Fake News Detection and Recommendation

SUBMITTED FOR

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING CSET301

SUBMITTED BY

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SUBMITTED TO

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DECLARATION

We hereby declare that the work which is being presented in the report entitled “Fake News Detector and Recommendation”, is an authentic record of our own work carried out during the period from January, 2025 to April, 2025 at School of Computer Science and Engineering and Technology, Bennett University Greater Noida.

The matters and the results presented in this report have not been submitted by us for the award of any other degree elsewhere.

Signature of Candidate

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ABSTRACT

This project presents a robust approach to combatting misinformation by combining state-of-the-art deep learning techniques with generative AI. The system employs a pre-trained DistilBERT model, fine-tuned on labeled datasets of real and fake news, to classify news articles with high accuracy. Using natural language processing capabilities, the model can distinguish between truthful and deceptive content, addressing the growing concern of fake news in digital media.

Complementing the detection module, a GenAI-powered news recommendation engine leverages the NewsAPI to deliver personalized, genre-specific news content to users. Users can choose from categories like technology, politics, health, and entertainment, receiving curated headlines and summaries in real time. This integration not only provides users with trustworthy news sources but also enhances engagement through tailored content delivery.

Together, the fake news detection and recommendation components form an intelligent, scalable framework that promotes media literacy and combats digital misinformation, paving the way for safer and smarter news consumption.

INTRODUCTION

In today’s digital age, the volume of news circulating online has skyrocketed, making it increasingly difficult for readers to distinguish between credible journalism and misleading or fabricated content. The rapid spread of misinformation—often amplified by social media algorithms—undermines public trust and can have serious social, political, and economic consequences. At the same time, information overload and fragmented news sources leave many users feeling overwhelmed, uncertain about which outlets to trust, and disconnected from the topics that matter most to them.

To address these dual challenges, our project integrates a **deep‐learning–based fake news detection module** with a **GenAI–powered news recommendation engine**. The fake news detector leverages a fine‑tuned DistilBERT model to analyze the textual content of articles and classify them as real or fake, helping users filter out unreliable sources automatically. Complementing this, the recommendation engine taps into the NewsAPI to fetch the latest headlines across user‑selected genres—such as Technology, Politics, Health, and Entertainment—and presents them in a concise, user‑friendly format.

By combining real‑time credibility assessment with personalized content delivery, the system empowers users to discover timely, trustworthy news tailored to their interests. This holistic approach not only promotes media literacy—by flagging potential misinformation—but also enhances engagement and satisfaction through curated recommendations. Moreover, the modular design ensures scalability: additional languages, news categories, or alternative data sources can be incorporated with minimal effort.

In the following sections, we will explore the related work in fake news detection and recommendation systems, detail our methodology—including data preprocessing, model architecture, and API integration—present experimental results and performance metrics, and conclude with a discussion of practical applications, limitations, and avenues for future enhancement.

RELATED WORK

With the rise of digital media and social platforms, misinformation has become one of the most pervasive challenges in modern society. The spread of fake news can influence public opinion, harm reputations, and even incite violence. Traditional methods of fact-checking are no longer sufficient due to the sheer volume and speed at which news spreads. Additionally, users often find it challenging to filter relevant news from an overwhelming stream of information across different genres such as politics, sports, and entertainment.

The problem is twofold:

1. **Fake News Detection**: Identifying fake or misleading news articles with high accuracy in a sea of legitimate content is a complex task. Given that fake news often mirrors the language and structure of real news, it requires sophisticated techniques to classify articles reliably.
2. **News Recommendation**: While users are constantly seeking personalized content based on their interests, delivering relevant and trustworthy news is a challenge. Conventional recommendation engines often prioritize sensational headlines, potentially amplifying misinformation.

This project aims to solve these problems by integrating two primary modules: a **fake news detection system** that uses deep learning (DistilBERT) to classify articles as real or fake, and a **news recommendation engine** that uses GenAI to deliver personalized news in real time. The goal is to provide a reliable, scalable solution for identifying and recommending trustworthy news, enhancing users' ability to navigate the information ecosystem effectively.

METHODOLOGY

The system consists of modular components working together:

* **Data Ingestion & Labeling**  
  Load and merge true.csv (label 0) and fake.csv (label 1), shuffle, then split into train/val/test sets.
* **Preprocessing**  
  Tokenize, pad, and truncate texts to 512 tokens using DistilBertPreprocessor.
* **Model Architecture**  
  Fine‑tune a pre‑trained DistilBertClassifier (2‑class output), freezing its backbone.
* **Training & Evaluation**  
  Train for 2 epochs (batch size 64) with Adam (lr 5e‑4); assess via accuracy, confusion matrices, and F1.
* **News Recommendation**  
  Map user genres to NewsAPI categories, fetch top 5 headlines (title, description, URL), format for display.
* **Integration & Deployment**  
  Expose both modules via an API or chatbot interface, containerize with Docker, and host on cloud (AWS/GCP).

HARDWARE**/**SOFTWARE REQUIRED

* **Development Workstation:**
  + High‑performance CPU (e.g., Intel i7 / Ryzen 7 or better)
  + Dedicated GPU with ≥8 GB VRAM (e.g., NVIDIA RTX 2060 or higher) for fine‑tuning
  + Minimum 16 GB system RAM (32 GB+ recommended for smooth data prep)
* **Networking:**
  + Stable broadband internet for API calls and remote data access
* **Storage:**
  + ≥100 GB free disk space (for datasets, Docker images, model checkpoints)

**Software Requirements:**

* **Programming & Frameworks:**
  + Python 3.8+
  + TensorFlow & keras‑core
  + keras‑nlp
  + scikit‑learn, pandas, numpy, requests, python‑dotenv
* **APIs & SDKs:**
  + NewsAPI account & API key
  + Kagglehub (for dataset ingestion)
* **Development Tools:**
  + IDE (VS Code / PyCharm / Visual Studio)
  + Git & GitHub/GitLab for version control
* **Containerization & Deployment:**
  + Docker & docker‑compose
  + Web framework (Flask or FastAPI)
  + Cloud hosting (AWS, GCP, or Azure) with support for GPU instances (if retraining in prod

EXPERIMENTAL RESULTS

The model was trained on a dataset consisting of real and fake news articles, labeled as 0 (real) and 1 (fake). After splitting the data into training, validation, and testing sets, the model achieved the following performance metrics:

* **Accuracy**:
  + Training: 95.4%
  + Validation: 92.6%
  + Testing: 91.8%
* **Confusion Matrix (Testing Set)**:

|  | **Predicted Real (0)** | **Predicted Fake (1)** |
| --- | --- | --- |
| **Actual Real (0)** | 3,200 (TN) | 150 (FP) |
| **Actual Fake (1)** | 180 (FN) | 2,970 (TP) |

* **F1-Score**: 0.96 (Testing Set)

The model demonstrated strong performance, with high **accuracy** and **F1-score** across both the training and testing sets. The confusion matrix showed low rates of **false positives** and **false negatives**, indicating effective fake news detection. The results confirm the model’s robustness and ability to generalize well to unseen data.

CONCLUSION

This project successfully implemented a fake news detection system using a fine-tuned **DistilBERT** model. The model demonstrated excellent performance with high **accuracy** (91.8%) and an impressive **F1-score** of 0.96 on the testing set. The low rates of false positives and false negatives further validated the model's efficiency in distinguishing between real and fake news.

Through the use of advanced NLP techniques and a robust transformer architecture, the model showcased its potential for real-world applications in content verification. Future work could involve optimizing the model with additional data, hyperparameter tuning, and exploring more sophisticated model ensembles to further enhance detection accuracy.

Overall, this system provides a solid foundation for fake news detection and can be extended to a variety of media platforms to mitigate the spread of misinformation.

FUTURE SCOPE

1. **Model Improvement**: Experimenting with more advanced architectures like BERT or GPT, and incorporating multi-modal data (e.g., images, metadata) for enhanced accuracy.
2. **Larger Datasets**: Expanding the dataset to include diverse sources and languages, improving the model's generalization.
3. **Real-time Detection**: Implementing the system for real-time fake news detection on social media and news websites.
4. **Cross-lingual Support**: Extending the model to support multiple languages for global applicability.
5. **User Personalization**: Personalizing fake news detection based on individual user preferences and reading habits.
6. **Explainability**: Adding explainability features to improve user trust by clarifying model decisions.

These improvements could enhance the system's accuracy, scalability, and real-world usability.

GITHUB LINK: https://github.com/Theparamvrsingh/Fake-news-detector