



Tribhuvan University  
**Institute of Science and Technology**  
**A Final Year Project Proposal**  
On  
**“Fake News Detection”**

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## **Abstract**

**“Fake News Detection”** is an application designed to detect fake news that deals with fake and real news. This advanced python project of detecting fake news deals with fake and real news. Using Sklearn, we build a TfidfVectorizer on our dataset. Then, we initialize Naive Bayes Classifier and fit the model. In the end, the accuracy score and the confusion matrix tell us how well our model fares. After performing the experiment, it is observed that Naïve Bayes provides an accuracy of 95.5%. The performance of the proposed model is compared with the existing methods. The Naïve Bayes Classifier provides the best result compared to others.

**Keyword:** *Fake News Detection, TfidfVectorizer, Naïve Bayes Classifier, Python*

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# **1. Introduction**

A fake news is a type of yellow journalism, fake news encapsulates pieces of news that may be hoaxes and is generally spread through social media and other online media. This is often done to further or impose certain ideas and is often achieved with political agendas. Such news items may contain false and/or exaggerated claims, and may end up being viralized by algorithms, and users may end up in a filter bubble.

A broad definition of fake news is a collection of false, inaccurate information, fabricated to mimic the form of regular news media. Most of the time, fake news classifies as disinformation, or false information purposely created and spread to deceive people. The nature of social media and the internet makes the spread of information extremely rapid: often referred to as "going viral." These stories can take a life of their own, changing shape and sending the wrong message to millions. Situations like these can escalate to the point where it becomes difficult to discern between fact and fiction.

An extreme example of the effects of fake news is the Pizzagate shooting . A fake news story, and the comments attached to it, claimed that the Comet Ping Pong pizzeria was home to a pedophilia trafficking ring led by Hillary Clinton and her presidential campaign. A man believed this story so firmly that he opened [1]fire with an AR-15 in a local branch of the restaurant in an attempt to dismantle the non-existent trafficking ring. After discovering no sign of child trafficking, he stopped shooting and surrendered. While no one was hurt, this incident still serves as an example of the dangerous effects of fake news.

Search engines are one of the leading forces in tackling fake news. For example, Google has implemented various methods to stifle the spread of fake stories . To appear on Google News, a source must first meet Google's guidelines and apply for inclusion. The decision is then made based on a manual review. Manual review lacks the efficiency to check massive amounts of articles for credibility, thereby ignoring the fact that even a credible publisher could release biased or misleading news. Another method used by Google is banning known fake news sources from receiving ad revenue, which discourages the production of fake news by removing the financial incentive. However, this method does not stop fake stories from showing up in search results, nor does it stop politically-motivated fake stories. Other methods involve funding fact-checking organizations and flagging sites as having been fact-checked to raise awareness. Fact-checking organizations tie to another, broader problem: defining the Truth. Virtually all of these current methods depend on comparing articles to some form of objective reality. The issue with this is that

it is difficult to agree on what this objective truth is, as well as who gets to define it. For example, Google must continue relying on nonpartisan fact-checking organizations because getting involved in defining the truth would draw heavy scrutiny and criticism. Though it sounds counterintuitive, detecting fake news by directly checking the facts in an article may not be the best method. A machine learning solution would bypass the need to define the truth and would instead rely on an analysis of language patterns to determine whether a piece of news is real or not. Beyond just false information, fake news stories lure readers in, mislead them, and incite strong emotions. These motives produce specific language patterns and writing styles that may be unique to fake and misleading stories. A machine learning approach that can learn to recognize these differences in language, rather than consider the facts themselves, could be more efficient at detecting fake news. The dataset used for this study is from Kaggle.com, containing a set of fake and real news. After cleaning the data and vectorizing it, we test the effectiveness of machine learning in classifying the stories. [2]

## **2. Problem Statement**

Though it sounds counterintuitive, detecting fake news by directly checking the facts in an article may not be the best method. A machine learning solution would bypass the need to define the truth and would instead rely on an analysis of language patterns to determine whether a piece of news is real or not. Beyond just false information, fake news stories lure readers in, mislead them, and incite strong emotions. These motives produce specific language patterns and writing styles that may be unique to fake and misleading stories. A machine learning approach that can learn to recognize these differences in language, rather than consider the facts themselves, could be more efficient at detecting fake news.

## **3. Objectives**

The project attempts to fulfill the following objectives:

- To build the system that classify real and fake news.

## 4. Scope and Limitation

### Scope:

1. It helps to control and limit the spread of such misinformation more quickly and efficiently
2. It tunes the informational insight gained from the data at each step and then tries to make a prediction
3. It can extract labels instantaneously from known sources and updated in real-time.

### Limitations:

1. The data is erratic and this means that any type of prediction model can have anomalies and can make mistakes
2. Relying too much on weakly labelled data, the model may not generalize in all cases

## 5. Research Methodology

### A. TfIdf Vectorizer

Transforms text to feature vectors that can be used as input to estimator vocabulary is a dictionary that converts each token (word) to feature index in the matrix, each unique token gets a feature index.

		Actual Values	
		Positive (1)	Negative (0)
Predicted Values	Positive (1)	TP	FP
	Negative (0)	FN	TN

*Figure 1: Confusion Matrix*

### Formula to calculate TF-IDF

$tf(t) = (\text{No. of times term 't' occurs in a document}) / (\text{Frequency of most common term in a document})$

$$idf(t) = \log_e [ n / df(t) ]$$

where :

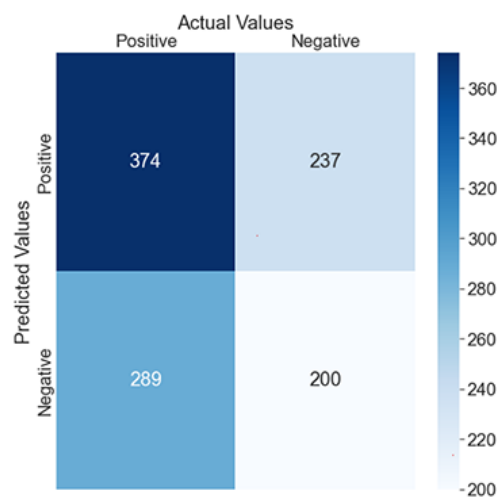
$n$  = Total number of documents available

$t$  = term for which idf value has to be calculated

$df(t)$  = Number of documents in which the term  $t$  appears

### B. Count Vectorizer

Transforms text to feature vectors that can be used as input to estimator vocabulary is a dictionary that converts each token (word) to feature index in the matrix, each unique token gets a feature index.



*Figure 2: Confusion Matrix*

### C. Naïve Bayes Classifier

A Naive Bayes classifier is a probabilistic machine learning model that's used for classification task. The crux of the classifier is based on the Bayes theorem. Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions. It is a probabilistic classifier, which means it predicts on the basis of the probability of an object.

The formula for Bayes' theorem is given as:

$$P(A/B) = P(B/A) * P(A) / P(B)$$

Where,

$P(A|B)$  is Posterior probability: Probability of hypothesis A on the observed event B.

$P(B|A)$  is Likelihood probability: Probability of the evidence given that the probability of a hypothesis is true.

#### **D. Passive Aggressive Classifier**

The passive-aggressive algorithms are a family of algorithms for large-scale learning. They are similar to the Perceptron in that they do not require a learning rate. However, contrary to the Perceptron, they include a regularization parameter. Passive-Aggressive algorithms are called so because: Passive: If the prediction is correct, keep the model and do not make any changes. i.e., the data in the example is not enough to cause any changes in the model. Aggressive: If the prediction is incorrect, make changes to the model.

#### **Algorithm of Passive Aggressive Classifier:**

INPUT: aggressiveness parameter  $C > 0$

INITIALIZE:  $w_1 = (0, \dots, 0)$

For  $t = 1, 2, \dots$

- receive instance:  $x_t \in \mathbb{R}^n$
- predict:  $\hat{y}_t = \text{sign}(w_t \cdot x_t)$
- receive correct label:  $y_t \in \{-1, +1\}$
- suffer loss:  $\ell_t = \max\{0, 1 - y_t (w_t \cdot x_t)\}$
- update:
  1. set:
 
$$\tau_t = \ell_t$$

$$\|x_t\|_2 \text{ (PA)}$$

$$\tau_t = \min$$

$$\{$$

$$C, \ell_t$$

$$\|x_t\|_2$$

$$\}$$
 (PA-I)
 
$$\tau_t = \ell_t$$

$$\|x_t\|_2 + 1$$

$$2C$$



(PA-II)

2. update:  $w_{t+1} = w_t + \tau_t y_t x_t$

## 5.1 Literature Review

In 2020, Kauret al. (2020) have implemented a new fake news identification model through a multi-level voting ensemble model including 12 classifiers, where the features were extracted using Hashing-Vectorizer (HV), “Count-Vectorizer (CV), and Term Frequency–Inverse Document Frequency (TF–IDF)” through three datasets. [3]

In 2021, Shahbazi and Byun (2021) have implemented an integrated model for different criteria of natural language processing and block chain for applying machine learning approaches for detecting fake news and offered a better prediction on posts and accounts on fake users. They used reinforcement learning approach that was used for this process. This scheme utilized the decentralized block chain framework for offering security, which has offered the method of outlining the digital contents. Lastly, the learning rate of the model was predicted for detection to explore the correlation among contents. [4]

In 2021, Mehta et al. (2021) have focused on the fake news classification model through “Bidirectional Encoder Representations from Transformers termed as BERT”. It has required a nominal pre-processing technique and has utilized two diverse versions of BERT, which has shown considerable improvement in terms of the fake news classification model regarding binary classification measures. The designed model has shown higher reliability in terms of multi-label classification. In 2021, Shishah (2021) has implemented a new fake news detection model through BERT with a joint learning scheme by integrating the Named Entity Recognition (NER) and Relational Features Classification (RFC). [5]

In 2021, Jiang et al. (2021) have investigated the efficiency of three deep learning models and five machine learning models. The superior performance of the designed model was verified while estimating with other existing approaches. In 2021, Kumari and Ekbali (2021) have implemented a novel multimodal fake news detection scheme with a suitable fusion of multimodal features, which leveraged the information from images and text and tried for maximizing the correlation among them for efficient multimodal distributed depiction. The performance of the designed model was improved by combining the text with images. The experiments have been conducted for validating the efficiency of the designed model that has attained superior performance to others. [6]

Primarily, the input is taken in the form of a dataset through the user and then the dataset is handled using the model build based on the count vectorizer or a tf-idf matrix (word tallies how often they are used in other articles in our dataset). Now the next step is to split the dataset and extract the most optimal features for tfidf-vectorizer, this is done by using a n-number of the most used words mainly removing the stop words which are common words such as “the”, “when”, and “there” and only using those words that appear at least a given number of times in a given text dataset. [7]

Problem is a kind of text classification, implementing both Naevi’s byes and passive aggressive algorithm will be best as this is standard for text-based processing. The actual goal is in developing a model which was the text transformation (count vectorizer vs tfidf vectorizer) and choosing which type of text to use. Accuracy is calculated and printing the true and false positives and negatives using confusion matrix. Confusion matrix is nothing but a table used to describe the performance of classification model or classifier on set of data set. Accuracy based on how well our classifier are working and the data set is bet feet in it. Accuracy is calculated based on true and false positives and negatives. [8]

$$\textbf{Accuracy} = \textbf{TP+TN/ TP+FP+TN+FN}$$

$$\textbf{Precision} = \textbf{TP/TP+FP}$$

## **5.2 Feasibility Study**

Feasibility analysis, in simple words is an analysis and evaluation of a proposed project to ensure if it is technically, economically and operationally feasible. As the name suggests, a feasibility analysis is a study of the viability of an idea. It focuses on answering the essential question of “should this proposed project idea be proceeded?”

### **5.2.1 Technical**

The project is technically feasible; complies with current technology, including both the hardware and the software. All the technical requirements for this project are listed below:

- A laptop with at least 4GB RAM with GPU
- High speed internet

This application is supported by almost all latest personal computers with minimum hardware and software requirements.

### **5.2.2 Operational**

This project can be conducted with a minimum human resource. Two developers are working in the project which is more than enough manpower required for this project. This project aims to create a Fake news detection that detect fake news from the available dataset.

### **5.2.3 Economic**

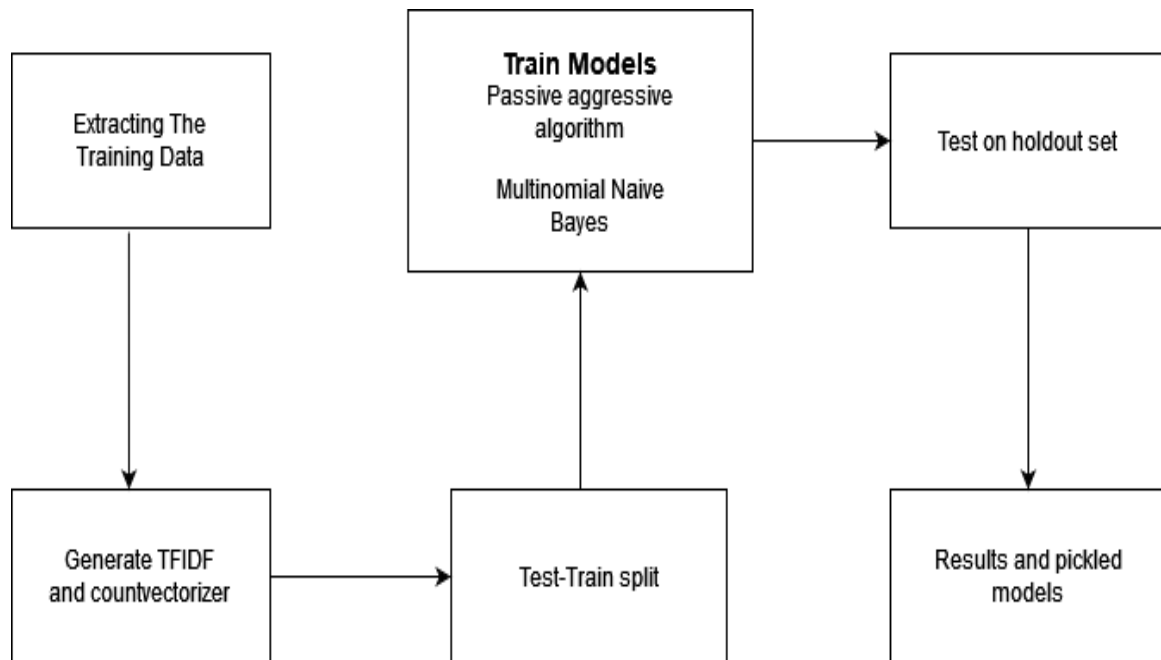
The project to be developed is very cost effective because the project will be using open-source software like python etc. which are freely available to download. There are many websites which host other websites for free until certain storage limit is met which is currently efficient for the project. Also, the benefits provided by the project easily outweigh the cost. So, the project can be considered economical feasible for the time being.

### **5.2.4 Schedule**

In scheduling feasibility, an organization estimates how much time the project will take to complete. When these areas have all been examined, the feasibility analysis helps identify any constraints the proposed project may face, including: Internal Project Constraints: Technical, Technology, Budget, Resource, etc.

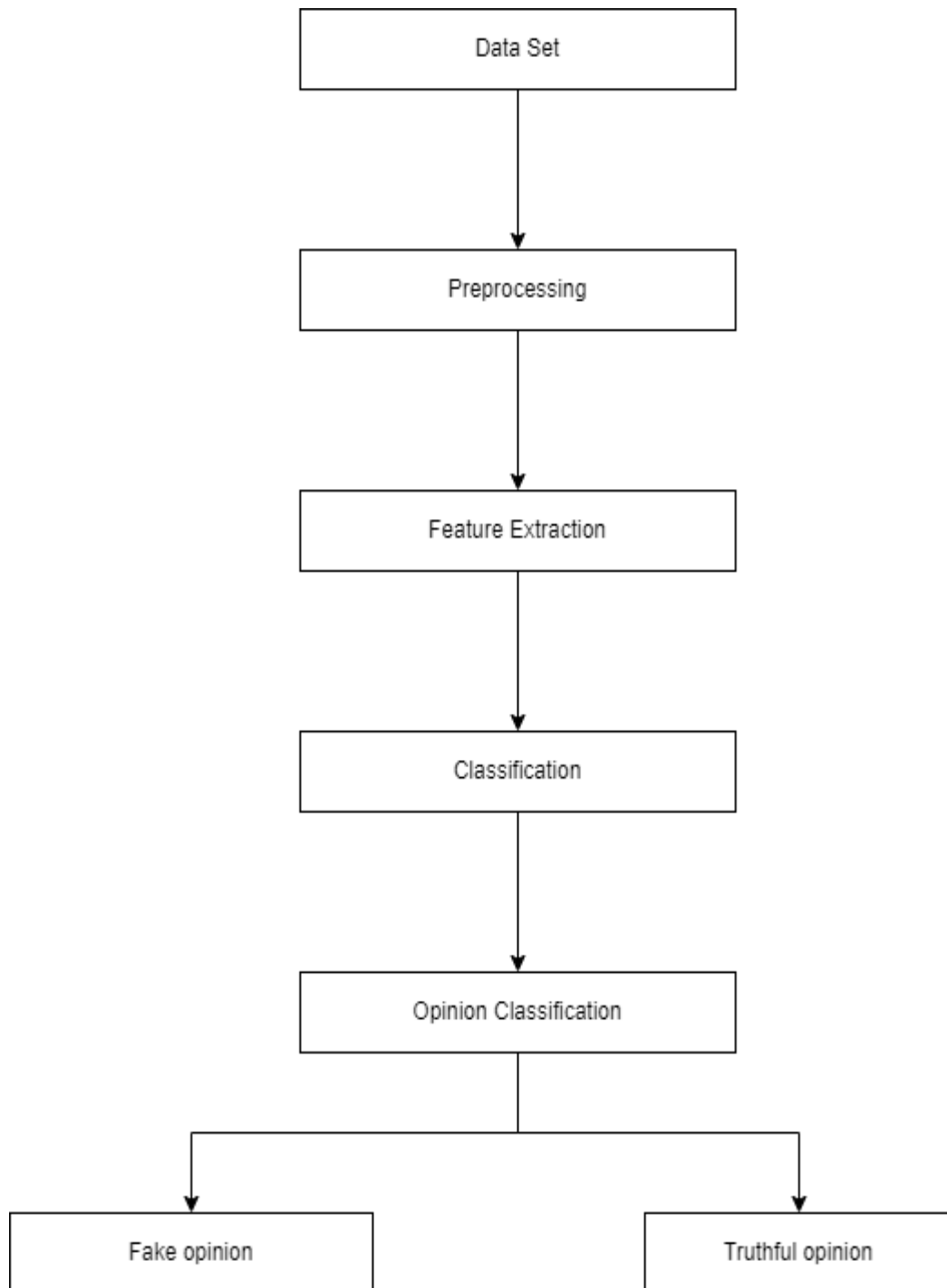
### 5.3 Proposed System

In this paper a model is build based on the count vectorizer or a tfidf matrix ( i.e. ) word tallies relatives to how often they are used in other artices in your dataset ) can help . Since this problem is a kind of text classification, Implementing a Naive Bayes classifier will be best as this is standard for text-based processing. The actual goal is in developing a model which was the text transformation (count vectorizer vs tfidf vectorizer) and choosing which type of text to use (headlines vs full text). Now the next step is to extract the most optimal features for countvectorizer or tfidf-vectorizer, this is done by using a n-number of the most used words, and/or phrases, lower casing or not, mainly removing the stop words which are common words such as “the”, “when”, and “there” and only using those words that appear at least a given number of times in a given text dataset.



*Figure 3: Pre-Processing*

## 5.4 Working Mechanism



*Figure 4: Working mechanism of system*

## 5.5 Requirements

- **NumPy**: A library for the Python programming language, adding support for large, multi-dimensional arrays and matrices along with high-level mathematical functions to operate with.
- **Matplotlib**: A plotting library for the Python programming language and its numerical mathematics extension NumPy.
- **Sklearn**: Scikit-learn is a very powerful Python library for machine learning & predictive modeling.
- **Panda**: Pandas is built on top of two core Python libraries—matplotlib for data visualization and NumPy for mathematical operations. Pandas acts as a wrapper over these libraries, allowing you to access many of matplotlib's and NumPy's methods with less code.

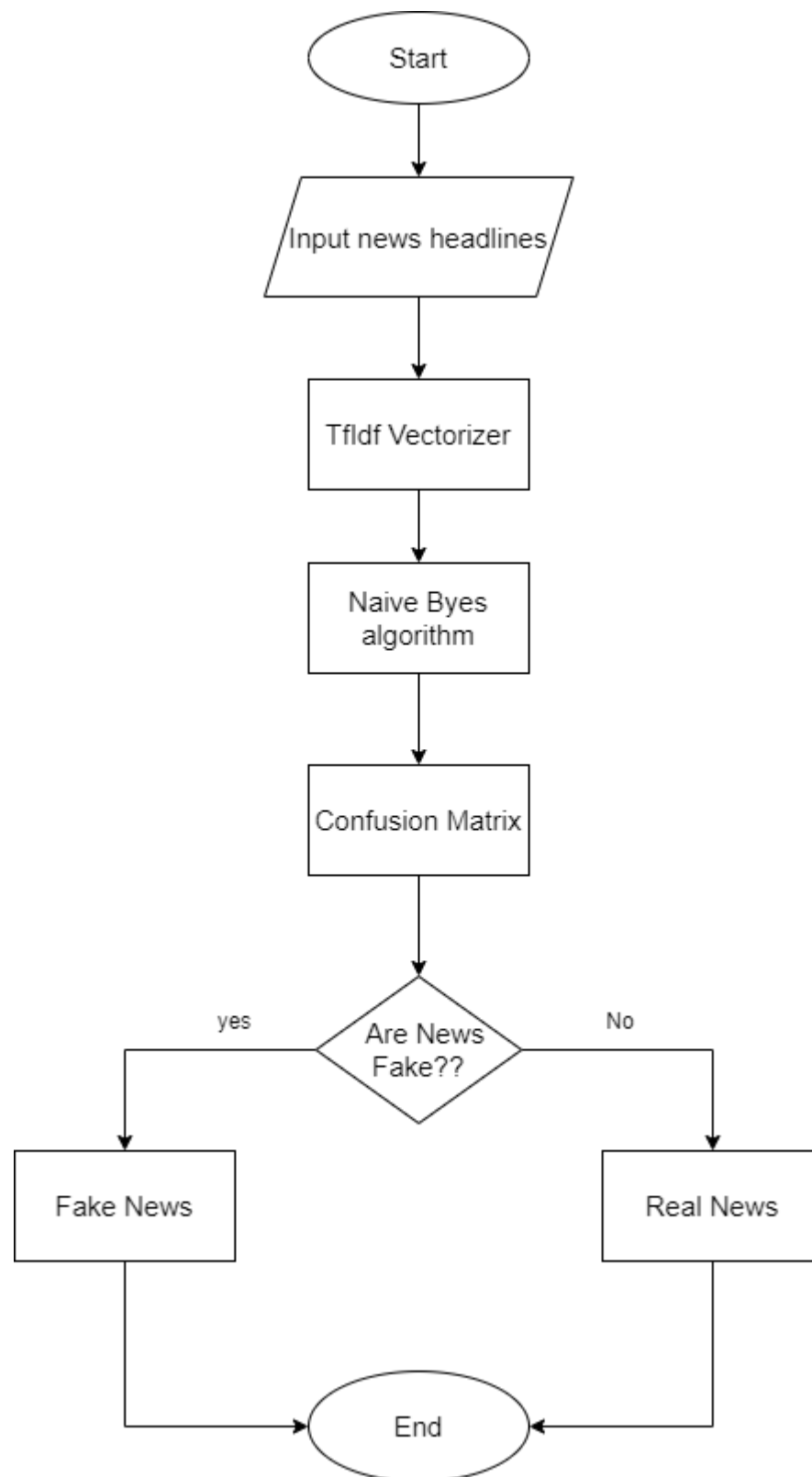
## 5.6 Implementation and tools used

Here python is used as a main programming language. Here we achieve data set from Kaggle for implementing our project.

### Tools:

- **PyCharm** : PyCharm is a dedicated Python Integrated Development Environment (IDE) providing a wide range of essential tools for Python developers, tightly integrated to create a convenient environment for productive Python, web, and data science development.
- **Jupyter Notebook** : The Jupyter Notebook is the original web application for creating and sharing computational documents. It offers a simple, streamlined, document-centric experience.
- **Microsoft Excel** : Excel is a spreadsheet program from Microsoft and a component of its Office product group for business applications. Microsoft Excel enables users to format, organize and calculate data in a spreadsheet.
- **Html and CSS** : Html and CSS is used to design front end tool.

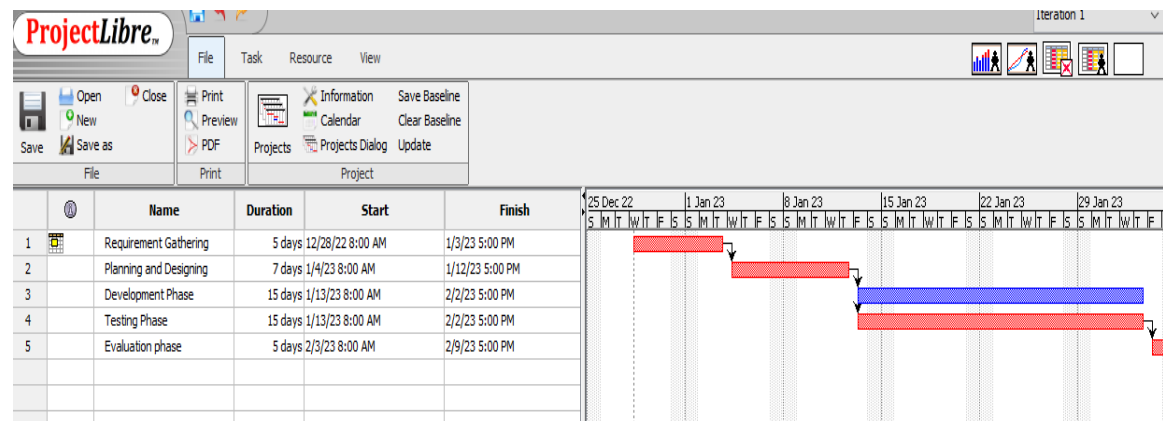
## 5.7 Design and Analysis



*Figure 5: Flowchart of system*

## 6. Working Schedule

The project will be built in time to overcome the problems as soon as possible. The degree of the project will be achievable and project won't be able to lose its benefits, expediency and profitability.



*Figure 6: Gantt Chart*

## 7. Expected Outcome

This advanced python project of detecting fake news deals with fake and real news. Using SkLearn, TfidfVectorizer is applied on our dataset. Then, initialize a Naïve Bayes Classifier and fit the model. In the end, true positives, true negatives, false positives, and false negatives value are obtained. True positive value are the correct true news predicted and false positive are the correct fake news and other two are error.

Then an accuracy test is performed. At the end one of the text from the dataset to check whether the text is real or fake. Output will be in the form “The news is Real” or “The news is Fake”.



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