. R "Fake News Detection using Passive Aggressive and TF-IDF Vectorizer". vol. 7,2020.
- [18] Jatain, A. Chaudhary, S. Batra, P. Bhaskar, S. (2021) Rest web services: An elementary learning. Research Journal of Engineering and Technology, 12(3), 75-78.
- [19] Mor, P. Bhaskar, S. (2021) Enabling Technologies and Architecture for 5G-Enabled IoT. Blockchain for 5G-Enabled IoT: The new wave for Industrial Automation, 223-259.
- [20] Jatain, A. Chaudhary, S. Nagpal, P. Bhaskar, S. (2021) Cloud Storage Architecture: Issues, Challenges and Opportunities. International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN, 2347-5552.
- [21] T Joy, D. Kaur, G. Chugh, A. Bhaskar, S. (2021) Computer Vision for Color Detection. International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN, 2347-5552.
- [22] Jaglan, V. Bhaskar, S. (2021) Locking Paradigm in Hierarchical Structure Environment. Advances in Mechanical Engineering: Select Proceedings of CAMSE 2020, , 653-661.
- [23] Nanda, A. Gupta, S. Bhaskar, S. (2020) A Comprehensive Survey of Machine Learning in Scheduling of Transactions. 2020 4th International Conference on Trends in Electronics and Informatics (ICOEI)(2020), 740-745.
- [24] Bhaskar S. Bhaskar, S. (2020) Study of locking protocols in database management for increasing concurrency. 2020 4th International Conference on Trends in Electronics and Informatics (ICOEI)(2020), 556-560.
- [25] Bhaskar S. Bhaskar, S. (2020) Reducing Complexity of Graph Isomorphism Problem. International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN, 2347-5552.
- [26] Bhaskar, S. (2020) CGVL:An Hierarchical Locking Mechanism . International Journal of Control and Automation, 12(6), 725-743.
- [27] Agarwal, R. Bullah, H.R. Prabhakar, A. Jatain, A. Jaglan, V. Bhaskar, S. (2020) Parkinson's Disorder: Taking a Step towards Homogenizing Machine Learning and Medical Science. International Journal of Psychosocial Rehabilitation, 24(4),
- [28] Bhaskar, S. (2020) A Review on the Concept of Deep Learning. International Journal of Innovative Research in Computer Science & Technology (IJIRCST), ISSN, , 2347-5552.
- [29] Jaglan, V. Sethi, N. Bhaskar, S. (2020) Distortion Free Image Generation. Grenze International Journal of Engineering and Technology, 15(8), 460-466.