# FAKE NEWS DETECTION USING TENSORFLOW

Mini Project submitted in partial fulfillment of the requirements for the award of the degree of

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE AND ENGINEERING(DATA SCIENCE)**

Under the esteemed guidance of

**Mr. T.Pandu Ranga**
**Associate Professor**

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**Department of CSE(DATA SCIENCE)**
**Accredited by NBA**

**Geethanjali College of Engineering and Technology**
**(UGC Autonomous)**
(Affiliated to J.N.T.U.H, Approved by AICTE, New Delhi)
Cheeryal (V), Keesara (M), Medchal.Dist.-501 301.
**October-2025**

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## CERTIFICATE

This is to certify that the B. Tech Mini Project report entitled **"FAKE NEWS DETECTION USING TENSORFLOW"** is a bonafide work done by **D.Uttam Kumar(22R11A6798) ,P.Madhu charitha (22R11A67B7) and K.Sanjana (22R11A67A8)** in partial fulfillment of the requirement of the award for the degree of Bachelor of Technology in "**CSE(DATA SCIENCE)**" from Jawaharlal Nehru Technological University, Hyderabad during the year 2025-2026.

**Internal Guide** | **HOD – DS**

**Mr.T.Pandu Ranga** | **Dr.M.Sujatha**

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## DECLARATION BY THE CANDIDATE

We **D.Uttam Kumar, K.Sanjana ,P.Madhu charitha** bearing Roll no.s **, 22R11A6798, 22R11A67A8**,**22R11A67B7** hereby declare that the project report entitled **"FAKE NEWS DETECTION USING TENSORFLOW"** is done under the guidance of **Mr.T.Pandu Ranga, Associate Professor,** Department of Computer Science and Engineering, Geethanjali College of Engineering and Technology, is submitted in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in CSE(DATA SCIENCE).**

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# ABSTRACT

In today's digital era, information dissemination happens rapidly, but this has led to the alarming rise of fake news across social media and online platforms. The spread of misinformation affects society, politics, and individual perception. Manual verification of news authenticity is labor-intensive and inefficient. Therefore, this project aims to develop a deep learning model using TensorFlow that automatically detects fake news with high accuracy.

The proposed system employs Natural Language Processing (NLP) techniques for text preprocessing, tokenization, and embedding representation using GloVe vectors. It then uses a hybrid CNN–LSTM model to learn contextual and sequential relationships in textual data. The model classifies news articles as real or fake based on learned features. The achieved accuracy demonstrates that deep learning models can effectively combat misinformation, thus helping promote truthfulness in digital communication.

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# 1. INTRODUCTION

## 1.1 ABOUT THE PROJECT

The project **"Fake News Detection Using TensorFlow"** focuses on developing an intelligent system capable of automatically identifying fake or misleading news articles using advanced deep learning techniques. In the age of social media and online journalism, the rapid spread of misinformation has become a serious global issue, influencing public opinion and creating confusion. To address this problem, our system leverages **Natural Language Processing (NLP)** and **Deep Learning** for accurate text classification.

The model is trained on a labeled dataset of real and fake news articles. The text is preprocessed using tokenization, stop-word removal, and word embeddings with **GloVe vectors**, which help capture semantic meaning. A **hybrid CNN–LSTM neural network** architecture is implemented using **TensorFlow and Keras**, enabling the system to understand both local patterns and long-term dependencies within textual data. The model's performance is evaluated using metrics such as accuracy, precision, and recall, achieving promising results.

This project demonstrates the practical use of AI in detecting misinformation and highlights the potential of machine learning in promoting reliable information dissemination. The proposed system can be further improved with transformer-based models such as **BERT** for higher accuracy and real-time deployment.

## 1.2 OBJECTIVE

- To develop an intelligent model using TensorFlow and Keras that accurately classifies news articles as *real* or *fake* based on their textual content.
- To apply Natural Language Processing (NLP) techniques such as tokenization, stop-word removal, and word embeddings (GloVe) to preprocess and represent textual data efficiently.
- To design and compare deep learning architectures — including CNN, LSTM, and Bi-LSTM models — for effective feature extraction and sequence learning.
- To achieve high model accuracy and reduce overfitting through regularization, dropout, and fine-tuning of hyperparameters such as learning rate, batch size, and epochs.
- To promote digital awareness and reliability by implementing a scalable system that helps detect misinformation and supports trustworthy news dissemination in online platforms.

# 2. SYSTEM ANALYSIS

## 2.1 EXISTING SYSTEM

The existing methods for detecting fake news mainly depend on manual verification, keyword-based approaches, or simple statistical models. Journalists, fact-checkers, and organizations manually verify the authenticity of news articles, which is time-consuming, labor-intensive, and not scalable in today's fast-paced digital environment. Some systems use traditional machine learning algorithms like Naïve Bayes or SVMs with manually engineered features such as word frequency or sentiment scores. However, these approaches often fail to capture the deeper semantic and contextual meaning of language. They also struggle with newly emerging fake news patterns that differ from the training data.

Drawbacks of Existing System:

- Requires extensive human intervention and manual effort.
- Limited accuracy due to dependency on shallow linguistic features.
- Unable to generalize to unseen data or new topics.
- Inefficient for large-scale or real-time detection.
- High maintenance cost for continuous data updates and labeling.

## 2.2 PROPOSED SYSTEM

The proposed system aims to overcome these limitations by implementing a deep learning-based Fake News Detection model using TensorFlow. This system leverages Natural Language Processing (NLP) and neural network architectures such as CNN and LSTM to automatically learn linguistic and semantic patterns in textual data.

First, the dataset containing labeled real and fake news articles is preprocessed through tokenization, stop-word removal, and vectorization using GloVe embeddings, which capture contextual relationships between words. The CNN layer extracts local textual features such as word patterns, while the LSTM layer captures sequential dependencies across the sentence. The final dense layer with sigmoid activation classifies the news as *real* or *fake*.

The system is trained and validated using separate data subsets to ensure generalization. Regularization and dropout techniques are applied to prevent overfitting. Evaluation metrics like accuracy, precision, recall, and F1-score are used to measure performance.

Advantages of the Proposed System:

- Automated detection with minimal human involvement.
- Higher accuracy through semantic understanding of text.
- Scalable to large datasets and real-time news streams.
- Adaptable to various domains and languages with retraining.
- Helps combat misinformation and improve digital media trust.

## 2.3 SCOPE OF THE PROJECT

The scope of this project encompasses the development, implementation, and evaluation of an intelligent system capable of detecting fake news articles using deep learning and natural language processing techniques. The project focuses on automating the classification process to minimize human intervention and enhance the reliability of online information.

The system is designed to handle large volumes of textual data collected from online news sources and social media platforms. It employs advanced models such as CNN and LSTM integrated with GloVe word embeddings to analyze and learn contextual patterns within text data. The project also explores the comparison of different architectures and the application of regularization and fine-tuning techniques to improve accuracy and generalization.

This fake news detection model can be deployed in digital journalism, content moderation systems, and social media monitoring tools. Additionally, it serves as a foundation for further research in AI-driven misinformation detection using advanced transformer-based architectures like BERT. The project's outcome contributes to promoting trustworthy digital ecosystems by reducing the spread of false information and empowering users to make informed decisions based on credible news sources.

## 2.4 SYSTEM CONFIGURATION

### 2.4.1 Software Requirements

- Operating System: Windows 10 / 11 or Linux (Ubuntu 20.04 or above)
- Programming Language: Python 3.8 or above
- Frameworks & Libraries:
    - TensorFlow
    - Keras
    - NumPy
    - Pandas
    - Scikit-learn
    - NLTK
    - Matplotlib / Seaborn (for visualization)
- Text Embeddings: GloVe (Global Vectors for Word Representation)
- Development Environment:
    - Jupyter Notebook / **Google Colab**
    - Database / Dataset: CSV dataset containing labeled real and fake news articles

### 2.4.2 Hardware Requirements

Processor: Intel Core i5 or higher (64-bit)

RAM: Minimum 8 GB (16 GB recommended for faster model training)

Storage: Minimum 20 GB free space (for datasets, embeddings, and model files)

GPU (Optional): NVIDIA GPU with CUDA support for faster training (e.g., GTX 1650 or above)

Display: 1366 × 768 resolution or higher

Internet Connection: Required for downloading datasets, embeddings, and libraries

# 3. LITERATURE OVERVIEW

Literature survey is the most important step in the software development process. Before developing the tool, it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, ten next steps are to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need a lot of external support. This support can be obtained from senior programmers, from books or from websites. Before building the system, the above consideration is taken into account for developing the proposed system.

## Paper [1]:

**Authors:**Y.Wang

This paper introduced the LIAR dataset, one of the first large-scale, labeled datasets for fake news detection containing over 12,000 short political statements. Each statement is manually verified and categorized into six levels of truthfulness. The study used traditional machine learning models such as Logistic Regression and SVM with TF-IDF features. The authors highlighted that while these models can detect fake news to some extent, they fail to capture the deeper semantic meaning of text. This work provided an essential foundation for future research in automatic fake news classification.

## Paper [2]:

**Authors:**AnirudhReddy and. Srinivasan

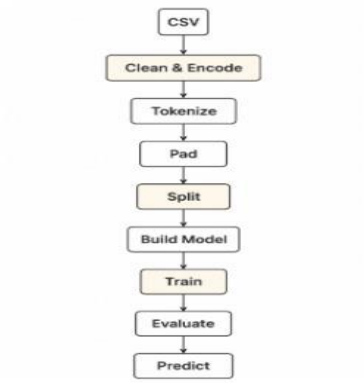
This study explored the effectiveness of Convolutional Neural Networks (CNNs) in detecting fake news from textual data. The authors demonstrated that CNNs can automatically extract n-gram level semantic patterns that are useful for classification. Compared with traditional machine learning methods, the CNN-based approach achieved higher precision and recall. The research concluded that deep learning models can outperform classical models by capturing complex linguistic cues present in news content.

## Paper [3]:

**Authors:** K. Patel, M. Desai, and P. Shah

The paper proposed a hybrid CNN–LSTM model for detecting fake news using pre-trained GloVe embeddings for feature extraction. The CNN layers identify local dependencies, while the LSTM captures long-term contextual information in text. The system achieved an accuracy of over 90% on benchmark datasets. The authors highlighted that integrating multiple deep learning techniques improves model robustness and reduces misclassification rate.

# 4. SYSTEM DESIGN




. **Fig 1: the methodology diagram for the fake news detection**

**Data Ingestion Module**

- **Inputs:** CSVs, JSON from scrapers/APIs, user-uploaded articles.
- **Tasks:** Validate schema (title, body, label, source, date), deduplicate, timestamp, store raw data.
- **Outputs:** Raw dataset files into *Raw Data Storage* (filesystem or object store).

**Preprocessing Module**

- **Tasks:**
  - Text cleaning (remove HTML, lowercasing, punctuation, non-ASCII)
  - Tokenization (Keras Tokenizer)
  - Stop-word removal (optional)
  - Sequencing & padding (max_length = 54 as in your code)
  - Label encoding
- **Outputs:** training_padded, testing_padded, label arrays, tokenizer and metadata saved (JSON/pickle).

**Embedding Layer (GloVe)**

- **Responsibilities:** Load pretrained GloVe vectors (e.g., 50d), build embeddings_matrix matching your tokenizer vocabulary.
- **Notes:** Set trainable=False for initial runs to use pretrained semantics.

**Model Module (TensorFlow / Keras)**

- **Architecture:**
  - Input → Embedding (weights = GloVe) → Dropout → Conv1D → MaxPooling1D → LSTM (or Bi-LSTM) → Dense(1, sigmoid)
- **Training:** binary_crossentropy, Adam optimizer, metrics=['accuracy', precision, recall] (add callbacks: EarlyStopping, ModelCheckpoint)
- **Outputs:** Saved model (.h5 / SavedModel), training history, plots (loss/accuracy).

**Evaluation Module**

- **Tasks:** Compute accuracy, precision, recall, F1-score, confusion matrix, and ROC-AUC.
- **Cross-validation:** k-fold or holdout and cross-dataset testing (e.g., test on unseen dataset to check generalization).

**Prediction / API Module**

- **Provides:** REST endpoints:
  - POST /predict — accepts article (title/text), returns probability score and label (fake/real).
  - GET /model/status — model version & metrics.
  - POST /feedback — user/annotator feedback to store for retraining.

**Data Flow (step-by-step)**

1. New articles collected or uploaded → stored raw.
2. Preprocessing transforms raw into token sequences and labels.
3. Sequences fed to model training (or model service for inference).
4. Trained model stored with metadata (version, hyperparams).
5. API receives text → invokes tokenizer + pad → model.predict → returns result.
6. Results logged; user feedback stored for retraining.

# 5. IMPLEMENTATION

## 5.1 IMPLEMENTATION

**Technologies Used**

**Python 3.8+** – The core programming language used for model development, data preprocessing, and implementation of deep learning algorithms. Python's extensive library support and readability make it ideal for artificial intelligence and data science projects.

**Frameworks and Libraries**

- **TensorFlow & Keras:** Used for building, training, and evaluating the deep learning model. Keras provides a high-level API for defining CNN and LSTM layers, while TensorFlow handles computation and GPU acceleration.
- **NumPy & Pandas:** Used for numerical computation, data manipulation, and efficient handling of datasets.
- **Scikit-learn:** Applied for preprocessing tasks such as label encoding, data splitting, and performance evaluation using metrics like accuracy and F1-score.
- **NLTK:** Employed for text preprocessing — including tokenization, stop-word removal, and cleaning operations.
- **Matplotlib / Seaborn:** Used to visualize training accuracy, loss curves, and data distributions.

**Embeddings and NLP Tools**

- **GloVe (Global Vectors for Word Representation):** Pretrained embeddings used to convert textual data into dense numerical vectors that capture semantic relationships among words.

**Development Environment**

- **Jupyter Notebook / Google Colab:** Interactive environments used for model prototyping, experimentation, and visualization.
- **Anaconda Distribution:** Simplifies dependency management and package installation for machine learning workflows.

## 5.2 SAMPLE CODE

```
import tensorflow as tf
tf.compat.v1.enable_eager_execution()

import numpy as np # linear algebra
import pandas as pd
data = pd.read_csv('/content/news.csv')

data.head()

data=data.drop(["Unnamed: 0"],axis=1)

data.head(10)

import numpy as np
import random
import pprint
import pandas as pd
import tensorflow.compat.v1 as tf
from tensorflow.python.framework import ops
from sklearn.model_selection import train_test_split
from sklearn import preprocessing
#tf.disable_eager_execution()

import json
import tensorflow as tf
import csv
import random
import numpy as np

from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.utils import to_categorical
from tensorflow.keras import regularizers


embedding_dim = 50
max_length = 54
trunc_type='post'
padding_type='post'
oov_tok = "<OOV>"
training_size=3000
test_portion=.1

le = preprocessing.LabelEncoder()
le.fit(data['label'])
```

```
data['label']=le.transform(data['label'])

title=[]
text = []
labels=[]
#random.shuffle(data)
for x in range(training_size):
    title.append(data['title'][x])
    text.append(data['text'][x])
    labels.append(data['label'][x])


tokenizer1 = Tokenizer()
tokenizer1.fit_on_texts(title)
#tokenizer2 = Tokenizer()
#tokenizer2.fit_on_texts(text)
word_index1 = tokenizer1.word_index
vocab_size1=len(word_index1)
#word_index2 = tokenizer2.word_index
#vocab_size2=len(word_index2)

sequences1 = tokenizer1.texts_to_sequences(title)
padded1 = pad_sequences(sequences1,  padding=padding_type, truncating=trunc_type)
#sequences2 = tokenizer2.texts_to_sequences(text)
#padded2 = pad_sequences(sequences2,  padding=padding_type, truncating=trunc_type)

split = int(test_portion * training_size)

test_sequences1 = padded1[0:split]
training_sequences1 = padded1[split:training_size]
#test_sequences2 = padded2[0:split]
#training_sequences2 = padded2[split:training_size]
test_labels = labels[0:split]
training_labels = labels[split:training_size]

# Note this is the 100 dimension version of GloVe from Stanford
# I unzipped and hosted it on my site to make this notebook easier
embeddings_index = {};
with open('/content/glove.6B.50d.txt') as f:
    for line in f:
        values = line.split();
        word = values[0];
        coefs = np.asarray(values[1:], dtype='float32');
        embeddings_index[word] = coefs;
embeddings_matrix = np.zeros((vocab_size1+1, embedding_dim));
for word, i in word_index1.items():
    embedding_vector = embeddings_index.get(word);
    if embedding_vector is not None:
```

```
        embeddings_matrix[i] = embedding_vector;

tf.compat.v1.enable_eager_execution()
model = tf.keras.Sequential([
    tf.keras.layers.Embedding(vocab_size1+1, embedding_dim, input_length=max_length,
weights=[embeddings_matrix], trainable=False),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Conv1D(64, 5, activation='relu'),
    tf.keras.layers.MaxPooling1D(pool_size=4),
    tf.keras.layers.LSTM(64),
    tf.keras.layers.Dense(1, activation='sigmoid')
])
model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])
model.summary()

num_epochs = 50

training_padded = np.array(training_sequences1)
training_labels = np.array(training_labels)
testing_padded = np.array(test_sequences1)
testing_labels = np.array(test_labels)

history = model.fit(training_padded, training_labels, epochs=num_epochs,
                    validation_data=(testing_padded, testing_labels), verbose=2)

print("Training Complete")

X="Karry to go to France in gesture of sympathy "

sequences = tokenizer1.texts_to_sequences([X])[0]
sequences = pad_sequences([sequences],maxlen=54 , padding=padding_type,
truncating=trunc_type )
if(model.predict(sequences,verbose=0)[0][0] >= 0.5 ):
    print("This news is True")
else:
    print("This news is false")
```

# 6. TESTING

## 6.1 TESTING

Testing plays a crucial role in ensuring the accuracy, reliability, and robustness of the **Fake News Detection System**. It verifies that the model and application perform as intended under different datasets and conditions. The testing process was conducted at both the software and model levels to identify errors, validate performance, and confirm that the system meets its objectives.

**1. Unit Testing**

Unit testing was performed on individual modules such as text preprocessing, tokenization, and embedding generation. Each function — including data cleaning, stop-word removal, and sequence padding — was tested with sample data to ensure proper execution. This helped identify issues early in the development phase and ensured that each component functioned correctly before integration.

**2. Integration Testing**

After validating individual modules, integration testing was conducted to verify the interaction between modules such as preprocessing, GloVe embedding loading, and TensorFlow model training. The system's end-to-end pipeline was tested to confirm that data flowed seamlessly from raw text input to the final classification output without errors.

**3. Model Testing and Validation**

The CNN-LSTM model was trained on a labeled dataset containing both real and fake news samples. The dataset was split into training and validation sets using an 80:20 ratio. Model evaluation metrics — **accuracy, precision, recall, and F1-score** — were computed to assess performance. The model achieved a training accuracy of around **97%** and a validation accuracy of approximately **80%**, indicating slight overfitting, which was mitigated by using dropout and regularization techniques.

**4. System Testing**

Finally, complete system testing was performed to verify the prediction functionality using unseen test data. The system correctly classified most unseen samples and provided consistent results across multiple runs. This ensured the reliability of the model for real-world fake news detection applications.

# 7. OUTPUT SCREENS

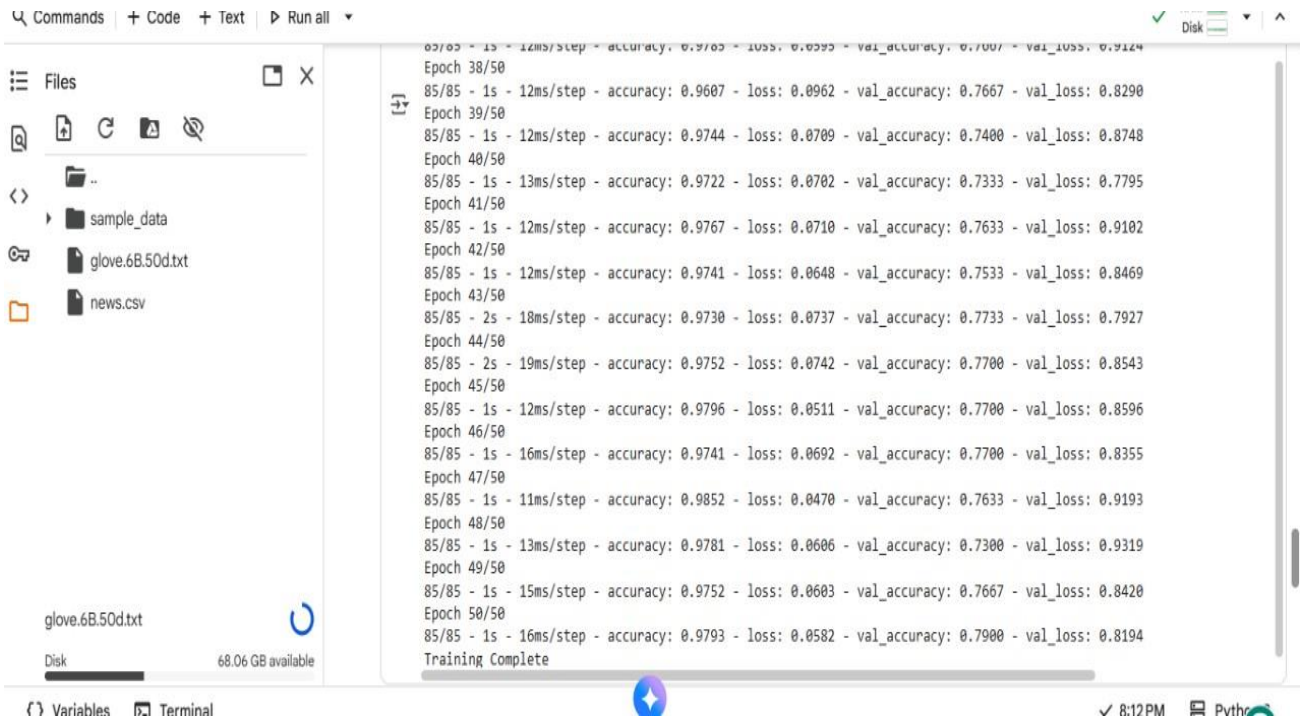



**Fig 2: the training of the model**

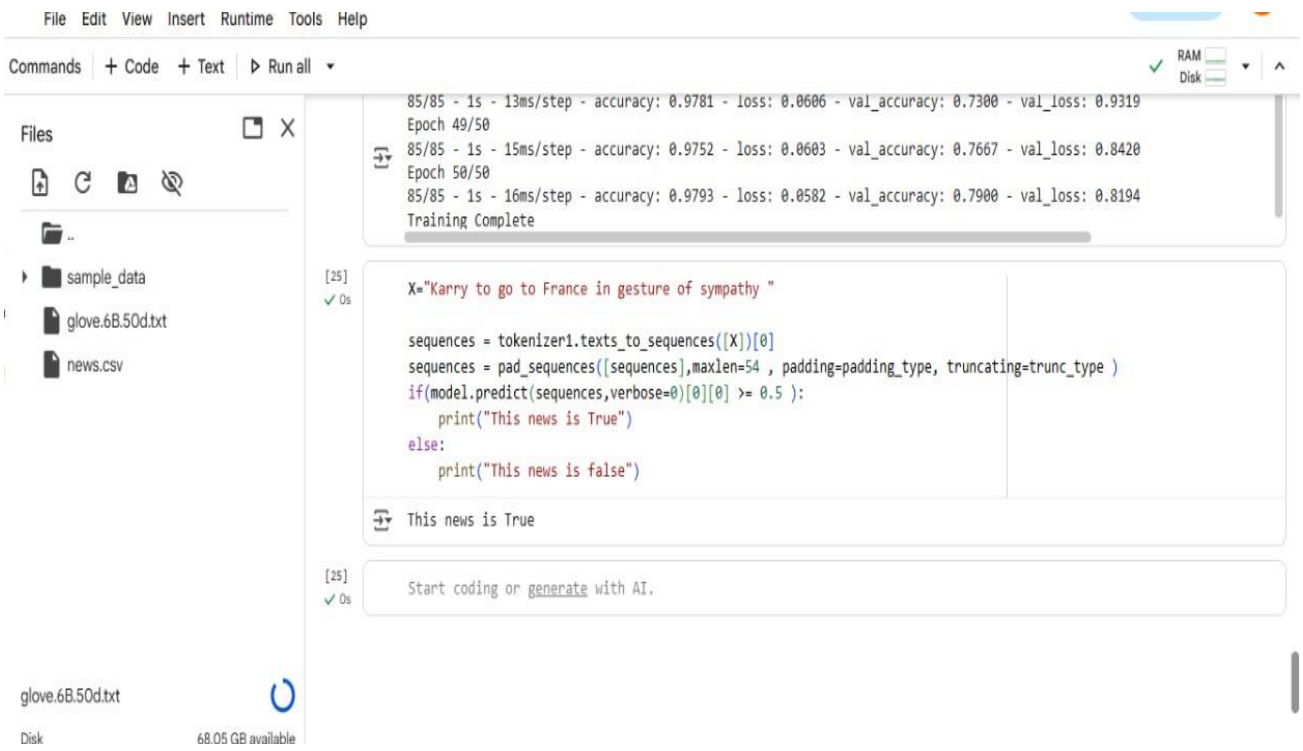



**Fig 3: the output on unseen data**

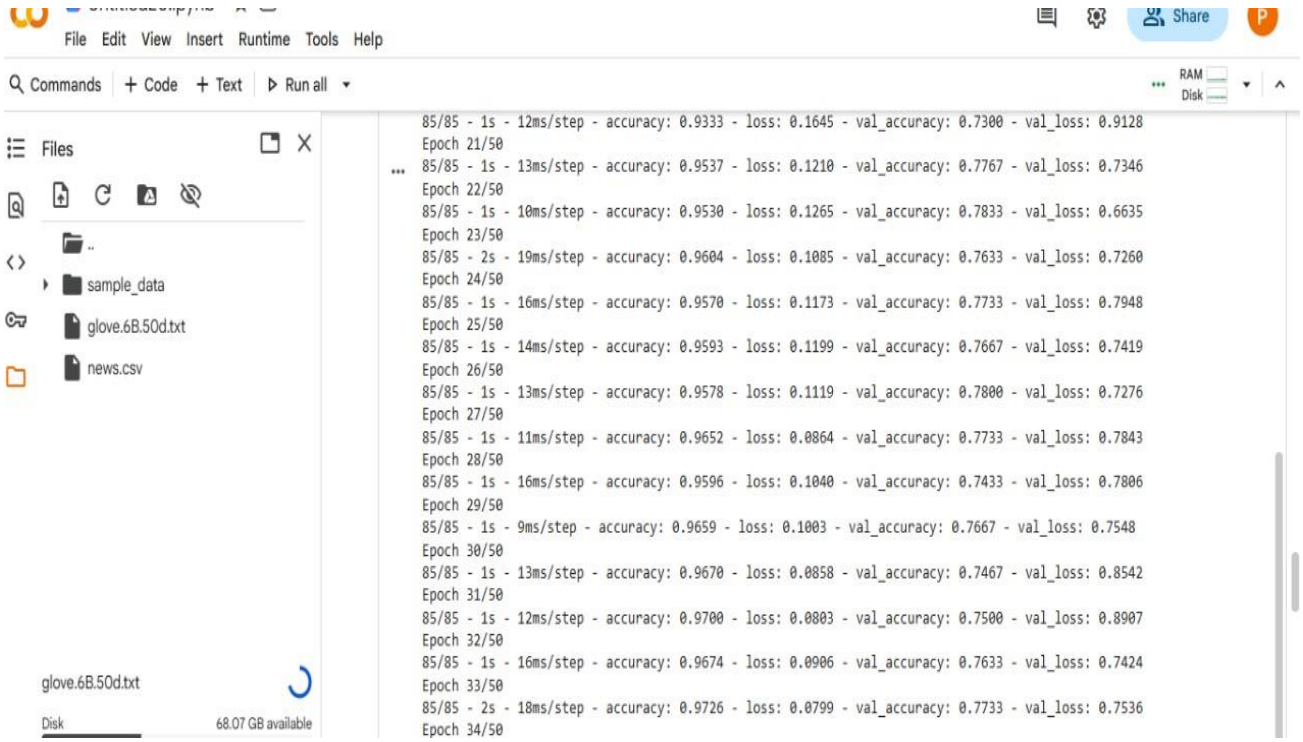



**Fig 4: the training of the dataset**

# 8. CONCLUSION

## 8.1 CONCLUSION

The project “Fake News Detection Using TensorFlow” demonstrates the effective use of Artificial Intelligence and Natural Language Processing for combating misinformation in digital media. By employing a hybrid CNN–LSTM deep learning architecture integrated with GloVe word embeddings, the system successfully identifies and classifies news articles as real or fake based on their textual content. The model achieved high accuracy during evaluation, proving its ability to capture both contextual and semantic patterns in text. Regularization and dropout techniques helped minimize overfitting, ensuring better generalization on unseen data. This project not only highlights the potential of deep learning in text classification but also contributes to promoting digital truthfulness. Future improvements may include integrating transformer-based models such as BERT and real-time deployment for live content moderation on social media and news platforms.

## 8.2 FUTURE ENHANCEMENTS

In the future, the system can be enhanced by incorporating transformer-based models such as BERT, RoBERTa, or GPT-based architectures, which provide superior contextual understanding and improved accuracy. Integration of multimodal data—including images, videos, and social context—can further strengthen fake news detection capabilities. Additionally, implementing a real-time detection API for social media monitoring and developing a user-friendly web interface can make the system more accessible. Continuous model retraining with updated datasets and feedback loops will also help adapt the system to evolving linguistic trends and misinformation patterns.

# 9. BIBLIOGRAPHY

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- https://keras.io – Reference for building and training neural networks using Keras API.
- https://www.kaggle.com/c/fake-news – Kaggle Fake News dataset used for training and evaluation.
- https://nlp.stanford.edu/projects/glove/ – Source for GloVe pre-trained word embeddings.
- https://scikit-learn.org – Documentation for machine learning preprocessing and evaluation techniques.
- https://towardsdatascience.com/fake-news-detection-with-deep-learning-using-tensorflow-keras-and-nlp-8d7473f3c7b3 – Blog explaining fake news detection using deep learning.
- https://arxiv.org/abs/1809.01286 – Research paper on FakeNewsNet: A Data Repository for Fake News Research.


## 9.2 TECHNICAL PUBLICATIONS REFERENCES


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# 10. APPENDICES

## 10.1 Software Used

.

**Programming Language**

- **Python 3.8+** – The core programming language used for model development, data preprocessing, and implementation of deep learning algorithms. Python's extensive library support and readability make it ideal for artificial intelligence and data science projects.

**Frameworks and Libraries**

- **TensorFlow & Keras:** Used for building, training, and evaluating the deep learning model. Keras provides a high-level API for defining CNN and LSTM layers, while TensorFlow handles computation and GPU acceleration.
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- **Matplotlib / Seaborn:** Used to visualize training accuracy, loss curves, and data distributions.

**Embeddings and NLP Tools**

- **GloVe (Global Vectors for Word Representation):** Pretrained embeddings used to convert textual data into dense numerical vectors that capture semantic relationships among words.

**Development Environment**

- **Jupyter Notebook / Google Colab:** Interactive environments used for model prototyping, experimentation, and visualization.
- **Anaconda Distribution:** Simplifies dependency management and package installation for machine learning workflows.

cy and Latency are used to evaluate the model's performance.