# FAKE NEWS DETECTION: A MACHINE LEARNING APPROACH

**A PROJECT REPORT**

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# BONAFIDE CERTIFICATE

Certified that this project report “FAKE NEWS DETECTION: A MACHINE LEARNING APPROACH”

is the bonafide work of Arjun Deshta, Priyanshu Raj Rai and Uday Pratap Singh who carried out the project work under my/our supervision.

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Submitted for the project viva-voce examination held on

**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

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# ABSTRACT

In recent years, due to the booming development of online social networks, fake news for various commercial and political purposes has been appearing in large numbers and widespread in the online world. With deceptive words, online social network users can get infected by these online fake news easily, which has brought about tremendous effects on the offline society already. An important goal in improving the trustworthiness of information in online social networks is to identify the fake news timely. This paper aims at investigating the principles, methodologies and algorithms for detecting fake news articles, creators and subjects from online social networks and evaluating the corresponding performance. Information preciseness on Internet, especially on social media, is an increasingly important concern, but web-scale data hampers, ability to identify, evaluate and correct such data, or so called "fake news," present in these platforms. In this paper, we propose a method for "fake news" detection and ways to apply it on Facebook, one of the most popular online social media platforms. This method uses Naive Bayes classification model to predict whether a post on Facebook will be labeled as real or fake. The results may be improved by applying several techniques that are discussed in the paper. Received results suggest, that fake news detection problem can be addressed with machine learning methods.

# CHAPTER 1
# INTRODUCTION

These days‟ fake news is creating different issues from sarcastic articles to a fabricated news and plan government propaganda in some outlets. Fake news and lack of trust in the media are growing problems with huge ramifications in our society. Obviously, a purposely misleading story is “fake news ‘but lately blathering social medias discourse is changing its definition. Some of them now use the term to dismiss the facts counter to their preferred viewpoints. The importance of disinformation within American political discourse was the subject of weighty attention, particularly following the American president election. The term 'fake news' became common parlance for the issue, particularly to describe factually incorrect and misleading articles published mostly for the purpose of making money through page views. In this paper, it is seek to produce a model that can accurately predict the likelihood that a given article is fake news. Facebook has been at the epicenter of much critique following media attention. They have already implemented a feature to flag fake news on the site when a user seen it ; they have also said publicly they are working on to distinguish these articles in an automated way. Certainly, it is not an easy task. A given algorithm must be politically unbiased – since fake news exists on both ends of the spectrum – and also give equal balance to legitimate news sources on either end of the spectrum. In addition, the question of legitimacy is a difficult one. However, in order to solve this problem, it is necessary to have an understanding on what Fake News.

## 1.1. Client Identification/Need Identification/Identification of relevant Contemporary issue

In today's digital age, the proliferation of fake news has become a pressing contemporary issue that demands attention. The client in this scenario could be any individual or organization seeking to combat the dissemination of false or misleading information through the implementation of an automated solution.

The need for such a solution is justified through the following:

**1. Problem Existence Through Statistics and Documentation:**

- Statistical data reveals a significant increase in the circulation of fake news across various digital platforms, leading to misinformation and mistrust.
- Reports and studies from reputable sources, such as Pew Research Centre and Reuters Institute for the Study of Journalism, provide concrete evidence of the rising prevalence of fake news.

**2. Consultancy Problem:**

The client faces the challenge of discerning between genuine and fabricated news articles, which can have substantial consequences in various domains, including politics, public health, and business.

**3. Survey-Based Need:**

A survey conducted among the target audience or users of the client's platform has identified a strong demand for a solution that can aid in identifying and filtering out fake news.

**4. Contemporary Issue Documentation:**

Various governmental and non-governmental agencies, including UNESCO and FactCheck.org, have documented the escalating issue of fake news. These reports emphasize the urgency of addressing this problem for the well-being of society.

## 1.2. Identification of Problem

The core problem at hand is the identification and dissemination of fake news. This problem revolves around the challenges of detecting and mitigating the influence of false information, rumours, and misleading content within digital media. The problem statement should not include any hints of the solution and should serve as a clear and concise definition of the issue.

The objective of this project is to examine the problems and possible significances related with the spread of fake news. We will be working on different fake news data set in which we will apply different machine learning algorithms to train the data and test it to find which news is the real news

or which one is the fake news. As the fake news is a problem that is heavily affecting society and our perception of not only the media but also facts and opinions themselves. By using the artificial intelligence and the machine learning, the problem can be solved as we will be able to mine the patterns from the data to maximize well defined objectives. So, our focus is to find which machine learning algorithm is best suitable for what kind of text dataset. Also, which dataset is better for finding the accuracies as the accuracies directly depends on the type of data and the amount of data. The more the data, more are your chances of getting correct accuracy as you can test and train more data to find out your results.With the advancement of technology, digital news is more widely exposed to users globally and contributes to the increment of spreading and disinformation online. Fake news can be found through popular platforms such as social media and the Internet. There have been multiple solutions and efforts in the detection of fake news where it even works with tools. However, fake news intends to convince the reader to believe false information which deems these articles difficult to perceive. The rate of producing digital news is large and quick, running daily at every second, thus it is challenging for machine learning to effectively detect fake news.

Some Problems we may face that we have to Identify it:

1. **Proliferation of Misinformation:** The exponential growth of the internet and social media has made it easy for misinformation to spread rapidly. Users often share articles and information without verifying their accuracy, contributing to the dissemination of fake news.
2. **Trust Erosion in Media:** The prevalence of fake news erodes trust in traditional media outlets. The public's increasing skepticism about the reliability of news sources hampers the ability to make informed decisions and maintain a well-informed citizenry.
3. **Political Manipulation:** Fake news is frequently used as a tool for political manipulation and influence. Malicious actors, including state-sponsored entities, create and disseminate fake news to shape public opinion and interfere with democratic processes.
4. **Economic Impact:** Fake news can have a significant economic impact. False information about a company, product, or industry can cause stock market fluctuations, damaging businesses and investors.

5. **Public Health Risks:** During public health crises, the spread of fake news can have dire consequences. Misinformation about diseases, treatments, or vaccines can lead to public health risks, including the spread of preventable diseases.
6. **Algorithmic Amplification:** Social media platforms and search engines often use algorithms that prioritize sensational or controversial content, regardless of its veracity. This amplification of fake news can lead to its widespread circulation.
7. **Filter Bubbles and Echo Chambers:** Users are often exposed to content that aligns with their existing beliefs, leading to filter bubbles and echo chambers. This phenomenon reinforces confirmation bias and makes it challenging to counter fake news with factual information.
8. **Lack of Media Literacy:** Many individuals lack the skills and knowledge to critically evaluate news sources and identify fake news. This deficiency in media literacy makes people more susceptible to misinformation.
9. **Ethical Dilemmas:** Fake news detection and moderation present ethical dilemmas for tech companies. Decisions on what content to remove or flag can be seen as censorship and raise concerns about freedom of speech.
10. **Detection Challenges:** Identifying fake news is a complex task, as it often involves subtle language nuances, visual content analysis, and an understanding of the context. Developing accurate and reliable detection methods is a significant challenge.
11. **User Privacy Concerns:** Efforts to combat fake news may involve tracking and monitoring users' online behavior and interactions, raising concerns about user privacy and data security.
12. **Legal and Regulatory Challenges:** Governments and policymakers grapple with developing appropriate legal frameworks and regulations to address the fake news issue without infringing on freedom of the press and freedom of speech.
13. **Rapid News Cycles:** The rapid pace of news production and consumption can make it challenging to fact-check and debunk fake news stories in a timely manner, allowing them to gain traction.

14. **Deepfakes and AI-Generated Content:** The emergence of deepfake technology and AI-generated content poses a new dimension to the fake news problem, making it difficult to discern genuine from manipulated media.
15. **Crisis of Information Overload:** In an era of information overload, individuals and organizations struggle to sift through vast amounts of information, making them more vulnerable to fake news and disinformation.
16. **Global and Cross-Cultural Variations:** Fake news is not limited to a single region or language. It varies across cultures and languages, making it a global issue that requires solutions adapted to different contexts.
17. **Resource Constraints:** Developing and maintaining effective fake news detection systems require significant resources, which may not be accessible to smaller news outlets and social media platforms.
18. **Interconnectedness of Platforms:** Fake news can easily cross platforms and social media sites, making it challenging to contain its spread effectively.

## 1.3. Identification of Tasks

To address the problem effectively, the project entails the following tasks:

1. **Data Collection and Preprocessing:**

   The data set used is split into a training set and a testing set containing in Dataset 1 - 3256 training data and 814 testing data and in Dataset II- 1882 training data and 471 testing data respectively. Cleaning the data is always the first step. In this, those words are removed from the dataset. That helps in mining the useful information. Whenever we collect data online, it sometimes contains the undesirable characters like stop words, digits etc. which creates hindrance while spam detection. It helps in removing the texts which are language independent entities and integrate the logic which can improve the accuracy of the identification task.

   In this we used approx. 28000*2 datasets.

- Gathering a diverse dataset of news articles, both fake and real.
- Cleaning and preprocessing the data to make it suitable for analysis and modelling.

2. **Feature Engineering:**
    - Identifying relevant features and attributes for the machine learning model, such as textual content, metadata, and social media interactions.
3. **Model Building:**
    - Developing machine learning models, such as natural language processing (NLP) models, to classify news articles as fake or real.
4. **Model Evaluation:**
    - Assessing the performance of the developed models through various evaluation metrics like accuracy, precision, recall, and F1 score.
5. **Solution Integration:**
    - Integrating the machine learning model into the client's system or platform to automate the fake news detection process.
6. **Report Compilation:**
    - Preparing a comprehensive report that documents the entire process, findings, and recommendations.
7. **Feature Extraction:**
8. Feature extraction the process of selecting a subset of relevant features for use in model construction. Feature extraction methods helps in to create an accurate predictive model. They help in selecting features that will give better accuracy. When the input data to an algorithm is too large to be handled and it is supposed to be redundant then the input data will be transformed into a reduced illustration set of features also named feature vectors. Altering the input data to perform the desired task using this reduced representation instead of the full-size input. Feature extraction is performed on raw data prior to applying any machine learning algorithm, on the transformed data in feature space.

9. **Training the Classifier:**

As In this project I am using Scikit-Learn Machine learning library for implementing the architecture. Scikit Learn is an open source python Machine Learning library which comes bundled in 3rd distribution anaconda. This just needs importing the packages and you can compile the command as soon as you write it. If the command doesn't run, we can get the error at the same time. I am using 4 different algorithms and I have trained these 4 models i.e, Naïve Bayes, Support Vector Machine, K Nearest Neighbours and Logistic Regression which are very popular methods for document classification problem. Once the classifiers are trained, we can c heck the performance of the models on test-set. We can extract the word count vector for each mail in test-set and predict it class with the trained models.

## 1.4. Timeline

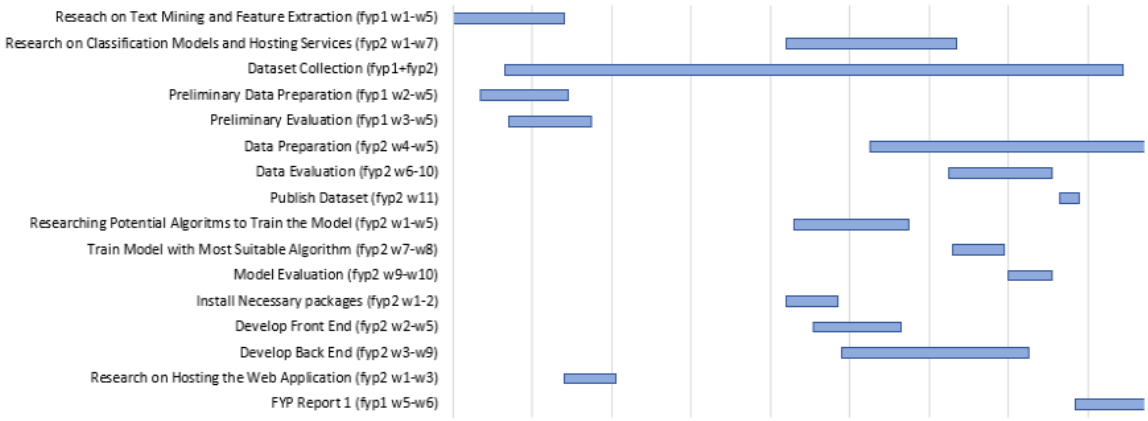



Fig.1.1

## 1.5. Organization of the Report

### 1. Introduction:

The invention of social media platforms has made it even easier for people to spread misinformation to the people around them. Fake news being spread across social media comes in several forms such as clickbait, propaganda, commentary/opinion and humour/satire (Campan et al. 2017). An example

that can be presented here are the fake news articles that were spread involving political implications during the 2016 US presidential elections. Several of these articles that were spread across Twitter and Facebook originated from satirical websites but could have been misunderstood to be true (Allcott & Gentzlow 2017).

Remember the time back in 2019-20 period when major catastrophe occurred in the world, COVID 19. The COVID-19 pandemic has grown to become a serious matter and the misinformation that has been spread regarding the topic is more likely to bring about even more harm to society. This misinformation ranges from conspiracy theories that the virus was created by China to be used as a biological weapon to unproven claims such as coconut oil being the cure for the virus (Pennycook et al. 2020). To elaborate, misinformation about the virus has brought about many negative impacts which include hatred towards a particular race and panic buying of face masks and hand sanitizers by worried citizens which lead to the shortage of medical equipment in hospitals. The COVID-19 pandemic has grown to become a serious matter and the misinformation that has been spread regarding the topic is more likely to bring about even more harm to society. This misinformation ranges from conspiracy theories that the virus was created by China to be used as a biological weapon to unproven claims such as coconut oil being the cure for the virus (Pennycook et al. 2020). To elaborate, misinformation about the virus has brought about many negative impacts which include hatred towards a particular race and panic buying of face masks and hand sanitizers by worried citizens which lead to the shortage of medical equipment in hospitals.

## 2. Methodology:

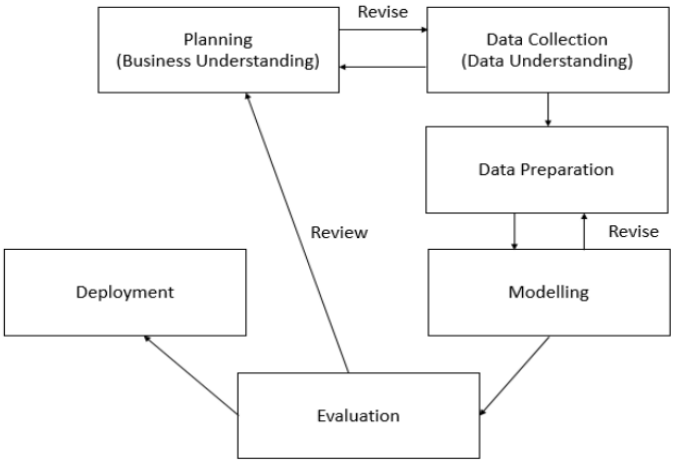


Fig.1.2

**3. Literature Review:**

The evaluation was made in terms of commonly used measures such as F1- measure and accuracy as the paper considered the detection of fake news as a binary classification task. Another measure that was considered was the execution time for the training and classification tasks. Several vectorization methods were used in order for the text to be represented numerically or as a vector. When reviewing this paper, the TFIDF-Vectorizer was the vectorization method of interest. As such, we mainly focus on the datasets related to the TF-IDF variants.

TF-IDF weighing scheme is made up of two terms which are, term frequency and inverse document frequency. Term Frequency refers to the number of times a term appears in a document over the total number of terms in that document. Inverse Document Frequency on the other hand refers to the log of the total number of documents divided by the number of documents whereby that same term appears. TF□IDF is represented by the product of the two terms (Katsaros, Stavropoulos and Papakostas, 2019).

**4. Discussion:**

- Algorithm's accuracy depends on the type and size of your dataset.
- More the data, more chances of getting correct accuracy.
- Machine learning depends on the variations and relations.
- Understanding what is predictable is as important as trying to predict it.
- While making algorithm choice, speed should be a consideration factor.

**5. Conclusion:**

Many people consume news from social media instead of traditional news media. However, social media has also been used to spread fake news, which has negative impacts on individual people and society. In this paper, an innovative model for fake news detection using machine learning algorithms has been presented. This model takes news events as an input and based on twitter reviews and classification algorithms it predicts the percentage of news being fake or real.

# CHAPTER 2

# DESIGN FLOW/PROCESS

## 2.1. Evaluation & Selection of Specifications/Features

In the development of a fake news detection system, the selection of appropriate features is crucial. These features serve as the basis for machine learning models to distinguish between real and fake news articles. Here, we critically evaluate the features commonly identified in the literature and prepare a list of features ideally required in the solution:

1. **Textual Features:**
    - **TF-IDF (Term Frequency-Inverse Document Frequency):** Measures the importance of words in a document relative to a corpus. Words that are more specific to a document but occur less frequently in the corpus can be indicative of fake news.
    - **Word Embeddings:** Utilizes pre-trained word vectors (e.g., Word2Vec, GloVe) to capture semantic relationships between words, which can help in identifying linguistic patterns indicative of fake news.
2. **Sentiment Analysis:**
    - **Sentiment Polarity:** Assessing the sentiment (positive, negative, neutral) of the language used in news articles can reveal emotional or biased content often found in fake news.
3. **Content-Based Features:**
    - **Title Length and Content Length:** Fake news articles may exhibit distinct patterns in the length of their titles and content.
    - **Grammar and Syntax Analysis:** Analysing the grammar and syntax of the content can help identify unusual or inconsistent language use.

4. **Source-Based Features:**
    - **Source Reputation:** Considering the credibility and history of the source can be a strong indicator of fake news. Reliable sources are less likely to produce fake content.
    - **Domain Analysis:** Examining the domain of the source can reveal patterns of fake news propagation from particular websites or domains.
5. **Metadata and Social Signals:**
    - **Metadata Examination:** Analysing metadata, such as publication date and author information, can help in assessing the authenticity of news articles.
    - **Social Media Engagement:** Evaluating the social media shares, likes, comments, and user engagement can indicate the popularity and potential spread of fake news.
6. **Stance and Bias Analysis:**
    - **Stance Detection:** Determining the political or ideological stance of an article can be useful, as fake news is often used to promote a specific agenda or narrative.
    - **Bias Detection:** Identifying biased language or framing can be an indicator of fake news.
7. **Fact-Checking and External References:**
    - **Fact-Checking Scores:** Integrating data from fact-checking organizations or services to verify the accuracy of claims made in news articles.
    - **External References:** Examining references and citations in articles can help assess their credibility.
8. **Multimodal Features:**
    - **Image and Video Analysis:** For news articles containing images or videos, analysing these multimedia elements can reveal manipulated or falsified content.
9. **Temporal Features:**

- **Time of Publication:** Analysing the timing of news publication can be significant, as fake news may be strategically timed to influence events or public opinion.

**10. Language Style Analysis:**

- **Linguistic Features:** Examining linguistic features, such as readability, complexity, and use of jargon, can help identify discrepancies in writing styles.

**11. Network Analysis:**

- **Propagation Patterns:** Analysing how news articles are shared and propagated across social networks can provide insights into their authenticity.

**12. Geolocation Data:**

- **Geographic Source Verification:** Verifying the geographic source of the news article, which can be essential in cases where location is relevant.

**13. User Behaviour Analysis:**

- **User Comments and Behaviour:** Analysing user comments and engagement on social media or news platforms can reveal insights into the authenticity of the news.

**14. Deep Learning and NLP Features:**

- **Neural Network Embeddings:** Utilizing deep learning techniques to extract high-level representations of text data.

## 2.2. Design Constraints

When developing a fake news detection system or any technology, it's essential to consider a wide range of design constraints and factors.

These constraints can encompass various aspects, from regulatory compliance and ethical considerations to economic and social impacts.

Here's an overview of design constraints that should be taken into account:

1. **Regulations:**
    - **Data Privacy Regulations:** Compliance with data protection laws like GDPR (General Data Protection Regulation) and ensuring user privacy in data collection and processing.
    - **Content Moderation Regulations:** Adherence to legal requirements for content moderation, including hate speech, libel, and defamation laws.
2. **Economic Constraints:**
    - **Budgetary Constraints:** Development and maintenance costs must be within budgetary limits.
    - **Monetization Model:** Deciding on a sustainable revenue model, especially if the solution is offered as a commercial product.
3. **Environmental Impact:**
    - **Energy Efficiency:** Ensuring that the computational requirements of the solution are energy-efficient to minimize its carbon footprint.
    - **Sustainable Practices:** Reducing environmental impact through responsible hardware and software choices.
4. **Health and Safety:**
    - **User Well-being:** Ensuring that the solution does not inadvertently harm user mental health or contribute to the spread of harmful content.
    - **Cybersecurity:** Implementing robust cybersecurity measures to protect user data and system integrity.
5. **Manufacturability:**
    - **Scalability:** Designing the solution to be scalable and easily deployable to handle increasing workloads or user demand.

- **Compatibility:** Ensuring compatibility with a variety of hardware and software environments.

6. **Professional and Ethical Constraints:**
    - **Professional Conduct:** Adhering to professional ethics in research, development, and deployment.
    - **Ethical AI:** Addressing ethical concerns related to AI, including bias, fairness, and transparency in decision-making.
7. **Social and Political Issues:**
    - **Social Impact:** Recognizing the potential societal implications of the solution, such as its impact on public discourse and information consumption.
    - **Political Neutrality:** Striving for political neutrality in fake news detection to avoid biases or favouritism.
8. **Cost Considerations:**
    - **Development and Operating Costs:** Analysing the overall cost of development, maintenance, and infrastructure.
    - **User Costs:** Considering any costs or pricing models for users or clients.
9. **Bias and Fairness:**
    - **Bias Mitigation:** Implementing measures to reduce biases in the model and decision-making process to ensure fairness in identifying fake news.
10. **Transparency and Accountability:**
    - **Explainability:** Ensuring that the system's decisions are explainable and transparent.
    - **Accountability:** Defining roles and responsibilities for monitoring and addressing issues.
11. **Human Rights:**

- **Freedom of Expression:** Respecting the right to free expression while balancing it against the need to combat fake news.

**12. Cultural and Regional Sensitivity:**

- **Cultural Context:** Recognizing cultural nuances and sensitivities in content analysis to avoid misinterpretation.

**13. Bias and Disinformation:**

- **Guarding Against Censorship:** Avoiding the suppression of legitimate content or overzealous content removal, which can be seen as censorship.

**14. Data Ethics:**

- **Data Collection and Handling:** Ethical sourcing and handling of data, especially when user-generated content is involved.

**15. User Consent:**

- **Informed Consent:** Ensuring that users are well-informed about data collection and consent to the use of their data.

**16. Collaboration and Stakeholder Engagement:**

- **Engaging Stakeholders:** Involving key stakeholders, including content creators and fact-checkers, in the design and improvement process.

## 2.3. Analysis and Feature finalization subject to constraints

As we design a fake news detection system, you need to analyse and finalize the features in light of the various constraints mentioned earlier. Here's how we might adapt and refine our feature set:

1. **Privacy and Data Protection:**

    - **Modify:** Consider removing or anonymizing personally identifiable information (PII) in the data used for training. Ensure that the system complies with data privacy regulations, such as GDPR.

- **Add:** Include features that assess data anonymization and data protection protocols in the system.

2. **Bias and Fairness:**
    - **Modify:** Review the feature set for any elements that might introduce bias, such as certain sentiment analysis techniques. Adjust or remove features that could lead to unfair judgments.
    - **Add:** Integrate fairness-aware machine learning techniques to mitigate potential bias in model predictions.
3. **Ethical Considerations:**
    - **Modify:** Scrutinize the features that relate to source reputation and content assessment to ensure they are aligned with ethical guidelines and principles.
    - **Add:** Incorporate features that explicitly address ethical considerations, such as bias detection and fairness indicators.
4. **Cultural Sensitivity:**
    - **Modify:** Ensure that the features used for linguistic analysis consider the cultural context in which the content is produced. Some language features might need to be adapted to avoid misinterpretation.
    - **Add:** Include features that assess the cultural and regional relevance of content.
5. **Cost Considerations:**
    - **Modify:** Review the computational complexity of feature extraction. Strive to optimize features to reduce resource requirements, thus controlling operational costs.
    - **Add:** Integrate cost monitoring and reporting features to track the resources and expenses associated with running the system.
6. **Transparency and Explainability:**

- **Modify:** Enhance features related to model explainability and transparency, making it easier to understand and interpret the model's decisions.
- **Add:** Implement explainability features that provide users with information about how decisions are made and why certain content is flagged.

7. **Environmental Impact:**
    - **Modify:** Optimize resource-intensive features to minimize energy consumption and reduce the system's environmental footprint.
    - **Add:** Incorporate features that monitor and report on the energy efficiency of the system.
8. **Legal and Regulatory Compliance:**
    - **Modify:** Ensure that all features comply with relevant content moderation regulations and guidelines.
    - **Add:** Implement features that track changes in regulations and adapt the system accordingly.
9. **Safety and User Well-being:**
    - **Modify:** Review features related to user engagement and well-being to ensure that they do not inadvertently contribute to harm.
    - **Add:** Include features that assess user sentiment and well-being, taking actions to limit exposure to harmful content.
10. **Collaboration and Stakeholder Engagement:**
    - **Modify:** Strengthen features related to stakeholder engagement and collaboration, ensuring that the system is open to feedback and improvements.
    - **Add:** Integrate features for real-time collaboration with fact-checkers and experts to improve the system's accuracy.
11. **Freedom of Expression:**

- **Modify:** Carefully review features related to content removal and moderation to avoid inadvertently limiting freedom of expression.
- **Add:** Incorporate features that assess content for potential suppression or censorship concerns.

12. **User Consent:**

- **Modify:** Review the features related to data consent and ensure that the system is transparent about data usage.
- **Add:** Include features for obtaining explicit user consent for data collection and usage.

## 2.4. Design Flow

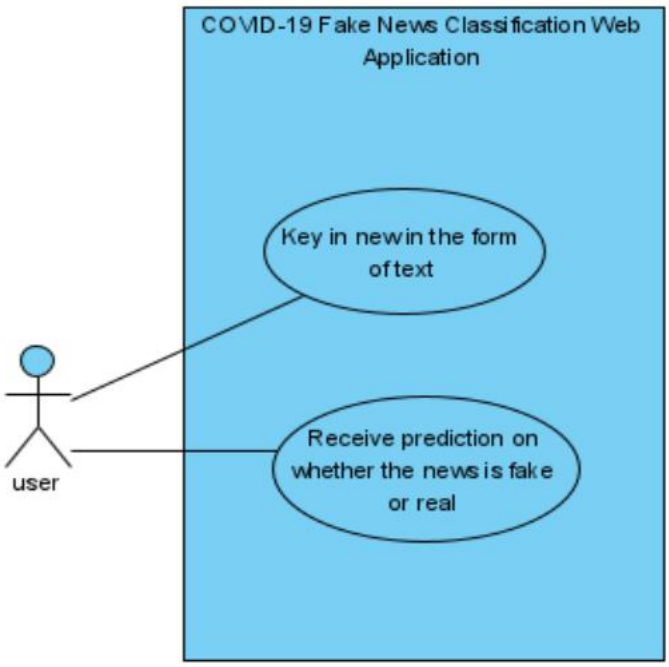



Fig.1.3

## 2.5. Implementation plan/methodology

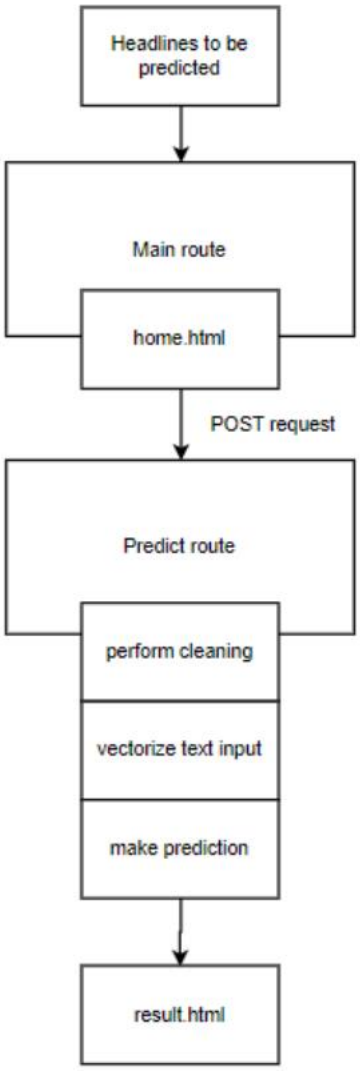



Fig.1.4 Fake News Classifier web interface flowchart

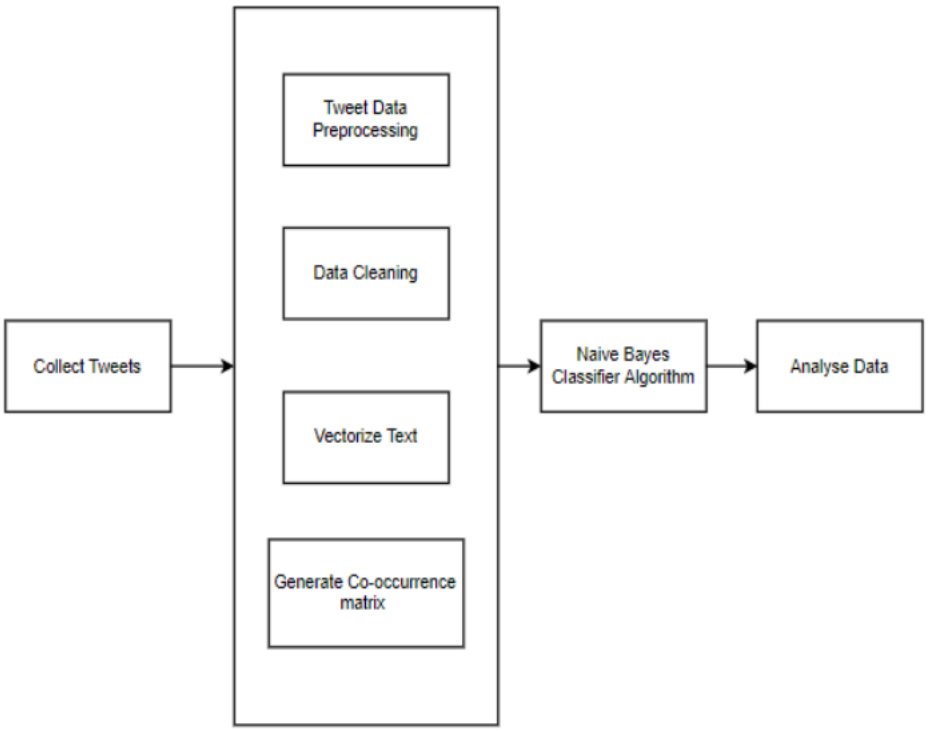



Fig.1.5 NLTK Block Diagram

# CHAPTER 3

# RESULTS ANALYSIS AND VALIDATION

## Technologies for Model Training

### 1. Jupyter Notebook

Jupyter notebook is a web application used to work with notebooks containing data such as code and visualizations. It can be used to perform operations such as data cleaning, data transformation, model training, data visualization and much more.

## Technologies for Deployment

### 1.1. Flask

Flask is a web framework that provides tools, libraries and other technologies needed to build a web application. It mainly works with the Python programming language. It can be used to deploy the model in a REST API to serve as a microservice.

### 1.2. Python

Python is an open-source high-level programming language.

### 2. Requirements

- The user shall be able to key in a headline into a textbox
- The user shall be able to get a prediction on whether the headline keyed in is likely to be Fake, Real or Unsure
- The user shall be able to get a confidence percentage of the predictions made.

```
Accuracy: 0.689 (0.040)
f1 micro: 0.689 (0.040)
f1 macro: 0.689 (0.040)
recall micro: 0.689 (0.040)
recall macro: 0.676 (0.045)
precision micro: 0.689 (0.040)
precision macro: 0.729 (0.024)
```

Fig.1.6 Performance on validation data set.

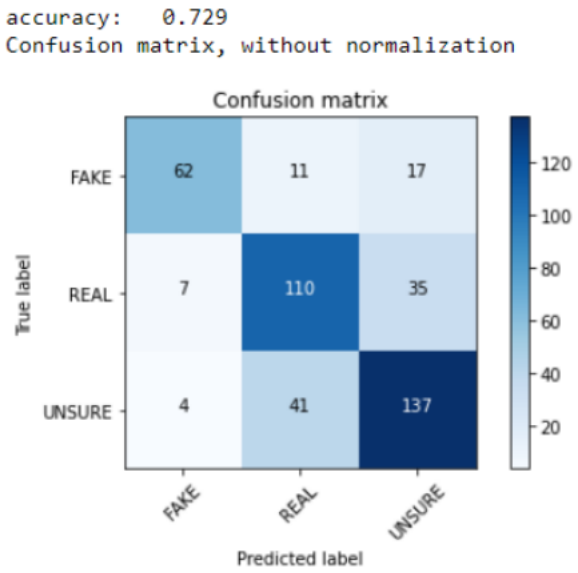



Fig.1.7 Performance of trained data set.

```
[3]  df = pd.read_csv("train.csv")                                    Python

[4]  df.head(5)                                                       Python
```

| | id | title | author | text | label |
|---|---|---|---|---|---|
| 0 | 0 | House Dem Aide: We Didn't Even See Comey's Let... | Darrell Lucus | House Dem Aide: We Didn't Even See Comey's Let... | 1 |
| 1 | 1 | FLYNN: Hillary Clinton, Big Woman on Campus - ... | Daniel J. Flynn | Ever get the feeling your life circles the rou... | 0 |
| 2 | 2 | Why the Truth Might Get You Fired | Consortiumnews.com | Why the Truth Might Get You Fired October 29, ... | 1 |
| 3 | 3 | 15 Civilians Killed In Single US Airstrike Hav... | Jessica Purkiss | Videos 15 Civilians Killed In Single US Airstr... | 1 |
| 4 | 4 | Iranian woman jailed for fictional unpublished... | Howard Portnoy | Print \nAn Iranian woman has been sentenced to... | 1 |

Fig.1.8 Code used to read the train.csv data set.

# CHAPTER 4

# CONCLUSION AND FUTURE WORK

## 4.1. Conclusion

In short. there is a lot of news being spread in Malaysia that is related to the Covid-19 pandemic, some of which may not be true. While there are websites such as Sebenarnya.my and Malaysiakini that can be used to check whether a news headline is true, this process is a manual and tedious process. Moreover, there are currently no datasets available that specifically focus on Covid-19 headlines in Malaysia. With that said, this project aims to build a dataset containing headlines specific to Covid-19 news in Malaysia, train a competent classification model using the dataset created, and deploying the model that was trained on a web application. The web application would play a part in helping reduce the amount of fake news being spread in Malaysia as it makes it easier for Malaysians to check the how likely a particular news headline is in a more automated manner. If they realise that the news headline in question has a high likelihood to be fake, they will be less likely to share that piece of news, thus reducing the amount of fake news being spread on the topic of Covid-19 here in Malaysia.

The main novelty of this project is the web application that can be used to predict if a particular news headline related to Covid-19 in Malaysia is fake and also display its prediction confidence. As previously mentioned, fact checking news headlines is a manual task, by deploying the trained classification model, this task becomes more automated and can help save time and effort for the users. The originality of this project lies in the classification model that was trained using the dataset that was self-collected. While the algorithm used to train the model may not be original, the final use case of the model is considered an original deliverable as it was trained using an original dataset.

## 4.2. Future Work

While the objectives of the project have been met, there are several aspects of the project that can be further improved on. For starters, the model could be trained using a larger dataset. The current model was trained using only 2121 rows of data due to time constraint issues for data collection.

Training a model using a larger dataset containing more news headlines collected over time could improve the performance of future models. Aside from the size of the dataset, another detail that can be highlighted as future work is dealing with the “Unsure” label within the dataset. Currently, if the model predicts a particular piece of news to be “Unsure”, the user does not get much insight on how likely that news headline is to be fake. Lastly, the web application developed could be deployed on hosting platforms in order to make it accessible to more people. Currently, the web application is hosted locally, hosting platforms such as Heroku could be used to host the web application on the internet.

# REFERENCES

[1]. Parikh, S. B., & Atrey, P. K. (2018, April). Media-Rich Fake News Detection: A Survey. In 2018 IEEE Conference on Multimedia Information Processing and Retrieval (MIPR) (pp. 436-441). IEEE.

[2]. Conroy, N. J., Rubin, V. L., & Chen, Y. (2015, November). Automatic deception detection: Methods for finding fake news. In Proceedings of the 78th ASIS&T Annual Meeting: Information Science with Impact: Research in and for the Community (p. 82). American Society for Information Science.

[3]. Helmstetter, S., & Paulheim, H. (2018, August). Weakly supervised learning for fake news detection on Twitter. In 2018 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) (pp. 274-277). IEEE. [4]. Stahl, K. (2018). Fake News Detection in Social Media.

# APPENDIX

## Source Code:

**For Train the data and preprocessing, Text-cleaning, Tokenization and so on…**

```
import pandas as pd

df = pd.read_csv("train.csv")

df.head(5)

df.isnull().sum()

df = df.fillna('')

df.isnull().sum()

df = df.drop(["id", "title", "author"], axis = True)

df

from nltk.corpus import stopwords

from nltk.stem.porter import PorterStemmer

import re

port_stem = PorterStemmer()

port_stem.stem("Hi, This is Priyanshu")

def stemming(content):

    con = re.sub('[^a-zA-Z]', ' ', content)

    con = con.lower()

    con = con.split()

    con = [port_stem.stem(word) for word in con if not word in stopwords.words('english')]

    con = ' '.join(con)
```

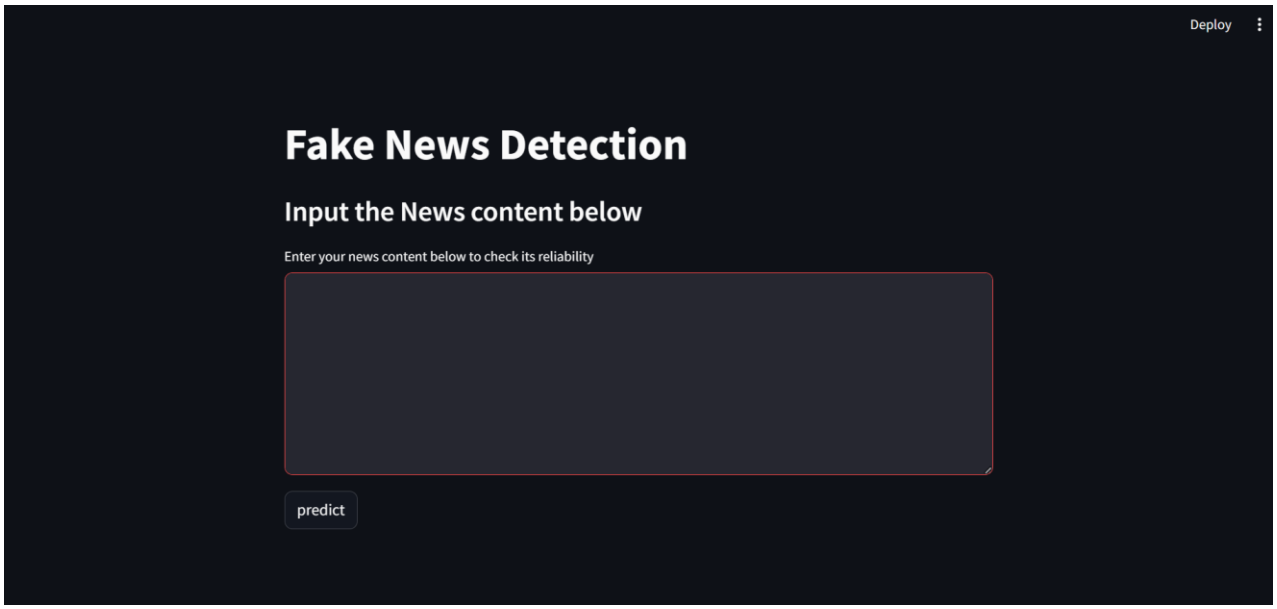
```
    return con

stemming("Hi, This Priyanshu")

df['text'] = df['text'].apply(stemming)


x = df['text']

y = df['label']

y.shape

from sklearn.model_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.25)

from sklearn.feature_extraction.text import TfidfVectorizer

vect = TfidfVectorizer()

x_train = vect.fit_transform(x_train)

x_test = vect.transform(x_test)


x_test.shape

from sklearn.tree import DecisionTreeClassifier

model = DecisionTreeClassifier()

model.fit(x_train, y_train)

prediction = model.predict(x_test)

prediction

model.score(x_test, y_test)

import pickle
```

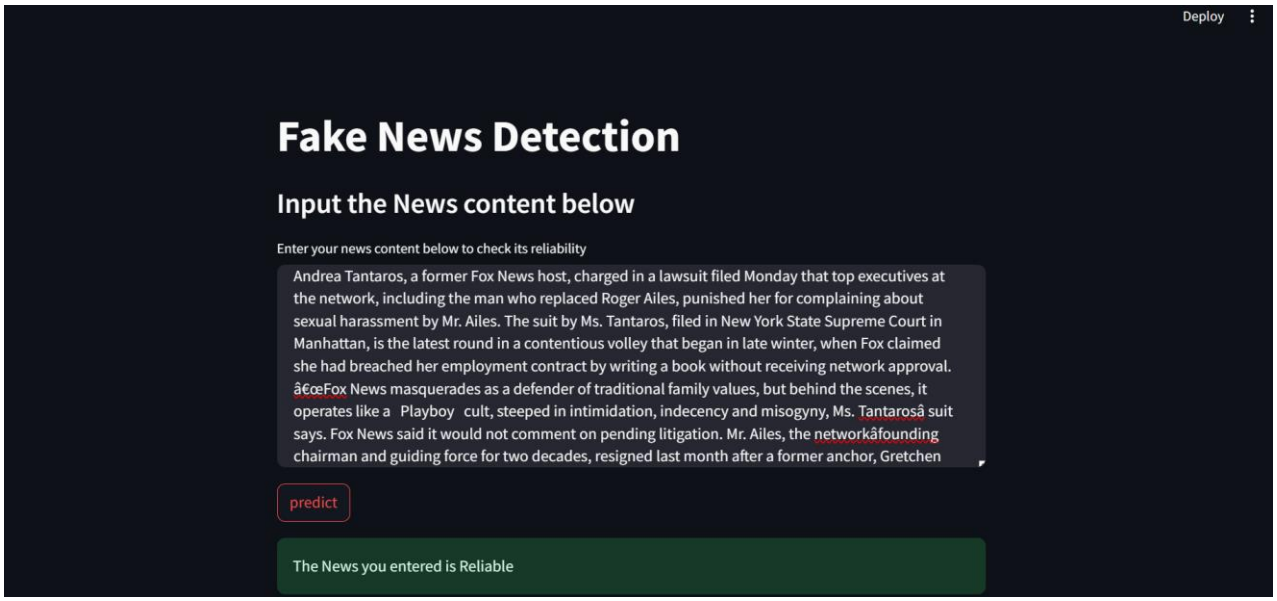
```
pickle.dump(vect, open('vector.pkl', 'wb'))

pickle.dump(model, open('model.pkl', 'wb'))

vector_form = pickle.load(open('vector.pkl', 'rb'))

load_model = pickle.load(open('model.pkl', 'rb'))

def fake_news(news):

    news = stemming(news)

    input_data = [news]

    vector_form1 = vector_form.transform(input_data)

    prediction = load_model.predict(vector_form1)

    return prediction

val = fake_news(""" House Dem Aide: We Didnâ€™t Even See Comeyâ€™s Letter Until Jason Chaffetz Tweeted It By Darrell Lucus on October 30, 2016 Subscribe Jason Chaffetz on the stump in American Fork, Utah ( image courtesy Michael Jolley, available under a Creative Commons-BY license)

if val == [0]:

    print("This News is Reliable")


else:

    print("This News is not Reliable")
```

## For Application Interface:

```
import streamlit as st

import pickle

import re

from nltk.corpus import stopwords

from nltk.stem.porter import PorterStemmer

from sklearn.feature_extraction.text import TfidfVectorizer

port_stem = PorterStemmer()

vectorization = TfidfVectorizer()


vector_form = pickle.load(open('vector.pkl', 'rb'))

load_model = pickle.load(open('model.pkl', 'rb'))


def stemming(content):

    con=re.sub('[^a-zA-Z]', ' ', content)

    con=con.lower()

    con=con.split()

    con=[port_stem.stem(word) for word in con if not word in stopwords.words('english')]

    con=' '.join(con)

    return con


def fake_news(news):
```

```
    news=stemming(news)
    input_data=[news]
    vector_form1=vector_form.transform(input_data)
    prediction = load_model.predict(vector_form1)
    return prediction


if __name__ == '__main__':
    st.title('Fake News Detection')
    st.subheader("Input the News content below")
    sentence = st.text_area("Enter your news content below to check its reliability", "",height=200)
    predict_btt = st.button("predict")
    if predict_btt:
        prediction_class=fake_news(sentence)
        print(prediction_class)
        if prediction_class == [0]:
            st.success('The News you entered is Reliable')
        if prediction_class == [1]:
            st.warning('The News you entered is Unreliable')
```


Deploy
Fake News Detection
Input the News content below
Enter your news content below to check its reliability
predict


Deploy
Fake News Detection
Input the News content below
Enter your news content below to check its reliability
Andrea Tantaros, a former Fox News host, charged in a lawsuit filed Monday that top executives at the network, including the man who replaced Roger Ailes, punished her for complaining about sexual harassment by Mr. Ailes. The suit by Ms. Tantaros, filed in New York State Supreme Court in Manhattan, is the latest round in a contentious volley that began in late winter, when Fox claimed she had breached her employment contract by writing a book without receiving network approval. â€œFox News masquerades as a defender of traditional family values, but behind the scenes, it operates like a Playboy cult, steeped in intimidation, indecency and misogyny, Ms. Tantarosâ suit says. Fox News said it would not comment on pending litigation. Mr. Ailes, the networkâfounding chairman and guiding force for two decades, resigned last month after a former anchor, Gretchen
predict
The News you entered is Reliable