



TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
THAPATHALI CAMPUS

A Project Proposal
On
Fake News Detection using Deep Learning

Submitted By:

Abhishek Chaudhary (THA076BCT003)

Adhip Bhattarai (THA076BCT004)

Kshitiz Poudel (THA076BCT018)

Nandan Singh (THA076BCT020)

Submitted To:

Department of Electronics and Computer Engineering

Thapathali Campus

Kathmandu, Nepal

January, 2023

ACKNOWLEDGEMENT

We would like to express our thanks and gratitude towards Institute of Engineering, Tribhuvan University for motivating us in doing this project by including minor project in the course of Bachelors in Computer Engineering.

Also, we would like to thank Department of Electronics and computer Engineering for providing the opportunity and guidance for their valuable guidelines in the coarse of this project.

Abhishek Chaudhary (THA076BCT003)

Adhip Bhattarai (THA076BCT004)

Kshitiz Poudel (THA076BCT018)

Nandan Singh (THA076BCT020)

ABSTRACT

Nowadays, everything is becoming digitized. In the same way, availability of news in the digital media is also increasing. People are using their smart devices to access this content online as it is cheaper and more convenient source of information. Despite these advantages it has some drawbacks as well. Many people are taking advantage by spreading misinformation online. So, our project attempts to solve this problem by classifying and distinguishing fake news from real news with the help of Deep learning techniques like transformers (BERT), SVM, and random forest algorithm and make it usable by deploying it on website.

Keywords: Fake, Deep learning, BERT, news, online, website

Table of Contents

ACKNOWLEDGEMENT	i
ABSTRACT	ii
Table of Contents	iii
List of figures	v
List of Tables	vi
List of Abbreviations	vii
1. INTRODUCTION	1
1.1. Motivation	2
1.2. Problem Definition	2
1.3. Applications of the Project	2
1.4. Project Objectives	3
2. LITERATURE REVIEW	4
2.1. Previous works	5
3. METHODOLOGY	8
3.1. Block Diagram	8
3.2. Description of the Working Principle:	9
3.3. Proposed System Architecture	12
4. EXPECTED OUTCOME	13
5. ESTIMATE PROJECT SCHEDULE	14
6. FEASIBILITY ANALYSIS	15

6.1. Data availability.....	15
6.2. Technical Feasibility	15
6.3. Economic Feasibility	15
7. References.....	16

List of figures

Figure 1. Random Forest Algorithm.....	5
Figure 2. Block Diagram.....	8
Figure 3. Supported Vector Machine.....	11
Figure 4. Proposed system architecture	12

List of Tables

Table 1. Gantt Chart.....	14
---------------------------	----

List of Abbreviations

SVM:	Supported Vector Machine
RNN:	Recurrent Neural Network
LSTM:	Long short-term memory
URL:	Uniform Resource Locator
ML:	Machine Learning
BERT:	Bidirectional Encoder Representations from Transformers
EDA:	Exploratory Data Analysis

1. INTRODUCTION

In today's world majority of the people rely on the news from social media platforms instead of the traditional platforms. This variation is due to the reason that it costs more time and money to rely on news from traditional platforms rather than social media. People propagate fake news on social media for the sole purpose of self or political gain. So, it is safe to say that despite the benefits provided by the social media in our daily life news provided by the social media are less reliable than traditional ones like newspapers. In February 27, 2022 WIONEWS published an article which was: 'Ghost of Kyiv' killed in fighting, has shot down 40 Russian jets. [1] This is one example of the fake news.

Since internet and smart devices have made easier to assess the news on the social media platforms, the spreading of the fake news through these platforms have also increased. Hence, it is safe to assume that the news on social media have a large influence on society and there are also people who can take advantage of this fact. There are websites and social media platforms which publish fake news, propaganda and misinformation pretending to be real news. Sometimes, these platforms and websites also publish the news which is half true and half false. Most of the time, the aim of these fake news is to affect the general public opinion on various matters. Politicians also circulate fake news to change the public opinion so that they can win the election. Some fake news is created just to trigger people's distrust and make them confused. It also casts hate on the people's mind. Even Forbes magazine has published an article providing the list of fake news websites. [2]

Fake news is not a new phenomenon. People often fall into the victim towards fake news because it divides people into two or more groups with each group claiming that their opinion towards a certain agenda is legitimate and correct. Also, since people are not the real time witness of an incident, they blindly trust the source which provides them the information about the incident. In addition to this, often people emotions are targeted which reduces their rational thinking power.

There are various types of fake news like:

- Clickbait
- Sponsored content
- Fabricated journalism

A typical characteristic of fake news is that it challenges people's belief and try to affect their opinion. They are too good to be true and have grammatical mistakes. They are not published by a reliable source either. They are often the news without facts or misleading or false facts. They are often reported by unreliable peoples. They may even contain a picture made using editing software to look like a real picture. They are often grammatically incorrect.

1.1. Motivation

During the time at election in Nepal on Mangsir month there were many false claims which were spread to gain political influence. As election is crucial for democracy, we started to feel that this misinformation must be stopped at all costs. Even online khabar published an article regarding this fake news in election. [3]

1.2. Problem Definition

This website developed aims to detect the fake news prevalent on the websites and other online platforms.

1.3. Applications of the Project

There are various applications of this project. Some of them are listed below:

- Reduce defamation of targeted people or group: As many fake news are targeted towards a certain person or group, this will help in preventing the defamation of that particular person or group.
- Minimize the political gain: As many politicians circulate fake news in order to achieve political gain for them, this project helps to minimize this type of behavior.
- Reduce false information business model: Many websites with fake news consists of many ads through which some people can earn money. So, this project also reduces this business model.

- Disclosure of propaganda: Many fake news websites run propaganda against someone for their personal gain. So, this project also helps in disclosure of such propaganda.

1.4. Project Objectives

The following were the objectives of our project: -

- i. Minimize the propaganda done by individuals for their personal gain.
- ii. Prevent clash between groups or individuals led by misleading facts or misinformation.

2. LITERATURE REVIEW

Fake news or fact checking methods have been carried out manually and automatically through use of different algorithms. Manual Fact checking websites like Reporter-Lab, Politi-fact, etc. rely on human judgement to determine the truthfulness of news. Such method can be prone to biases toward a certain religion, culture, or philosophy. They are also slower than automatic fact checking methods. Automatic methods mostly rely on Machine learning algorithms and also study about the source of news. Detection of news or articles that are entirely fake or misleading have been studied for a while now, especially after the advent of machine learning and artificial intelligence. Different algorithms have been used for this process.

Simple algorithms like Naïve Bayes classifiers have been used to detect fake news with a decent accuracy. It uses every word in article/news as features. Then on the assumption that every feature is independent to each other it calculates the probability that given news article is fake based on the evidence of the words that have occurred. Up-to 60% accuracy has been achieved.

Other supervised learning algorithms like logistic regression and SVM are used. Logistic regression gives probability of news being fake on the basis of different features like number of words, grammatical mistakes and words themselves.

Support vector machines (SVM) classifies fake news by using hyper-plane in n -dimensions where n is the number of features to separate the training examples which are labelled fake or real and then generalize on test cases. Combinations of these algorithms and other algorithms like Random Forest Passive aggressive classifier has also been used. Appropriate evaluation metrics can be calculated from the results of each method to come up with a single metric.

Often referred to as Random Decision Forests, Random Forests may be used for classification and regression issues. This may also be used in the unsupervised approach. The Random Forest technique was introduced by Brieman. Predictions of several trees are combined by random forest classifiers. Many decision trees are built by the random forest algorithm. Utilizing a subset of features, each decision tree is created. Each decision tree produces one class and eventually bootstraps the votes to obtain the better accuracy from the Random Forest technique. A tree-shaped pattern is

used to describe the plan of action in decision tree. At any node, a decision will be made. The below steps are followed:

- Divide the data in a way that the gain of data is maximum
(Gain is the calculation of entropy reduction upon dividing).
- The state at a node is chosen, offering the maximum gain for dividing.
- Split is done until entropy exceeds zero.
- To build several decision trees, the above process is repeated and eventually a class is chosen for a sample depending on significant voting

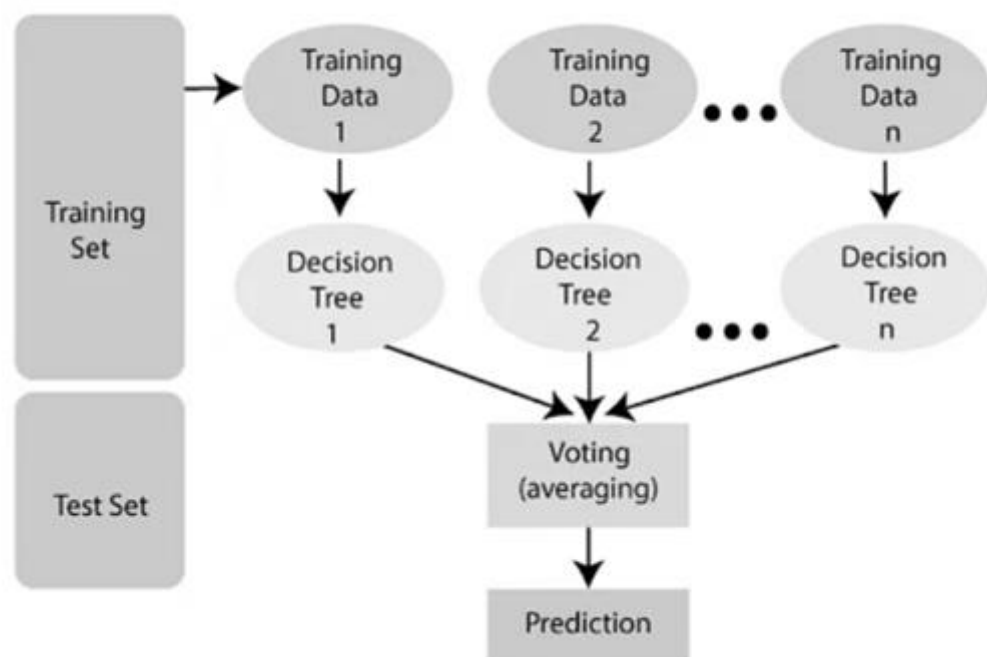


Figure 1. Random Forest Algorithm

2.1. Previous works

In research performed by Kelly Stahl, it uses Network Analysis, Linguistic Cue, Fact-checking, Naïve Bayes Classifier, SVM, Semantic Analysis. They used both Naïve Bayes Classifier and SVM. They found the accuracy of the combined methods was more than the accuracy of individual methods. They found that the biggest drawback of Naïve Bayes classifier was that it deems all features of a document, or whichever textual format being used, to be independent even though most of the time that is not the situation. [4]

Jiawei et al. Conducted a study based on actual textual information, authorship, and article subject relationship. They introduced FAKE DETECTOR framework which combines representation feature learning and credibility label interface to compose deep diffusive network model. They were able to achieve an accuracy of 0.63. [5]

Also, Gowthami. K et. al used SVM and Random Forest to identify fake news. At first, they collected the dataset and then pre-processed the data. They applied SVM and Random Forest algorithm and they compared the results and accuracy. They found an accuracy of 98% with this algorithm. [6]

In research conducted by Tejaswini Yesugade, et al. they collected scrap data and transformed the data into format. By the help of NLTK toolkit they removed the stop words. Then they performed word embedding and word index of tokenized dataset was generated. In addition to this, they compared RNN-LSTM and sigmoid validation. Here, they used 100 neurons in each layer with each layer using sigmoid activation function. They classified the news as fake news – 0, real news – 1. [7]

Uma et al. used combinations of different algorithms like static search, dynamic search and URL search in the classification of fake News. Static search included different machine learning algorithms Like Naive Bayes, Random Forest and Logistic Regression. Dynamic search asked the users to enter specific keywords in a news and produced a percentage probability of truthfulness of article by comparing articles with similar keywords on the internet .URL search method accepts a specific website domain and calculates the authenticity of website comparing to the websites databases like LIAR, BuzzFeed and BS Detector. They were able to get an up to 80 percent accuracy with Logistic regression model and 92.73 percent accuracy with passive aggressive classifier. [8]

In research conducted by I. Kadek Sastrawan et. al, about Detection of fake news using deep learning CNN–RNN based methods they conducted the research in 2 phases i.e., training phase and testing phase. First phase begins by retrieving the training data from database. Then data cleansing is performed on the data. Then they performed data augmentation process to the cleaned data to balance the data between the classes. This augmented data is then processed and transformed into word vectors. These word vectors are used to train the deep learning model. This model is stored in the database

for the next phase. In the second phase, the trained model is evaluated. At first testing data is pre-processed and previously stored model is taken from database. Now, the pre-processed data and saved model are used to predict the pre-processed test data and the results are displayed. It gave 99.95% accuracy. [9]

In research conducted by Mahmood Farokhian et. al, at first, they extracted the headlines of the news and fed it to the BERT network. On the other hand, using the MaxWorth algorithm, the most appropriate news text span is selected from the rest of the news text. This text span is again fed to another BERT network. The output from both BERT networks were joined together and fed to dropout layer. Then the output from dropout layer was fed to dense layer which classified the news as real or fake. [10]

3. METHODOLOGY

The steps involved in classification of datasets are:

- Collecting the data
- Data preprocessing
- Building the classification model (BERT)
- Train and test the model

3.1. Block Diagram

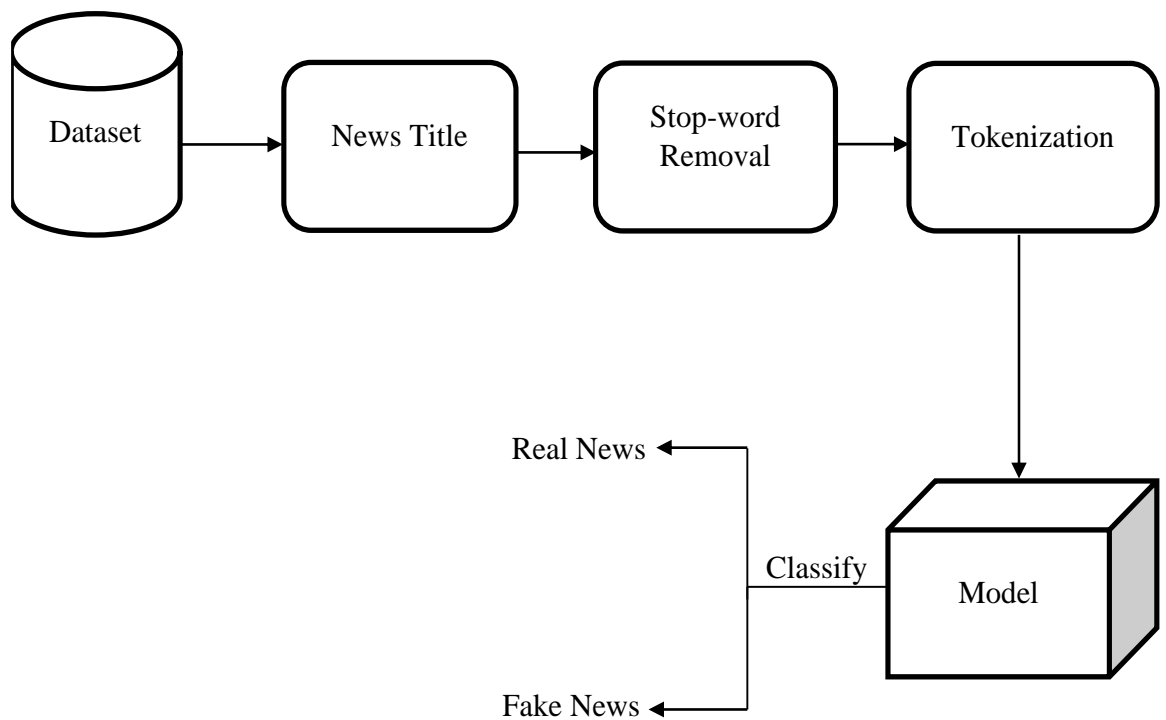


Figure 2. Block Diagram

3.2. Description of the Working Principle:

The working detail of this project is described as below:

- Data collection and pre-processing:
Collecting Fake news and Real news dataset from Kaggle. The dataset is present in .csv format.
- Data Cleaning:
Before modelling the dataset, data cleaning such as lowercasing the text, removing punctuation, tokenization (giving structure to unstructured word), removing stop words, lemmatization (changing word to root words), etc. are done.
- Train and test the dataset:
Here, we are using BERT model for the training and testing of the dataset. This model is supervised learning model. Here, the tokens are given as input to the BERT model which are passed through the embedding layers to convert them into continuous vectors.

If we are given input tokens $x_1, x_2, x_3, \dots, x_n$ then the embedding layer calculates embedding as,

$$\text{embedding}_i = \text{embedding_matrix}[x_i]$$

Here, `embedding_matrix` is a matrix of size $|V| \times d$, where $|V|$ is the size of the vocabulary (i.e., the number of unique tokens in the input) and d is the dimensionality of the word embeddings.

During the training phase, we provide the model with fake and real news dataset along with their label as real or fake.

These vectors thus generated are passed through a stack of transformer blocks. Each transformer block consists of self-attention and feed forward network. Then the output of transformer block is passed to the pooling layer. Here, we can use mean or weighted pool to extract important features of the input sequence. The BERT model also consists of a special [CLS] token at the

beginning of the input sequence, which is used to represent the entire sequence in the pooled output. This allows the model to make predictions about the entire input sequence, rather than just individual tokens. It generates the news as real or fake.

- **Fine-graded Classification:** Once the BERT model is fine-tuned, we can use it as a feature extractor as input to the Fine-grained classification to classify the fake news as propaganda, hoax, satire or other.

Algorithms used for fine graded algorithm:

❖ **Random Forest Algorithm:**

It is a type of ensemble learning method that can be used for classification tasks. It is a supervised learning algorithm. It is an extension of the decision tree algorithm. As the name suggests it consists of a number of decision trees and it predicts the output by the help of majority votes of the decision trees. The steps involved in this algorithm are:

- Select a random subset from the given dataset and train the decision tree.
- Repeat this process multiple times and train each dataset on different subsets.
- Take votes from each decision tree.
- Select the most voted result as the final output.

❖ **Supported Vector Machine (SVM):**

Supported Vector Machine (SVM) is supervised machine learning algorithm used for both classification and regression. The objective of SVM algorithm is to find hyperplane in n-dimensional space that distinctly classifies the data points. For 2 dimensions it is a line and for 3 dimensions it is a plane. If our dataset has n features the SVM will separate the datasets in n-dimensional space.

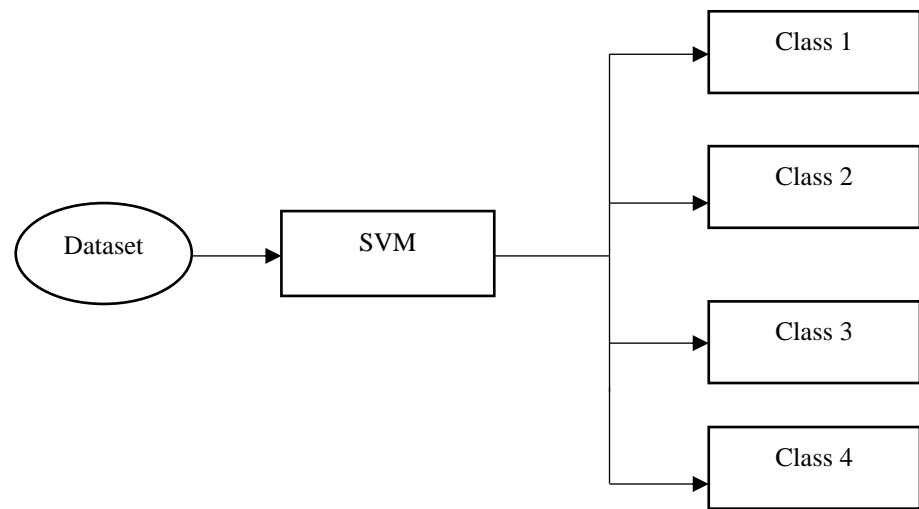


Figure 3. Supported Vector Machine

3.3. Proposed System Architecture

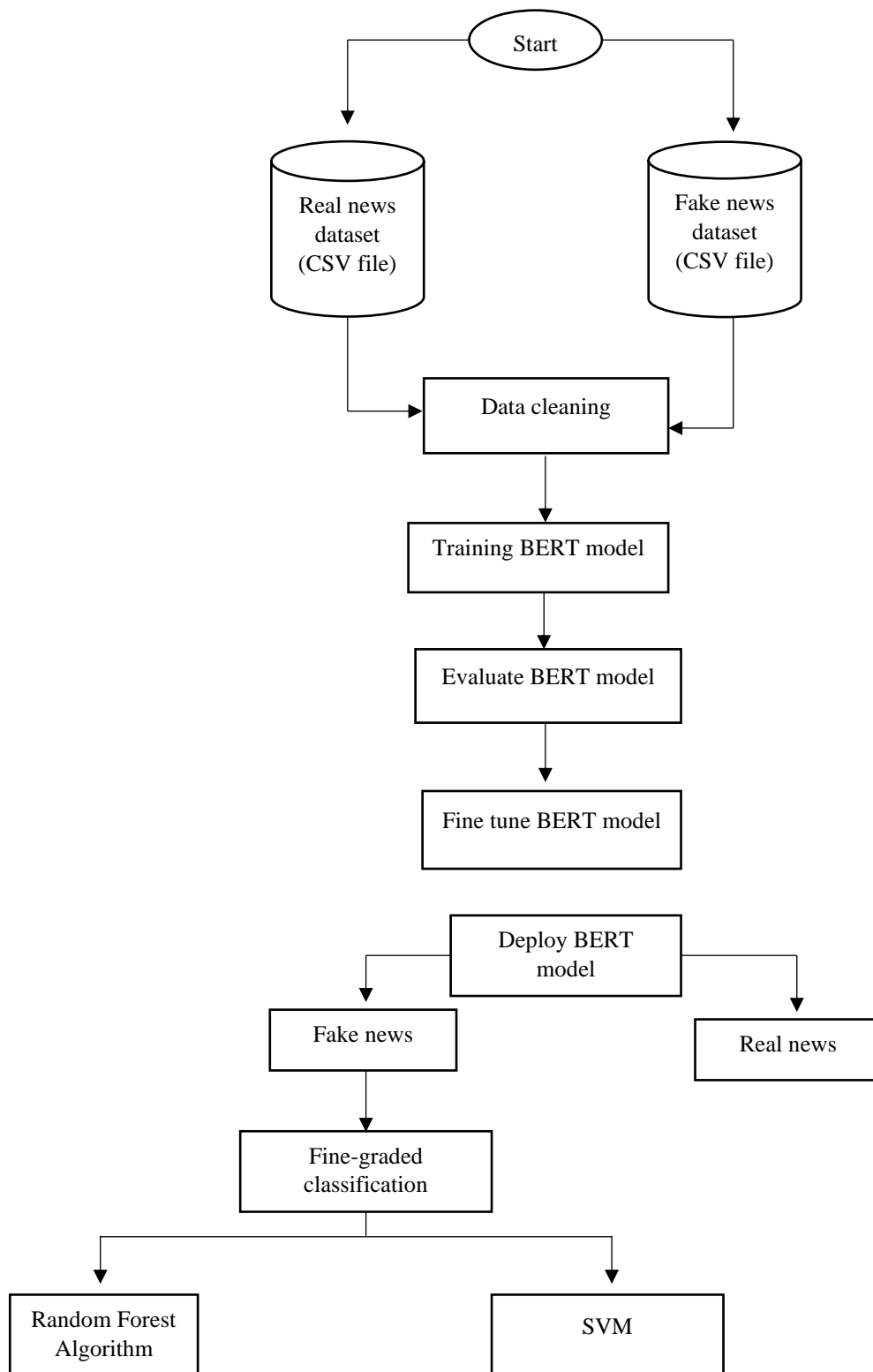


Figure 4. Proposed system architecture

4. EXPECTED OUTCOME

After the completion of this project, we expect our system will spit out a probability value of news being fake. The system will use different algorithms which will allow us to compare accuracy precision recall value F1 score and other similar metrics and to calculate the probabilities of news being fake. Also, we will be able to come up with one single metric for the system as a whole. The system is expected to have a web-based implementation with simple Graphical User Interface (GUI) that allows user to type the words present in news article or the news title.

5. ESTIMATE PROJECT SCHEDULE

Table 1. Gantt Chart

ID	Name	Start	Finish	Duration	Dec 2022				Jan 2023				Feb 2023				Mar 2023	
					12/11	12/18	12/25	1/1	1/8	1/15	1/22	1/29	2/5	2/12	2/19	2/26	3/5	
1	Planning	12/7/2022	12/9/2022	.6w														
2	Research	12/7/2022	12/20/2022	2w														
3	Coding	12/20/2022	2/13/2023	8w														
4	Training and Testing	2/14/2023	2/23/2023	1.6w														
5	Evaluation and Improvements	2/24/2023	3/10/2023	2.2w														
6	Documentaion	12/7/2022	3/10/2023	13.6w														

6. FEASIBILITY ANALYSIS

6.1. Data availability

The data set needed to train our machine is available in Kaggle. So, we just need to train the dataset.

6.2. Technical Feasibility

The dataset in Kaggle is approximately about 125 MB. Currently, we have a NVIDIA RTX 3050Ti Graphics with 4 GB Graphics Memory which would be enough to train our dataset.

6.3. Economic Feasibility

This project does not require much cost. So, it is economically feasible.

7. References

- [1] "'Ghost of Kyiv' killed in fighting, has shot down 40 Russian jets," 27 February 2022. [Online]. Available: <https://www.wionews.com/world/ghost-of-kyiv-killed-in-fighting-after-shooting-down-40-russian-jets-475309>.
- [2] C. Elliott, "forbes," 21 February 2019. [Online]. Available: <https://www.forbes.com/sites/christopherelliott/2019/02/21/these-are-the-real-fake-news-sites/?sh=2554c7c23c3e>.
- [3] D. Adhikari, "Onlinekhabar," 13 December 2022. [Online]. Available: <https://english.onlinekhabar.com/misinformation-elections-nepal.html>.
- [4] K. Stahl, "Fake news detection in social media," 2018.
- [5] B. D. P. S. Y. Jiawei Zhang, "FAKEDETECTOR: Effective Fake News Detection," 2019.
- [6] S. R. M. K. S. Gowthami. K, "Identification of Fake News through SVM and Random Forest," 2020.
- [7] S. K. S. P. R. V. S. P. Tejaswini Yesugade, "Fake News Detection using LSTM," International Research Journal of Engineering and Technology (IRJET), 2021.
- [8] S. S. S. M. P. Uma Sharma, "Fake News Detection using Machine Learning Algorithms," International Journal of Engineering Research & Technology (IJERT), 2021.
- [9] I. B. D. M. S. A. I. Kadek Sastrawan, "Detection of fake news using deep learning CNN–RNN based methods," 2021.
- [10] V. R. H. V. Mahmood Farokhian, "Fake news detection using parallel BERT deep neural networks".