



PANIMALAR ENGINEERING COLLEGE

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DETECTION OF NEWS WHETHER ITS FAKE OR NOT USING DATA ANALYSTICS



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Domain: Data Science

SDG 4: Quality Education

SDG 16: Peace, Justice and Strong Institutions

Social relevance

- Safeguard of public health by combating medical misinformation
- Support informed decision-making in society.
- Linked SDGs:
- SDG 4: Quality Education 
- SDG 16: Peace, Justice and Strong Institutions 
- Prevent social unrest caused by rumors and false report.

Base Paper Details

- Title: Fake News Detection Using Deep Learning and Transformer-Based Model
- Authors: Paliwal Mohan Subhash; Deepa Gupta; Suja Palaniswamy; Manju Venugopalan
- Journal: IEEE Xplore
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- Publisher: IEEE

Abstract

- Fake news detection is a critical data science application that uses machine learning and natural language processing to identify misleading content.
- With the rapid spread of misinformation on social media, manual fact-checking is insufficient.
- Data-driven methods provide scalable and accurate solutions to maintain information integrity and trust in digital communication.

- Fake news detection employs a combination of content-based, user-based, and propagation-based analysis.
- Content-based methods analyze linguistic and semantic features of text to identify deceptive writing patterns.
- User-based analysis evaluates the credibility and past behavior of information sources, while propagation-based methods study how news spreads across social networks.

Agenda

- Introduction
- Objective
- Literature Survey
- Problem Statement
- Architecture Diagram
- Use Case and Other Diagrams
- Modules
- Algorithms / Methodology
- Testing
- Test Cases and Validation
- Performance Analysis
- Screenshots
- Conclusion
- Future Work
- References

Introduction

- Fake news has become a global issue, affecting political, economic, and social systems.
- Fake news is false or misleading information disguised as news, aiming to manipulate opinions or gain attention. With social media, it spreads rapidly, influencing public opinion and causing confusion. Manual detection is slow and unreliable.
- We use data analytics and machine learning algorithm to detect the fake news

Objective

- Detect fake news using data analytics and ML
- Improve accuracy and reliability of information
- Build scalable and automated detection system
- Enhance decision-making with credible sources

Literature Survey

#	AUTHORS	YEAR	TITLE	KEY CONTRIBUTION
1	Shu, Sliva, Wang, Tang, Liu Kai Shu; Amy Sliva; Suhang Wang; Jiliang Tang; Huan Liu	2017	Fake News Detection on Social Media: A Data Mining Perspective	Early survey framing content, social context, and knowledge cues.
2	Ruchansky, Seo, Liu Natali Ruchansky; Sungyong Seo; Yan Liu	2017	CSI: A Hybrid Deep Model for Fake News Detection	Hybrid model combining content, user responses, and source behavior.
3	Wang William Yang Wang	2017	"LIAR": A New Benchmark Dataset for Fake News Detection	Introduces the LIAR dataset (12.8K statements) with fine-grained labels.
4	Ahmed, Traoré, Saad H. Ahmed; I. Traoré; S. Saad	2018	Detecting Hoaxes, Fake News, and Clickbait Using ML	Classical ML feature engineering for news credibility signals.
5	Singh et al. A. Singh; et al.	2019	Review on Fake News Detection Methods	Overview of content, context, and hybrid approaches.

6	Thorne, Vlachos, Christodoulopoulos, Mittal J. Thorne; A. Vlachos; C. Christodoulopoulos; A. Mittal	2018	FEVER: Fact Extraction and VERification	Large-scale fact-verification dataset and task.
7	Shu, Wang, Liu K. Shu; S. Wang; H. Liu	2019	Beyond News Contents: The Role of Social Context for FND	Models leveraging user/social signals with content.
8	Pérez-Rosas, Kleinberg, Lefevre, Mihalcea V. Pérez-Rosas; B. Kleinberg; A. Lefevre; R. Mihalcea	2018	Automatic Detection of Fake News	Linguistic features and new datasets for news veracity.
9	Yang, et al. Y. Yang; et al.	2019	Social Context-based Detection	Incorporates user-interaction and propagation signals.
10	Zhou, Zafarani X. Zhou; R. Zafarani	2020	Fake News Early Detection: A Survey	Early-stage detection before wide propagation.

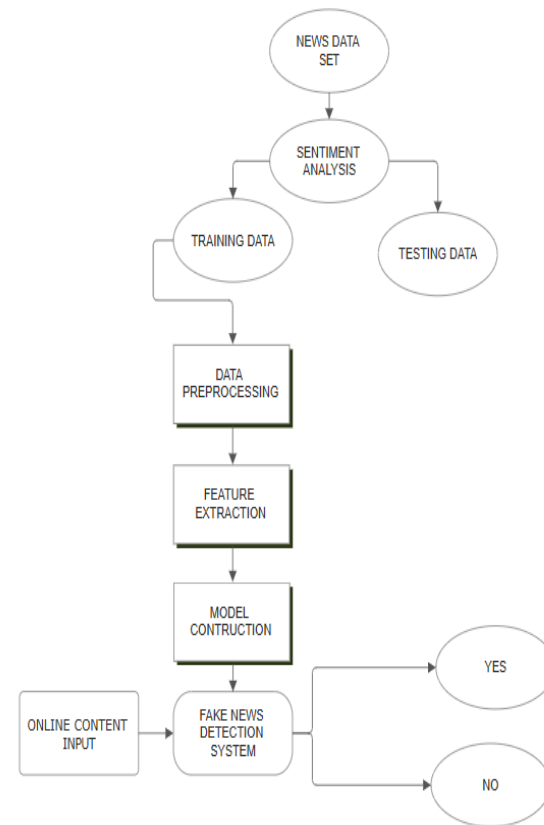
11	Sharma, Qian, Jiang, Ruchansky, Zhang, Liu K. Sharma; F. Qian; H. Jiang; N. Ruchansky; M. Zhang; Y. Liu	2019	Combating Fake News: Identification and Mitigation	Comprehensive review of detection & mitigation techniques.
12	Oshikawa, Qian, Wang R. Oshikawa; J. Qian; W. Y. Wang	2020	A Survey on NLP for Fake News Detection	Focus on text/NLP pipelines and datasets.
13	Volkova, Shaffer, Jang, Hodos S. Volkova; K. Shaffer; J. Jang; N. Hodos	2017	Separating Facts from Fiction: Linguistic Cues of Misinformation	Stylometry and affect for deception signals.
14	Shu, Mahudeswaran, Wang, Lee, Liu K. Shu; D. Mahudeswaran; S. Wang; D. Lee; H. Liu	2018	FakeNewsNet: A Data Repository with News Content and Social Context	Unified benchmark repository for FND research.
15	Tacchini, Ballarin, Della Vedova, Moret, de Alfaro E. Tacchini; F. Ballarin; M. L. Della Vedova; S. Moret; L. de Alfaro	2017	Some Like it Hoax: Automated Fake News Detection in Facebook	User-interaction features for social hoax detection.
16	Vosoughi, Roy, Aral S. Vosoughi; D. Roy; S. Aral	2018	The Spread of True and False News Online	Large-scale diffusion analysis; false news spreads faster.
17	Zhou, Zafarani, Shu, Liu X. Zhou; R. Zafarani; K. Shu; H. Liu	2019	Fake News: Fundamental Theories, Detection Strategies, and Challenges	Foundational taxonomy and open problems.

Problem Statement

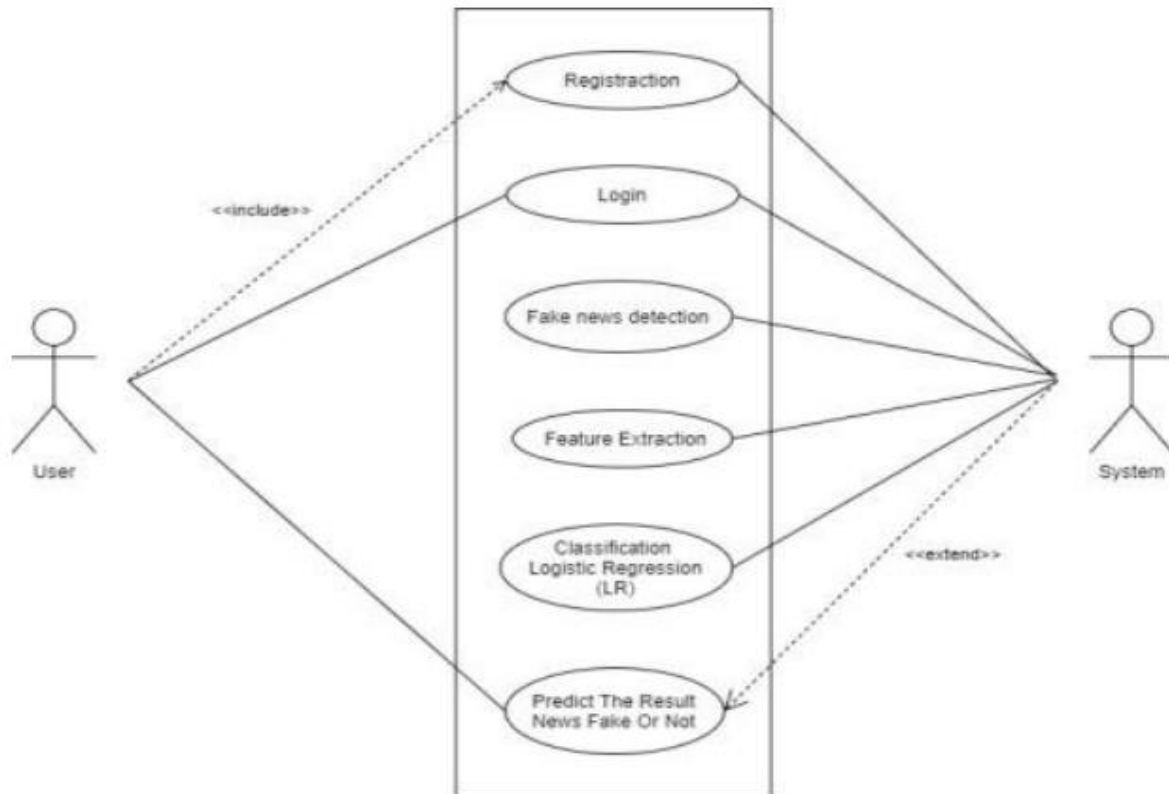
- Fake news misleads public opinion
- Difficult to manually identify misleading content
- Existing methods lack accuracy and scalability
- Need an automated, data-driven fake news detection approach

System Architecture

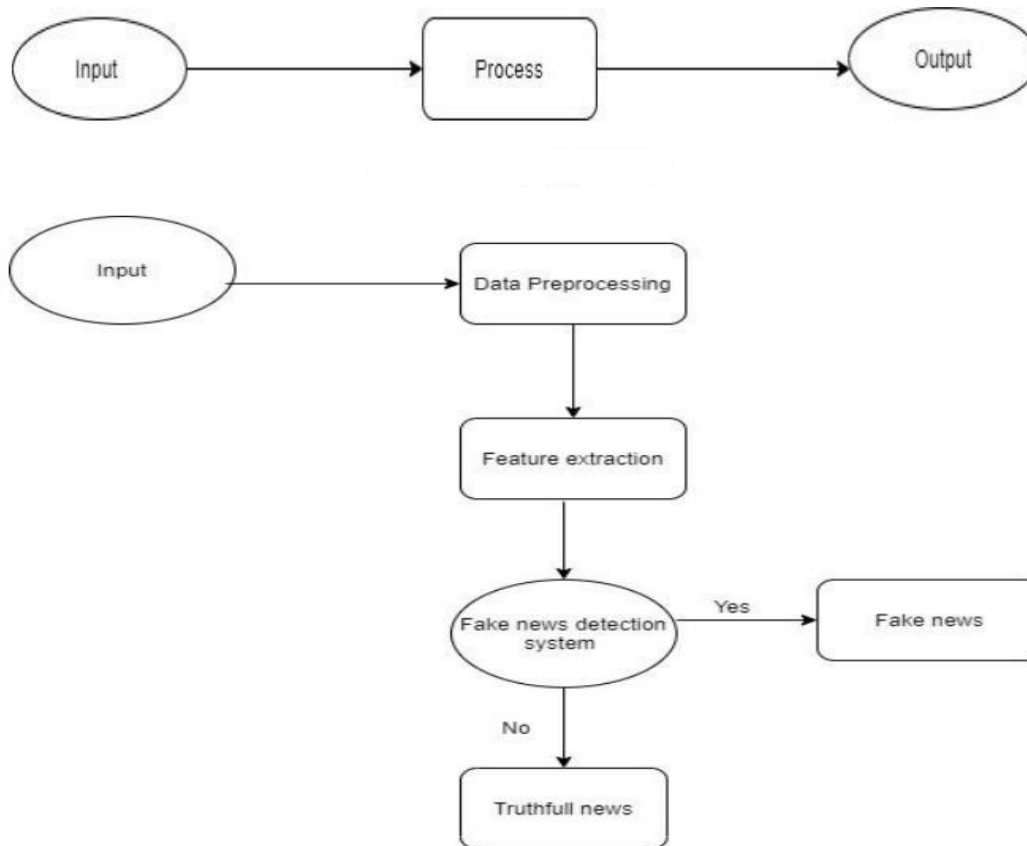
1. Data Input (News articles)
2. Text Preprocessing (cleaning, tokenizing)
3. Feature Extraction (TF-IDF/Word2Vec)
4. ML Model (SVM/Logistic Regression/LSTM)
5. Prediction Output (Fake or Real)



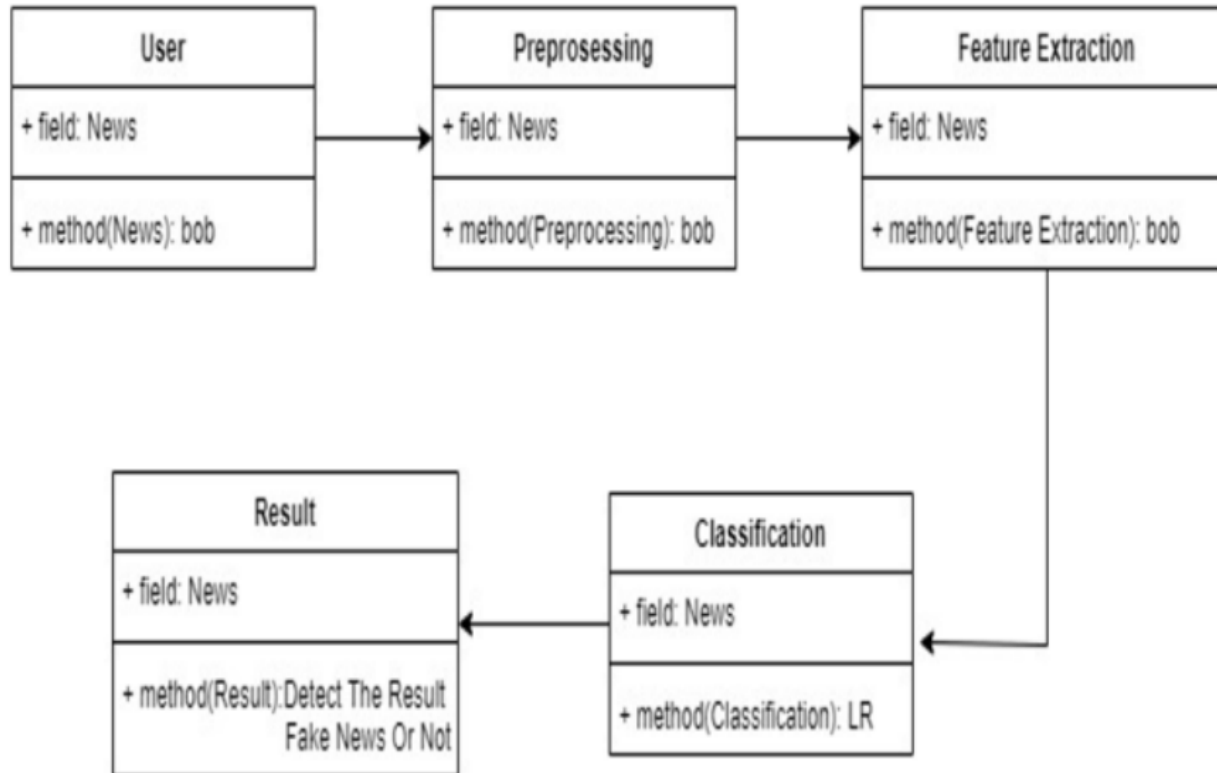
Use Case Diagram



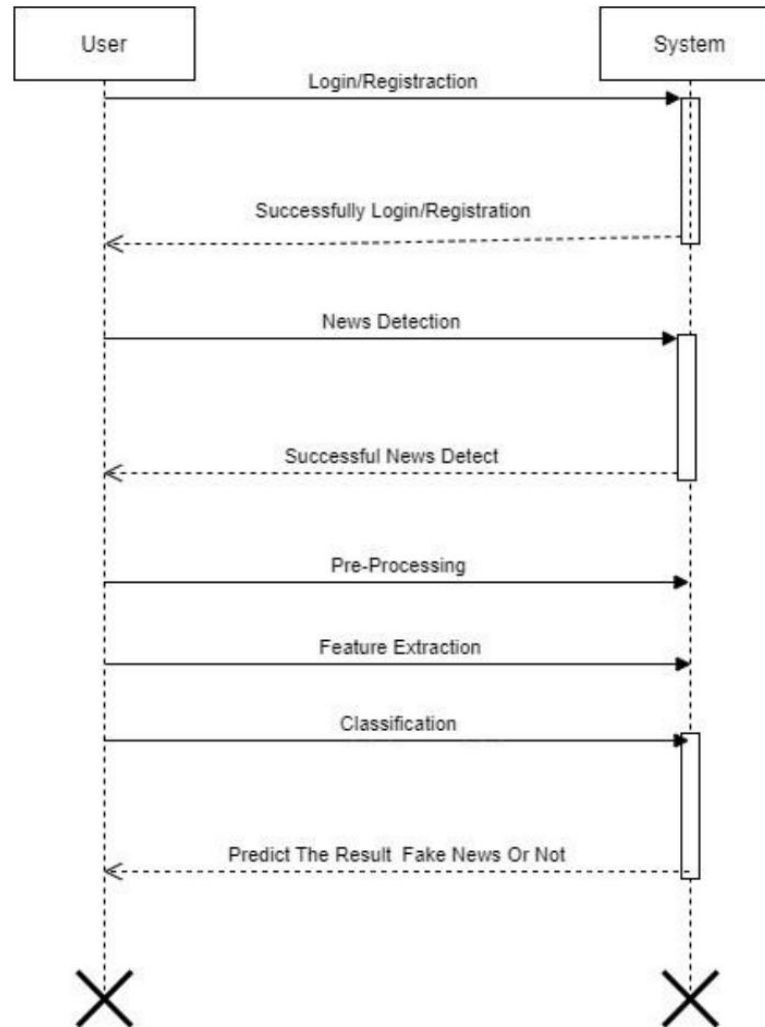
Data Flow Diagram (DFD)



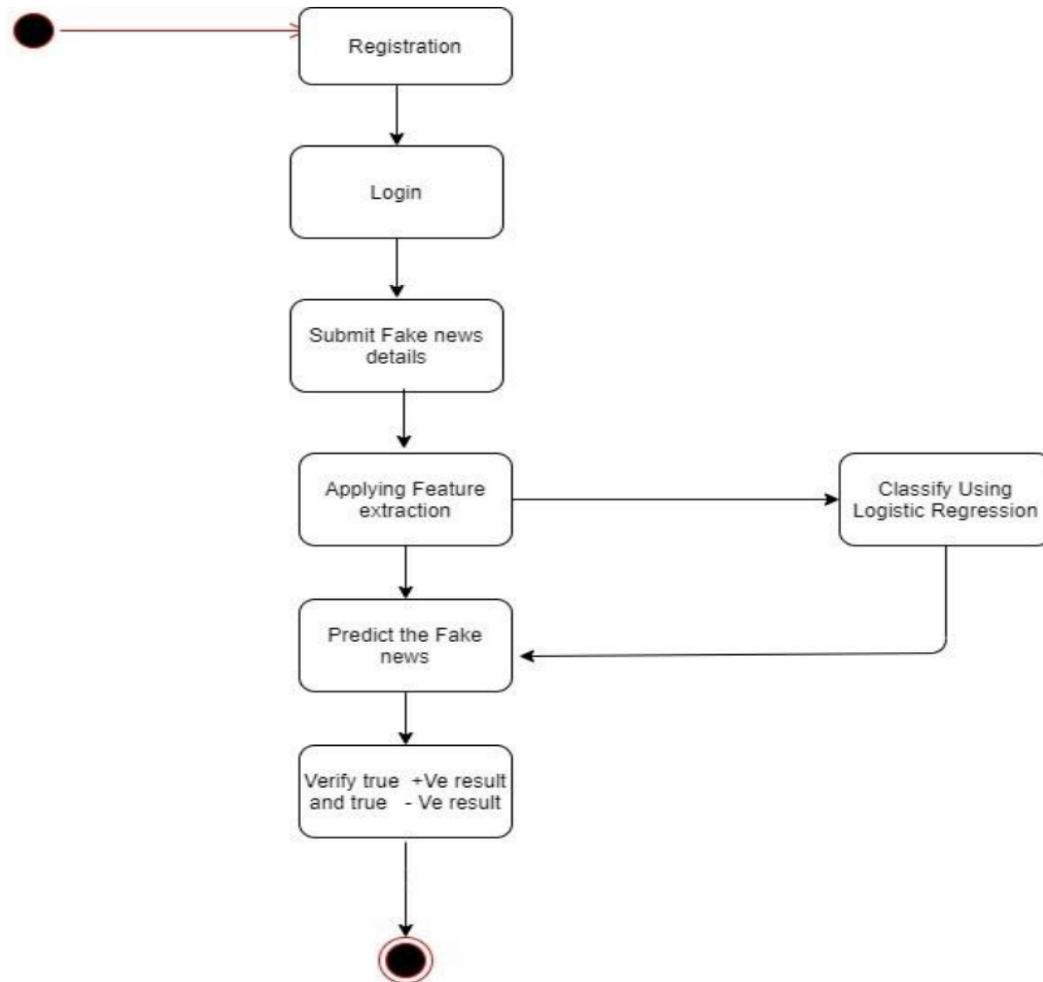
Class Diagram



Sequence Diagram



Activity Diagram



Modules

- Data Collection Module
- Preprocessing Module
- Feature Extraction Module
- Machine Learning Module
- Evaluation Module
- Interface Module

Algorithms / Methodology

- Step 1: Data Collection
- Step 2: Text Preprocessing (clean, tokenize, remove stop words)
- Step 3: Feature Extraction (TF-IDF, Word2Vec)
- Step 4: Model Training (SVM, Logistic Regression, LSTM)
- Step 5: Evaluation (Accuracy, Precision, Recall, F1-Score)

Testing

- **Unit Testing:** Module verification
- **Integration Testing:** Combined module analysis
- **System Testing:** Complete flow testing
- **Validation Testing:** Model accuracy and output validation

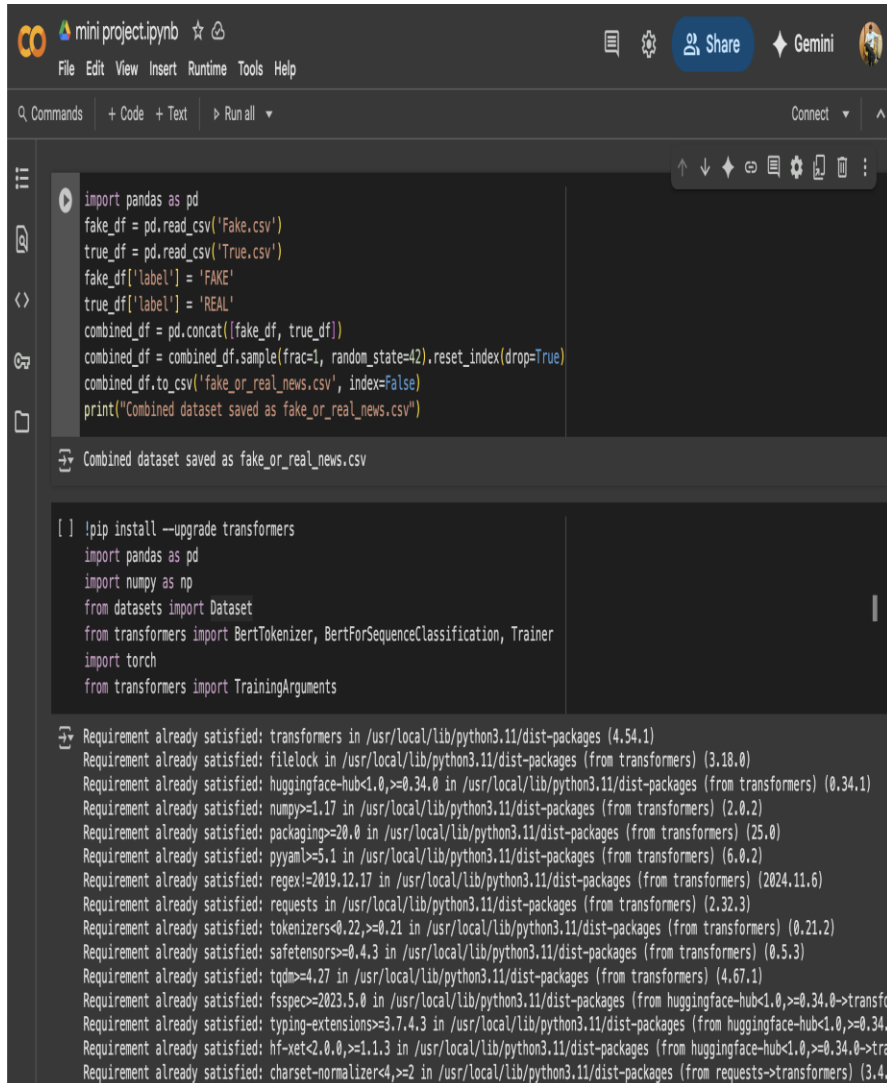
Test Cases / Validation

- **Input:** Sample news text
- **Expected Output:** Fake / Real
- **Actual Output:** Matches expected result
- **Metrics Used:** Accuracy, Precision, Recall

Performance Analysis

- Compared models: Logistic Regression, SVM, LSTM
- Evaluated metrics: Accuracy, Precision, Recall, F1-score
- LSTM achieved best accuracy
- Deep learning provides robust detection

Screenshots / Simulation



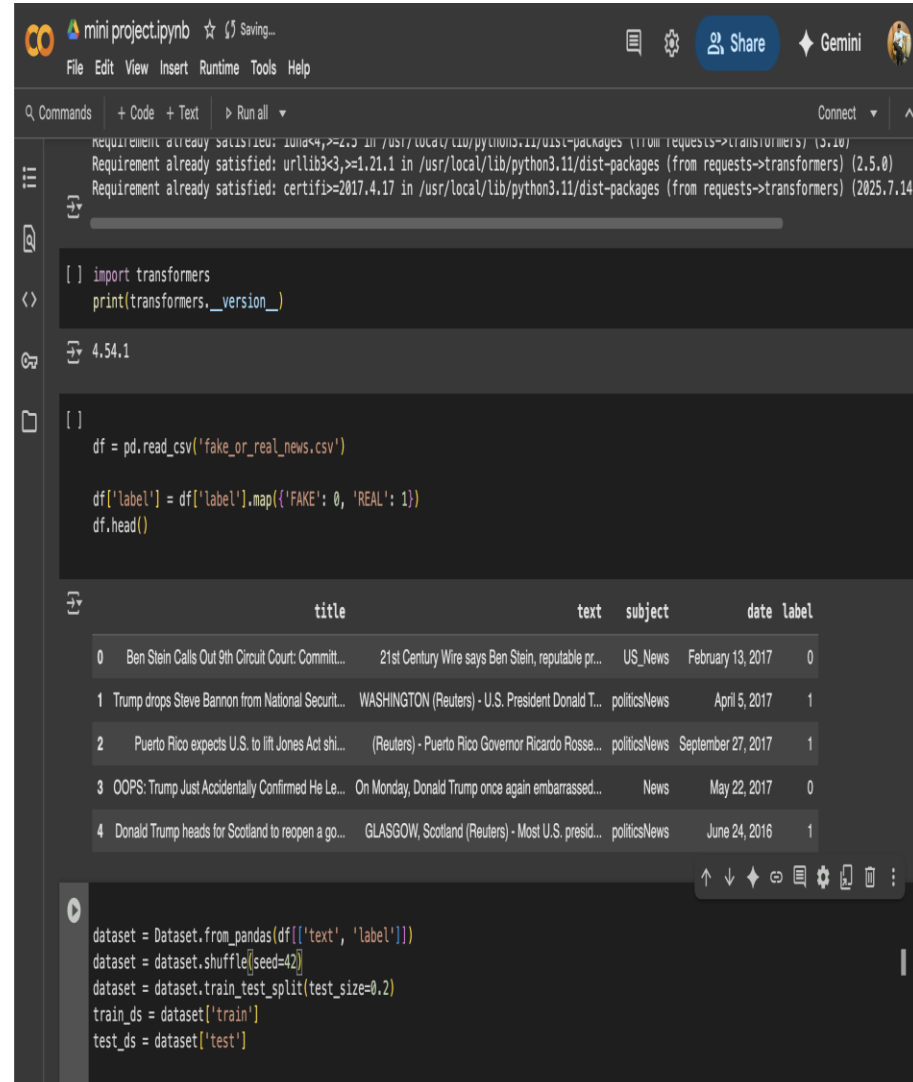
The screenshot shows a Jupyter Notebook with the following code and output:

```
import pandas as pd
fake_df = pd.read_csv('Fake.csv')
true_df = pd.read_csv('True.csv')
fake_df['label'] = 'FAKE'
true_df['label'] = 'REAL'
combined_df = pd.concat([fake_df, true_df])
combined_df = combined_df.sample(frac=1, random_state=42).reset_index(drop=True)
combined_df.to_csv('fake_or_real_news.csv', index=False)
print("Combined dataset saved as fake_or_real_news.csv")
```

Output: Combined dataset saved as fake_or_real_news.csv

```
[ ] !pip install --upgrade transformers
import pandas as pd
import numpy as np
from datasets import Dataset
from transformers import BertTokenizer, BertForSequenceClassification, Trainer
import torch
from transformers import TrainingArguments
```

Requirement already satisfied: transformers in /usr/local/lib/python3.11/dist-packages (4.54.1)
Requirement already satisfied: filelock in /usr/local/lib/python3.11/dist-packages (from transformers) (3.18.0)
Requirement already satisfied: huggingface-hub<1.0,>=0.34.0 in /usr/local/lib/python3.11/dist-packages (from transformers) (0.34.1)
Requirement already satisfied: numpy>=1.17 in /usr/local/lib/python3.11/dist-packages (from transformers) (2.0.2)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.11/dist-packages (from transformers) (25.0)
Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.11/dist-packages (from transformers) (6.0.2)
Requirement already satisfied: regex<=2019.12.17 in /usr/local/lib/python3.11/dist-packages (from transformers) (2024.11.6)
Requirement already satisfied: requests in /usr/local/lib/python3.11/dist-packages (from transformers) (2.32.3)
Requirement already satisfied: tokenizers<0.22,>=0.21 in /usr/local/lib/python3.11/dist-packages (from transformers) (0.21.2)
Requirement already satisfied: safetensors<0.4.3 in /usr/local/lib/python3.11/dist-packages (from transformers) (0.5.3)
Requirement already satisfied: tqdm>=4.27 in /usr/local/lib/python3.11/dist-packages (from transformers) (4.67.1)
Requirement already satisfied: fsspec>=2023.5.0 in /usr/local/lib/python3.11/dist-packages (from huggingface-hub<1.0,>=0.34.0->transformers) (2024.10.1)
Requirement already satisfied: typing-extensions>=3.7.4.3 in /usr/local/lib/python3.11/dist-packages (from huggingface-hub<1.0,>=0.34.0->transformers) (4.12.2)
Requirement already satisfied: hf-xet<2.0.0,>=1.1.3 in /usr/local/lib/python3.11/dist-packages (from huggingface-hub<1.0,>=0.34.0->transformers) (1.2.0)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages (from requests->transformers) (3.4.0)



The screenshot shows a Jupyter Notebook with the following code and output:

```
[ ] import transformers
print(transformers.__version__)
```

Output: 4.54.1

```
[ ] df = pd.read_csv('fake_or_real_news.csv')

df['label'] = df['label'].map({'FAKE': 0, 'REAL': 1})
df.head()
```

	title	text	subject	date	label
0	Ben Stein Calls Out 9th Circuit Court: Commit...	21st Century Wire says Ben Stein, reputable pr...	US_News	February 13, 2017	0
1	Trump drops Steve Bannon from National Secur...	WASHINGTON (Reuters) - U.S. President Donald T...	politicsNews	April 5, 2017	1
2	Puerto Rico expects U.S. to lift Jones Act shi...	(Reuters) - Puerto Rico Governor Ricardo Rosse...	politicsNews	September 27, 2017	1
3	OOPS: Trump Just Accidentally Confirmed He Le...	On Monday, Donald Trump once again embarrassed...	News	May 22, 2017	0
4	Donald Trump heads for Scotland to reopen a go...	GLASGOW, Scotland (Reuters) - Most U.S. presid...	politicsNews	June 24, 2016	1

```
[ ] dataset = Dataset.from_pandas(df[['text', 'label']])
dataset = dataset.shuffle(seed=42)
dataset = dataset.train_test_split(test_size=0.2)
train_ds = dataset['train']
test_ds = dataset['test']
```


Conclusion

- Machine learning effectively detects fake news
- Automated detection ensures real-time verification
- Helps maintain trustworthy digital communication

Future Scope

- Real-time API-based fake news monitoring
- Multilingual dataset integration
- Transformer and hybrid model improvements
- Deployment as mobile/web application

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- [1] K. Shu, A. Sliva, S. Wang, J. Tang, and H. Liu, “Fake news detection on social media: A data mining perspective,” ACM SIGKDD, 2017.
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