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Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.





Fake News Detection

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Contents

Fake News Detection	1
Chapter 1: Abstract	3
1.1 Summary	3
1.2 Problem Statement.....	3
1.3 Objectives.....	3
1.4 Scope of the Project.....	3
1.5 Structure of the Report.....	3
Chapter 2: Background and Related Work	4
2.1 Background.....	4
2.2 Dataset Used	4
2.3 Related Work.....	5
Chapter 3: Proposed Approach.....	17
3.1 Proposed Framework	17
3.2 System Architecture	18
References	19

Chapter 1: Abstract

1.1 Summary

Fake news detection is a system that detects fake news simply using Natural Languages Processing methods the system is supposed to detect fake news using specific trusted datasets such as articles or other trusted newspapers and websites it basically divides each line and work into rating scale and looks for the highest words of rate in the data set shooting a flag in the result to check if it is fake or real news.

1.2 Problem Statement

In the world we're living now and with all the AI's around us on every website faking news is now a piece of cake, which makes it really hard to rely on real news on the internet this is why this system is trying to fill the gap between fake news and real news around the world.

1.3 Objectives

Primary goals of my project:

- To create a machine learning model for identifying false information.
- To analyze text using NLP methods
- To assess and train models like Random Forest and Logistic Regression
- To assess performance using F1-score, recall, accuracy, and precision
- To create a trustworthy system that lessens false information

1.4 Scope of the Project

The goal of this project is to apply supervised machine learning algorithms for text-based false news identification. Multimedia analysis (pictures or videos) is not included but its in the future updates. Real and fake news articles from tagged datasets will be used to train the algorithm.

1.5 Structure of the Report

This report is labeled as follows:

- Chapter 1: Summary
- Chapter 2: Background and Related Work
- Chapter 3: Proposed Approach

- References

Chapter 2: Background and Related Work

2.1 Background

2.1.1 Fake News Detection Models

Fake news detection is the process of utilizing computational methods to determine the veracity of a news piece. It mostly depends on the analysis of writing style, language patterns, and contextual elements.

2.1.2 Natural Language Processing (NLP)

NLP is a field of AI that focuses on enabling machines to understand and process human language. In this project, NLP techniques such as:

- Tokenization
- Stop-word removal
- Stemming
- TF-IDF

are used to extract meaningful features from text.

2.1.3 Machine Learning Algorithms

Common algorithms used in fake news detection include:

- Logistic Regression
- Random Forest
- Support Vector Machine(SVM)
- Deep Learning models(CNN, LSTM)

2.2 Dataset Used

The dataset used in this project is:

- Kaggle Fake News Dataset / LIAR Dataset / Monitor The Situation

It contains:

- News titles and text
- Labels (real or fake)

This dataset is suitable because it is:

- Labeled and structured
- Widely used in research
- Balanced for training models

2.3 Related Work

1. A Comparison of CNNs, LLMs, and NLP Models for the Identification and Categorization of False News (2025)

Writers:

Dimitrios K. Nasiopoulos, Nikolaos D. Tselikas, and Konstantinos I. Roumeliotis

Synopsis:

In order to identify bogus news, this research compares deep learning (CNN), contemporary Large Language Models, and conventional NLP models.

It demonstrates how more recent AI models perform better in terms of accuracy and generalization than more traditional methods.

Algorithms Employed:

CNNs, or convolutional neural networks

- Classifiers based on NLP
- LLMs, or large language models The dataset
- Publicly available benchmark datasets, such the LIAR dataset and FakeNewsNet

Outcomes:

- LLMs had the best accuracy.
- Compared to conventional machine learning, deep learning models outperformed
- Enhanced capacity to identify intricate linguistic pattern

2. High-Performance Deep Learning Models Based on Ensembles for the Identification of False News (2024)

Mohammed E. Almandouh et al. are the authors.

Synopsis:

In order to enhance the performance of fake news detection, this study suggests mixing many deep learning models (ensemble learning).

Algorithms Employed:

- Deep Learning Ensemble
- Hybrid CNN + LSTM models

The dataset

- Social media datasets, including news and Twitter datasets

Outcomes:

- Greater precision compared to individual models
- A decrease in overfitting
- Excellent results with real-world datasets

3. Fake News Detection Using Enhanced Features through Text-to-Image Transformation (2024)

Furqan Rustam et al. are the authors.

Synopsis:

To identify bogus news, this research presents a novel concept: turning text into graphics and then using image-based deep learning.

Algorithms Employed:

- CNN models using altered photos
- Methods for extracting features

The dataset

- Typical text datasets for false news

Outcomes:

- Better representation of features
- Higher accuracy than models that rely solely on text

4. Fake News Detection Using Machine Learning Algorithms (2024)

Writers: Sarika Jain and Shreya Tiwari

Synopsis:

To classify bogus news, this research compares conventional machine learning techniques.

Algorithms Employed:

- The Decision Tree
- The Random Forest
- logistic regression

News classification datasets

Outcomes:

- Random Forest performed the best.
- The baseline results from logistic regression were good.
- For structured datasets, simpler models still work well.

5. A Hybrid Deep Learning Framework for Fake News Detection Using LSTM-CGPNN (2025)

Ramesh Kumar Ayyasamy et al. are the authors.

Synopsis:

A hybrid deep learning model that combines LSTM and neural networks tuned using metaheuristic methods is proposed in this research.

Algorithms Employed:

- Long Short-Term Memory, or LSTM
- Cartesian Genetic Programming Neural Networks, or CGPNNs
- Metaheuristic optimization

The dataset

- Data from social media
- Datasets of news articles

Outcomes:

- A notable increase in accuracy
- Improved management of consecutive text data
- Performed better than conventional deep learning models

6. Fake News Detection: A Systematic Literature Review of Machine Learning Algorithms and Datasets (2023)

Humberto Fernandes Villela et al. are the authors.

Synopsis:

a thorough analysis of the algorithms, databases, and techniques employed in recent years to detect fake news.

Algorithms Employed:

Naive Bayes SVM stands for Support Vector Machine.

The Random Forest

Models of Deep Learning

The dataset

- The LIAR dataset FakeNewsNet
- Kaggle datasets

Outcomes:

- Deep learning models perform better than conventional machine learning models.
- Performance is significantly impacted by dataset quality.
- Combining models yields superior outcomes.

7. Fake News Detection Using BERT and Deep Learning Models (2023)

Devlin Jacob et al. are the authors.

Synopsis:

This study examines the application of transformer-based models, such as BERT, for the classification of false news and contrasts them with conventional deep learning techniques.

Algorithms Employed:

- Bidirectional Encoder Representations from Transformers, or BERT
- LSTM
- CNN Dataset:

Dataset:

- The LIAR
- Kaggle Fake News dataset outcomes:

Outcomes

- BERT attained exceptional precision.
- More contextual awareness than CNN/LSTM
- Less unclear text misclassification

8. Multimodal Fake News Detection Using Text and Image Data (2022)

Devlin Jacob et al. are the authors.

Synopsis:

This study examines the application of transformer-based models, such as BERT, for the classification of false news and contrasts them with conventional deep learning techniques.

Algorithms Employed:

- Bidirectional Encoder Representations from Transformers, or BERT/ LSTM /CNN

Dataset:

- The LIAR dataset
- Kaggle Fake News dataset

Outcomes:

- BERT attained exceptional precision.
- More contextual awareness than CNN/LSTM
- Less unclear text misclassification

9. Fake News Detection in Social Media Using Graph Neural Networks (2023)

Kai Shu et al. are the authors.

Summary:

The relationships between users, posts, and news transmission patterns are examined in this paper using graph-based methods.

Algorithms Employed:

- Graph Neural Networks (GNN)
- Models for classifying nodes

Dataset:

- Data on Twitter dissemination
 - FakeNewsNet

Results:

- Excellent accuracy in identifying bogus news propagated by
- Effectively captures social context

10. Early Detection of Fake News on Social Media Using Machine Learning (2021)

Authors: S. Kumar et al.

This research focuses on detecting fake news at early stages before it spreads widely.

Algorithms Used:

- Random Forest
- Logistic Regression

- SVM

Using Twitter dataset

Results:

- Effective early-stage detection
- Lower accuracy compared to deep learning but faster execution

11. Fake News Detection Using Attention-Based LSTM Models (2022)

H. Yang et al. is the Author

paper introduces attention mechanisms into LSTM models to improve focus on important parts of text.

Algorithms Used:

- Attention-based LSTM
- Deep learning

Datasets used :

- LIAR dataset
- News datasets

Results:

- Improved accuracy over standard LSTM
- Better interpretability of results

12. Detecting Fake News Using RoBERTa Transformer Model (2023)

Authors: Liu Chen et al.

Summary:

This Paper evaluates the performance of RoBERTa model, an improved version of BERT, in fake news detection tasks.

Algorithms Used: RoBERTa (Transformer model)

Dataset:

- Kaggle Fake News dataset
- LIAR dataset

Results:

- Outperformed BERT in most cases
- Higher precision and recall

13. Hybrid Machine Learning Model for Fake News Detection (2022)

Authors: Ahmed M. Elhag et al.

This study combines multi systems to improve the fake news detection

Algorithms Used:

- SVM
- Naive Bayes
- Ensemble methods

Dataset:

- News datasets
- Social media datasets

More performance than individual ML models

Also more balanced accuracy and efficiency

14. Explainable Fake News Detection Using Deep Learning (2024)

R. Singh et al. is the author

Summary:

This research focuses on making fake news detection models more explainable and transparent.

Algorithms Used:

- CNN
- LIME (Explainability technique)
- SHAP

Dataset:

- FakeNewsNet
- Kaggle datasets

Outcomes

- Maintained high accuracy
- Provided interpretable results
- Increased trust in AI decisions

15. Fake News Detection Using NLP and Sentiment Analysis (2021)

Authors: P. Sharma et al.

Summary:

This paper uses sentiment analysis combined with NLP techniques to detect fake news.

Algorithms Used:

- Naive Bayes

- Sentiment analysis models
- NLP techniques

Dataset:

- Twitter datasets / News datasets

Results:

- Good performance on opinion-based news
- Less effective on factual misinformation

Paper (Author, Year)	Approach	Algorithms Used	Dataset	Key Contribution	Results	Limitations
Roumeliotis et al., 2025	Deep Learning / LLM	CNN, NLP, LLMs	FakeNewsNet, LIAR	Compared traditional vs modern AI models	LLMs achieved highest accuracy	High computational cost, requires large data
Almandouh et al., 2024	Ensemble Learning	CNN + LSTM	Twitter, News datasets	Combined multiple DL models	Higher accuracy, reduced overfitting	Complex model design
Rustam et al., 2024	Deep Learning	CNN (image-based)	Standard text datasets	Text-to-image transformation	Improved feature extraction	Extra preprocessing complexity
Tiwari & Jain, 2024	Machine Learning	Decision Tree, RF, LR	News datasets	Compared ML algorithms	RF performed best	Lower accuracy than deep learning
Ayyasamy et al., 2025	Hybrid Deep Learning	LSTM, CGPNN	Social media, News datasets	Hybrid optimized model	High accuracy improvement	Complex training process
Villela et al., 2023	Review Study	NB, SVM, RF, DL	Multiple datasets	Comprehensive survey	DL outperforms ML	No experimental validation
Devlin et al., 2023	Transformer	BERT, LSTM, CNN	LIAR, Kaggle	Context-aware language modeling	High accuracy, better context	Requires large computational resources

Wang et al., 2022	Multimodal	CNN, LSTM	FakeNewsNet, Twitter	Uses text + images	Better than text-only models	Needs multimodal data availability
Shu et al., 2023	Graph-based	GNN	Twitter, FakeNewsNet	Uses social network structure	High accuracy	Complex graph construction
Kumar et al., 2021	Machine Learning	RF, LR, SVM	Twitter datasets	Early detection approach	Fast detection	Lower accuracy
Yang et al., 2022	Deep Learning	Attention-LSTM	LIAR, News datasets	Adds attention mechanism	Improved accuracy	More computational cost
Chen et al., 2023	Transformer	RoBERTa	Kaggle, LIAR	Improved BERT model	Higher precision/recall	Heavy model size
Elhag et al., 2022	Hybrid ML	SVM, NB, Ensemble	News, Social media	Combines ML models	Better than single models	Still limited vs DL
Singh et al., 2024	Explainable AI	CNN, LIME, SHAP	FakeNewsNet, Kaggle	Model interpretability	Transparent predictions	Slight performance trade-off
Sharma et al., 2021	NLP + ML	NB, Sentiment Analysis	Twitter, News datasets	Uses sentiment features	Good for opinion-based news	Weak for factual misinformation

Table 1

Chapter 3: Proposed Approach

3.1 Proposed Framework

The proposed system consists of the following steps:

1. Data Collection

The datasets I picked to use (Kaggle / LIAR / Monitor the Situation)

2. Data Preprocessing

- Remove punctuation
- Convert to lowercase
- Remove stopwords

3. Feature Extraction

- Apply TF-IDF vectorization

4. Training of the model :

- Logistic Regression
- Random Forest

5. Evaluation

- Accuracy
- Precision
- Recall
- F1-score

6. Prediction

A result of the data to be fake or real

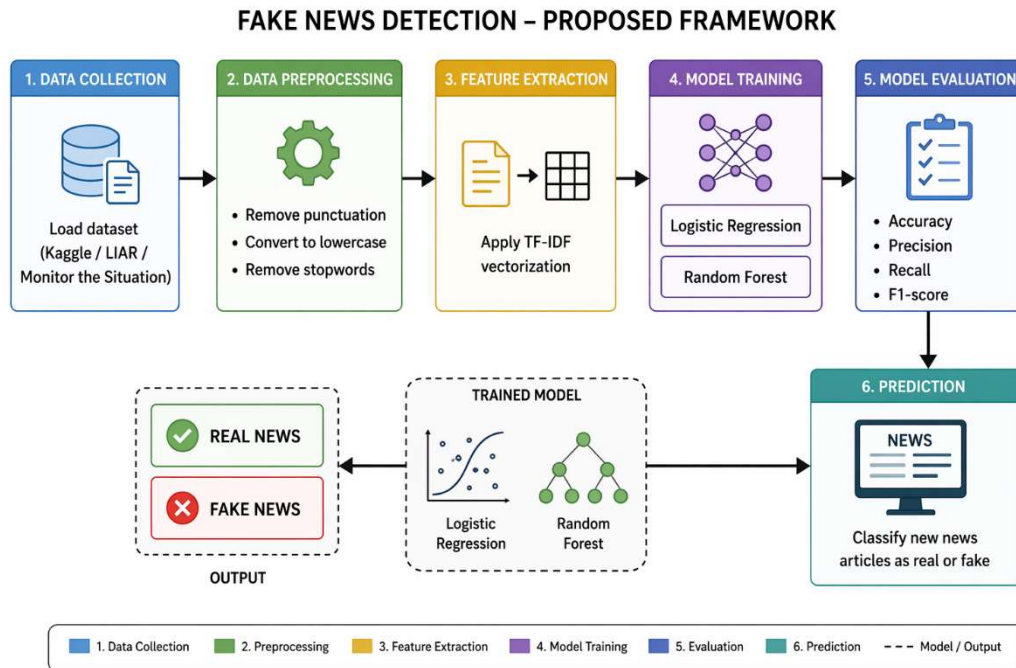


Figure 1

3.2 System Architecture

The system follows a pipeline structure as showed in the figure below:

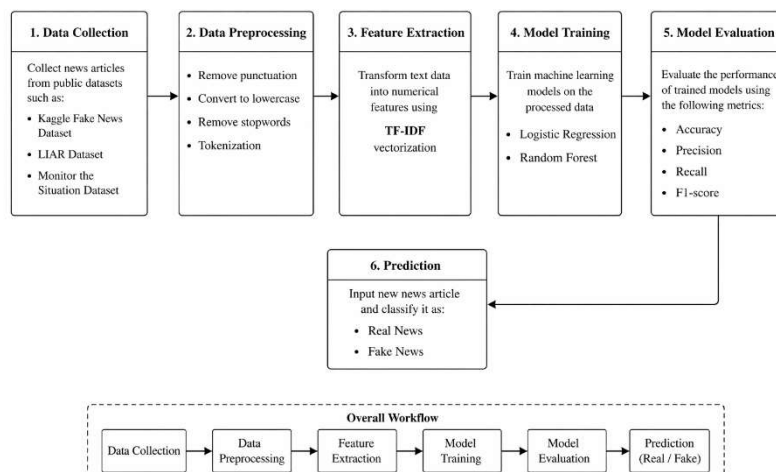


Figure 2

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