

Project Title



Fake News Detection Using Machine Learning



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Business Understanding

Problem: Fake news spreads faster than fact-checking can keep up.
Damages public trust and impacts politics, health, and society.

Objectives:

- Build an ML model to classify news as FAKE or TRUE.
- Analyze linguistic patterns distinguishing misinformation.
- Deliver interpretable and reliable results for awareness & moderation.

Stakeholders & Ethical Considerations

Stakeholders:

- Public → Access to credible information
- Media → Support fact-checking
- Policymakers → Counter misinformation
- Tech platforms → Reduce moderation burden



Ethics:

- Dataset bias & labeling ambiguity
- Contextual relevance (time, source)
- Avoid misuse --- model supports awareness, not censorship



Data Understanding



Dataset: Fake.csv (23,481) + True.csv (21,417) = 44,898 articles

Balance: ~52% FAKE vs ~48% TRUE

Columns: title, text, subject, date, label

Word Clouds:

Fake News: emotional, social-media tone

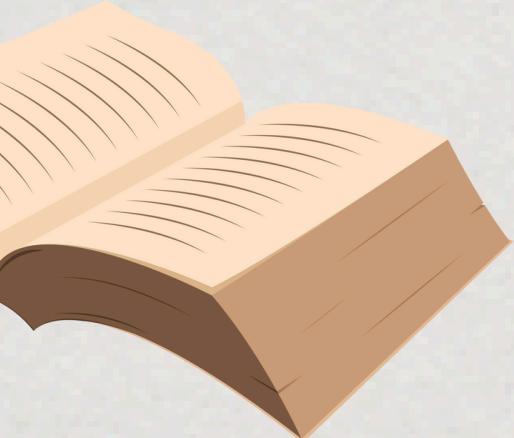
True News: factual, time-bound, institutional language

- Dataset is balanced, clean, and ideal for classification



Data Preparation

- Lowercasing, URL & HTML removal
- Non-alphabetic cleanup
- Stopword removal + Lemmatization
- Created new column: `combined_text = title_clean + text_clean`
- Text length: median ~215 words → suitable for NLP models
- Stratified Train/Val/Test split (80/10/10)



Modeling Pipeline

Model	Input	Key Features	Tools
Logistic Regression	TF-IDF	Baseline + GridSearchCV tuning	scikit-learn
LSTM	Tokenized sequences	Deep learning sequential patterns	TensorFlow/Keras
BERT	Contextual embeddings	Transformer fine-tuning	Hugging Face

Results Summary

Model	Variant	Accuracy	F1	Recall
LogReg	Text Only	0.98701	0.9872	0.9971
LogReg (Tuned)	Combined	0.9922	0.99	0.9997
LSTM	Text Only	0.9981	0.99847	0.9986
LSTM	Combined	0.9981	0.9981	0.9981
BERT	Text Only	0.998416	0.998416	0.998416
BERT	Combined	0.999095	0.999095	0.999095

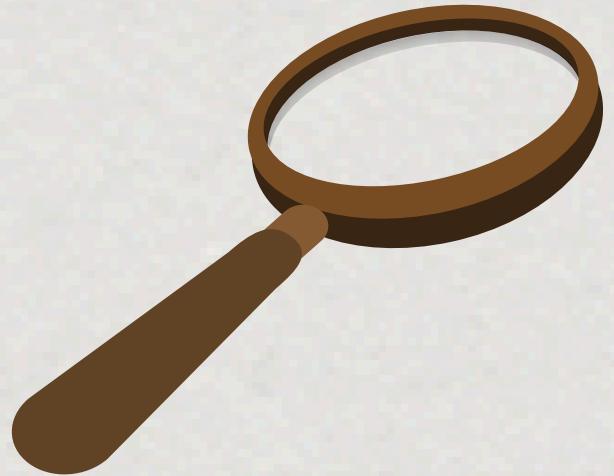
Insights

All our models achieve high performance on the classification task, here are the nuances to the models:

- Logistic Regression: Fast, Simple and inexpensive to train and deploy
- LSTM offers near-perfect accuracy while remaining efficient and easier to train & deploy than BERT.
It understands text flow well and delivers the best balance of performance and cost
- BERT achieves the highest accuracy and captures subtle language nuances
This makes it perfect for high-stakes fact-checking or deep misinformation analysis.
However, it is the slowest and most resource-intensive model.



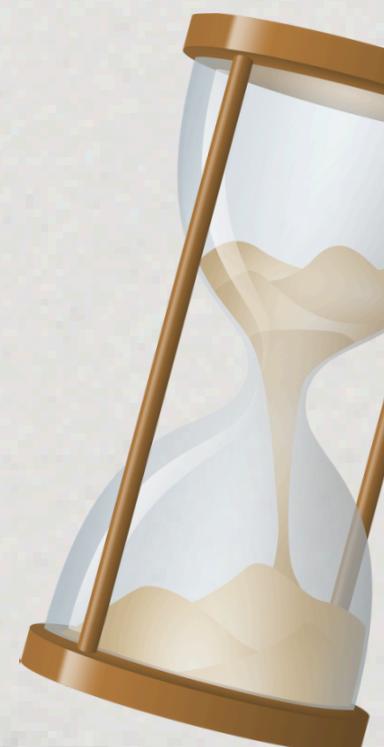
Conclusion & Recommendations



- Machine learning models can effectively identify fake news.
- Even simple TF-IDF + Logistic Regression is highly accurate.
- BERT fine-tuning offers state-of-the-art performance.

Next Steps:

- Expand dataset with diverse sources
- Add explainable AI (feature interpretation)
- Integrate model into web app or moderation API





Thank You

ANY QUESTIONS?