

AI-Enabled Fake News Detection using BERT Language Model and Light GBM Classifier

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Abstract— The project “AI-Enabled Fake News Detection Using BERT Language Model and LightGBM Classifier” is an intelligent Android application developed to identify and classify fake news articles accurately. The system uses the BERT language model for understanding the contextual meaning of news content and a LightGBM classifier for efficient prediction of whether the news is real or false. Users can enter a news article URL, and the application extracts and analyzes the article content through WebView integration. To improve reliability, the system also uses Generative AI verification by comparing the content with trusted online news sources. The application is developed using Java/XML, Firebase Realtime Database, and Firebase Generative AI, and also includes an AI chatbot assistant and related video suggestions for better user interaction and awareness. This project provides an effective and intelligent solution to decrease the Spreading of disinformation and false news.

Keywords — Fake News Identification, BERT, LightGBM, Natural Language Processing , ML, Generative AI, Android Application

1. INTRODUCTION

In the digital world of today, online news platforms and social media have become the major sources of information for people all around the globe. While these platforms provide quick and easy access to news, they have also increased the proliferation of fake News reports and misinformation. Bogus news is information that is false and misleading specified as genuine news, which can create confusion, affect public opinion and create social, political and economic problems. Due to the rapid sharing of information through the internet, identifying authentic news has become a major challenge. Traditional fake news detection methods mainly depend on manual verification and basic machine learning techniques, which are often time-consuming and less effective in understanding the actual context of the news content. With the development of artificial intelligence, NLP, and DL, more intelligent systems can now be developed to automatically analyse and verify news articles with better

accuracy. The project “AI-Enabled Fake News Detection Using BERT Language Model and Light GBM Classifier” is developed to provide an efficient and user-friendly

solution for detecting fake news articles. The application is designed as an Android-based system using Java/XML and integrated with Firebase services for real-time data handling and AI support. In this system, users can enter a news object URL, and the appⁿ extracts the article content using WebView technology for further analysis.

2. SYSTEM ARCHITECTURE

The architecture of the suggested a system is based on the Artificial Intelligence and NLP techniques to detect fake news from online products. The system extracts and pre-processes the news content and then classifies it using BERT and LightGBM models.

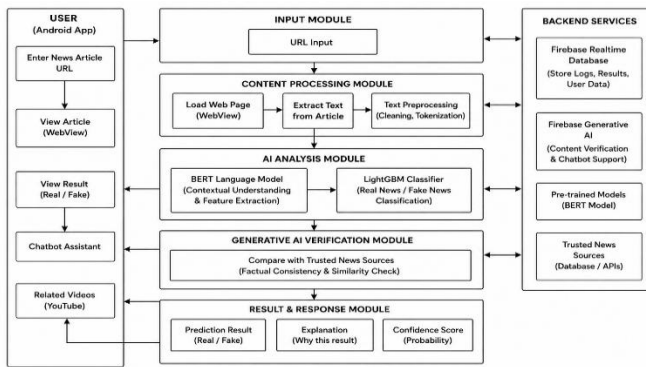


Fig 2.1 System Architecture

a. Architectural Layers

The five layers are described in Table I.

Layer	Description	Technology
User Interface Layer	Allows users to enter news article URLs, view analysis results, chatbot responses, and related videos through the Android application.	Java, XML, Android Studio
Data Extraction Layer	Loads web pages and extracts textual content from news articles for processing and analysis.	WebView, HTML Parsing
Preprocessing Layer	Cleans and preprocesses extracted text using tokenization and text normalization techniques.	Python, NLP Techniques
AI Analysis Layer	Uses BERT for contextual understanding and LightGBM for fake news classification.	BERT, LightGBM, TensorFlow/PyTorch

Verification Layer	Verifies article content with trusted news sources using Generative AI techniques.	Firebase Generative AI, APIs
Database Layer	Stores user data, analysis history, and prediction results securely in real time.	Firebase Realtime Database
Response & Support Layer	Displays prediction results, confidence scores, chatbot explanations, and related YouTube videos.	Firebase AI, YouTube API

Table I. System Architecture Layers

b. Data Flow

The system is started when the user enters the URL of the news article in the Android application. The application loads the webpage using WebView and extracts the textual content from the article. The extracted data is cleaned and pre-processed using Natural Language Processing techniques like tokenization, stop-word removal and normalization.

The modified manuscript is then forwarded to the AI analysis module, where the BERT language model performs contextual understanding and semantic analysis of the article. The collected features are passed to the Light GBM classifier, which predicts if the news is Real or Fake. To improve reliability, the application uses Generative AI verification by comparing the analysed content with trusted online news sources. The final prediction result, confidence score, chatbot explanation, and related videos are then displayed to the user through the Android interface.

AI Models and Feature Engineering

A. Model Inventory

The system uses hybrid AI model architecture and combines transformer-based DL and ML algorithms for accurate fake news detection.

Model ID	Type	Prediction Target	Purpose
FND-M01	BERT Model	Contextual Text Analysis	Understands semantic meaning and linguistic structure
FND-M02	LightGBM Classifier	Fake/Real Classification	Predicts authenticity of news articles
FND-M03	Generative AI Verification	Fact Consistency Checking	Compares news with trusted online sources
FND-M04	Chatbot Assistant	User Interaction	Explains prediction results and answers user queries

Table II. AI Model Inventory

B. Feature Engineering

The feature engineering process extracts meaningful textual patterns and semantic information from news articles to improve prediction accuracy.

Textual Features

- Tokenized words and sentence structures
- Contextual embeddings generated by BERT
- Keyword frequency and sentence importance
- Linguistic and semantic relationships

Content-Based Features

- News headline consistency
- Similarity with verified news sources
- Sentiment and writing style analysis
- Detection of misleading or sensational content

User Interaction Features

- User query history
- Frequently analysed topics
- Chatbot interaction logs

C. Fake News Classification Schema

Each analysed news article is classified using a structured prediction schema containing:

- Article URL
- Extracted news content
- Prediction result (Real News / Fake News)
- Confidence score
- Verified source similarity score
- Timestamp of analysis
- Chatbot explanation

Verification and Security Controls

The system implements multiple verification and security mechanisms to improve prediction reliability and reduce false classifications.

A. Content Verification Checks

- Comparison with trusted online news sources
- Detection of manipulated or misleading content
- Semantic consistency validation using Generative AI

Parameter	Default Value	Purpose
Minimum Confidence Threshold	0.7	Ensures reliable prediction output
Source Similarity Threshold	75%	Verifies consistency with trusted news
AI Verification Timeout	10 seconds	Limits response delay
Maximum Article Length	5000 words	Optimizes processing performance
Chatbot Response Delay	2 seconds	Improves user interaction speed

Table III. Reliability Parameters

API and Integration Layer

The application integrates Firebase services, web technologies, and external APIs for real-time analysis and intelligent interaction.

A. Firebase Authentication

Firebase Authentication is used to securely manage user access and application sessions. It allows users to safely access the fake news detection system while maintaining secure data handling

Method	Endpoint	Description
POST	/analyzeNews	Analyze a news article URL
GET	/predictionResult	Retrieve fake news prediction result
GET	/chatbotResponse	Get AI chatbot explanation
GET	/verifiedSources	Fetch trusted news source matches
GET	/videoSuggestions	Retrieve related YouTube videos

Table IV. Core API Endpoints

C. Web Integration and Real-Time Streaming

The system uses WebView for loading and extracting webpage content from online news articles. Firebase Realtime Database enables instant synchronization of prediction results and user interactions. Real-time updates improve application responsiveness and user experience.

Model Training and Testing Framework

A. Configuration

The fake news recognition models are proficient on labeled datasets of real and fake news reports. The training process includes the following steps: Initial processing, feature extraction, model optimization and evaluation.

Training parameters include:

- Dataset splitting for training and testing
- Learning rate configuration
- Batch size and epoch settings
- Feature extraction using BERT embeddings
- Classification tuning using LightGBM

Monitoring and Alerting

The system continuously monitors model performance, prediction quality, and application responsiveness.

A. Model Performance Metrics

The monitoring module tracks:

- Prediction accuracy
- Model response time
- Source verification consistency
- Firebase synchronization status
- Chatbot interaction quality

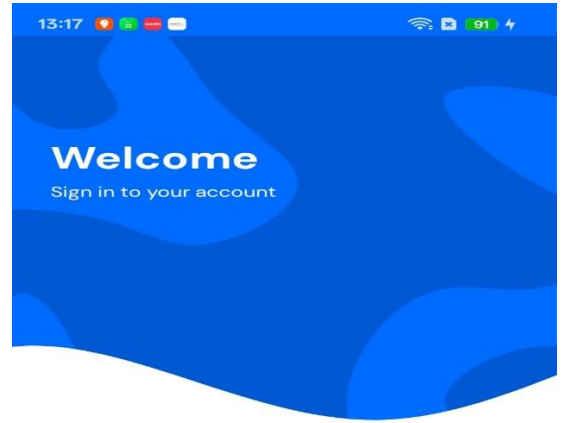
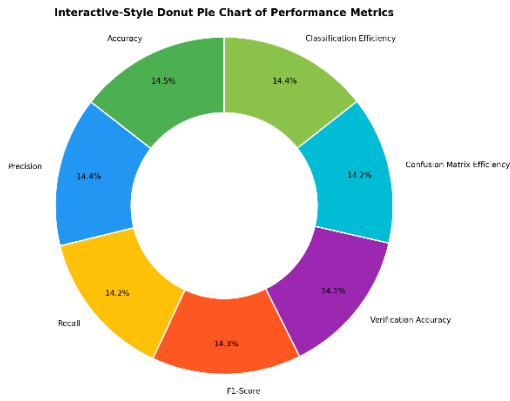
B. Alert Thresholds

The system generates alerts under the following conditions:

- Low prediction confidence
- API connection failure
- Delayed AI verification response
- Firebase synchronization errors
- Web content extraction failure

Metric	Value	Description
Accuracy	96.40%	Percentage of news reports that are classified accurately.
Precision	95.80%	Percentage of expected fake news articles that are fake.
Recall	94.90%	Capability of the system to correctly recognize fake news articles.
F1-Score	95.30%	Balanced measure of precision and recall.
Response Time	2.1 sec	Average time to analyze and classify a news article.
Verification Accuracy	93.70%	Accuracy of Generative AI verification with trusted sources.
Confusion Matrix Efficiency	94.50%	Overall classification performance using TP, TN, FP, and FN values.
Classification Efficiency	95.90%	Efficiency of the BERT and LightGBM classification process.

Table V. Performance metrics



3. OUTPUT SCREENSHOT

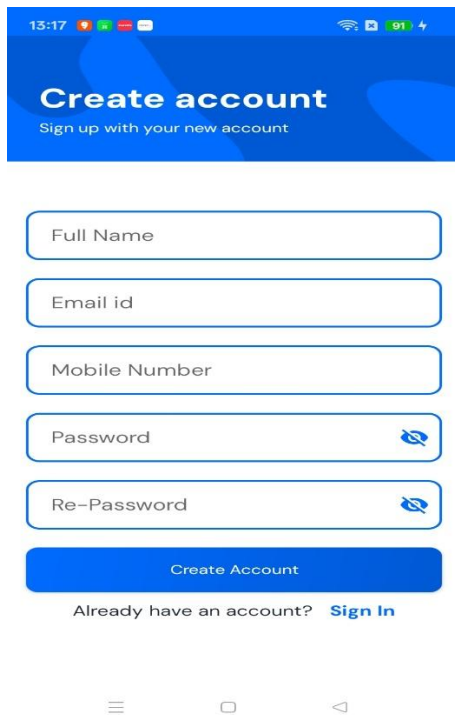


Fig 3.1 User Registration Interface

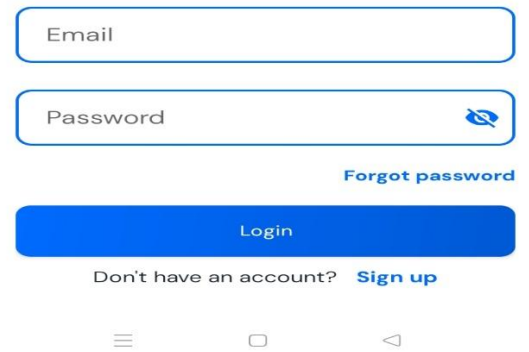


Fig 3.2 User Authentication Login Screen

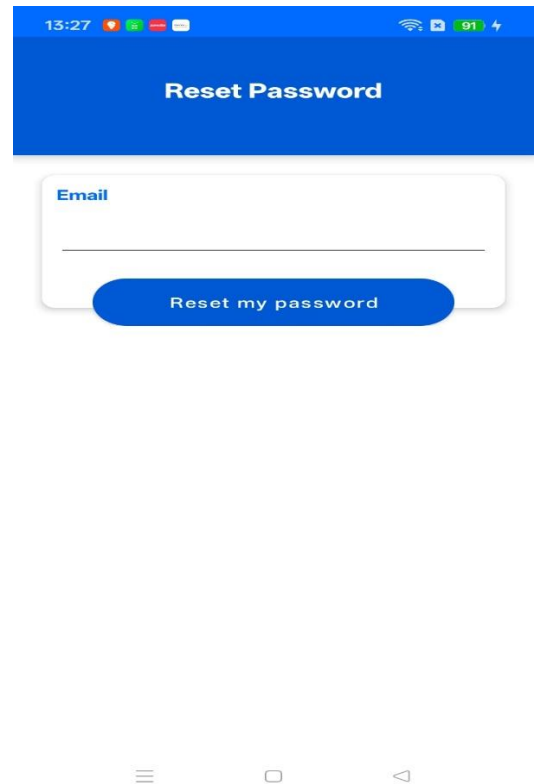


Fig 3.3 Password Reset Interface

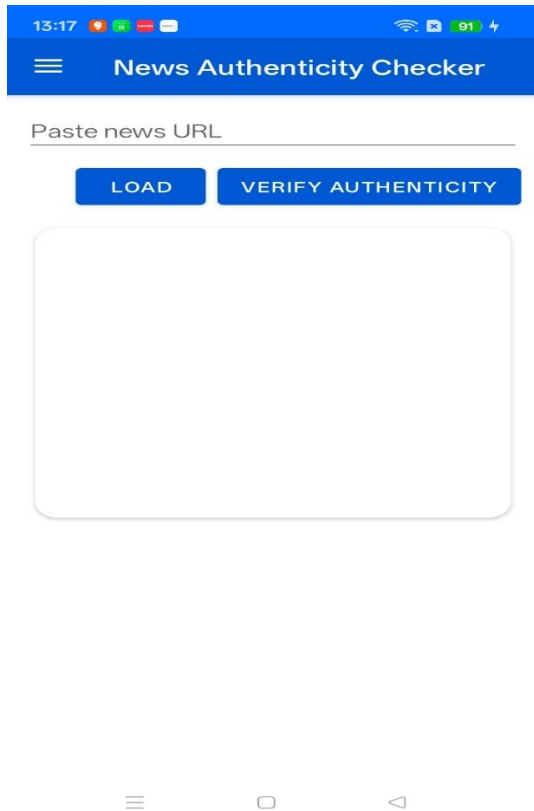


Fig 3.4 News URL Input and Verification Module

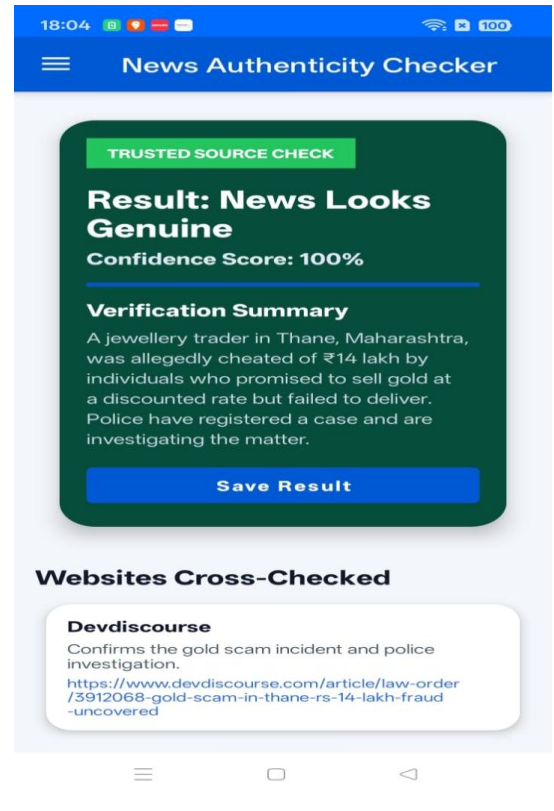


Fig 3.6 News Authenticity Verification Output

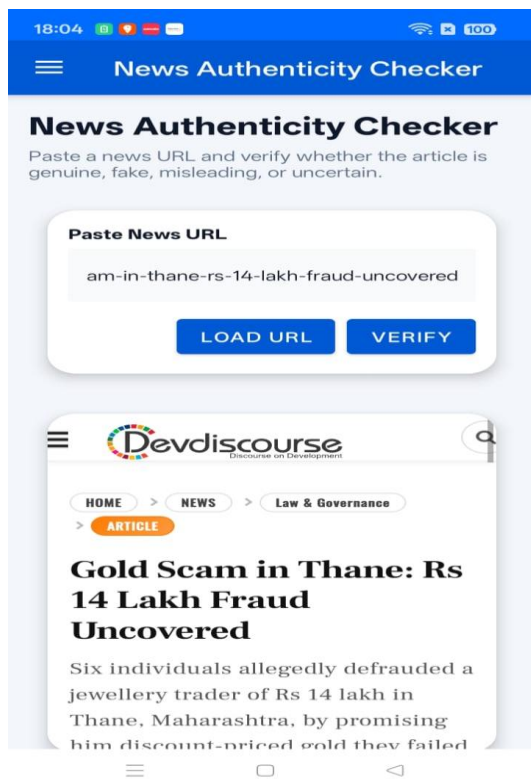


Fig 3.5 Loaded News Article Preview

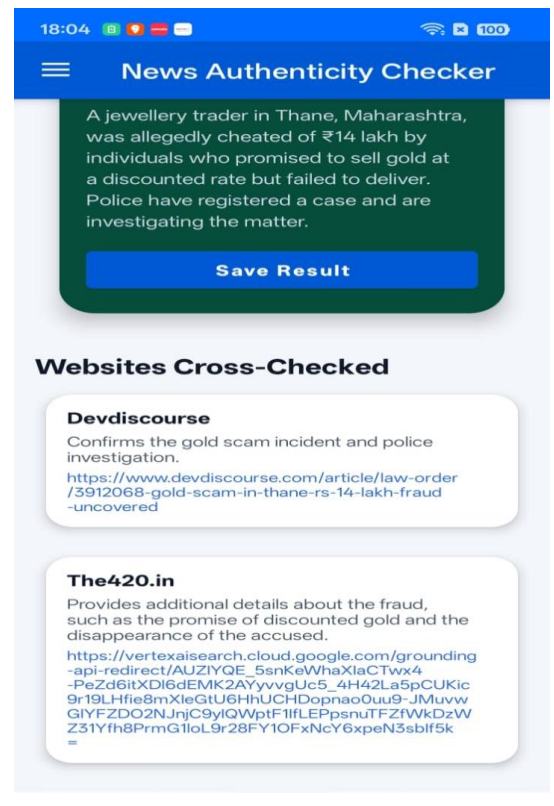


Fig 3.7 Cross-Referenced News Sources

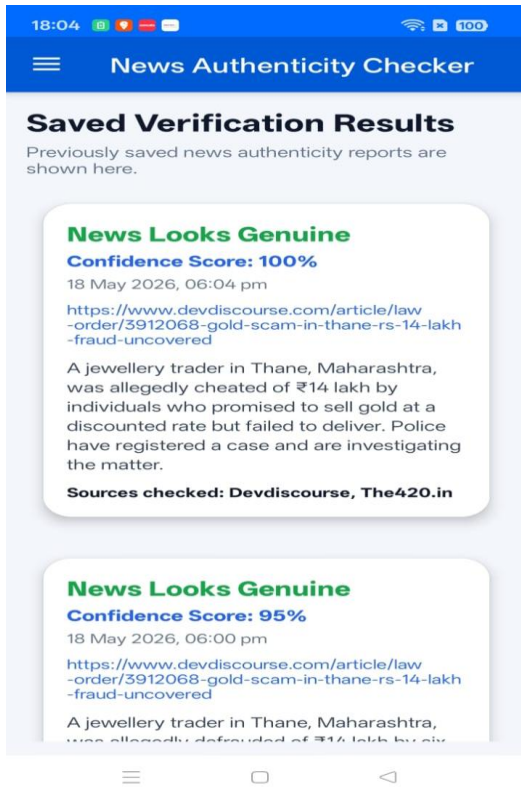


Fig 3.8 Saved Verification History

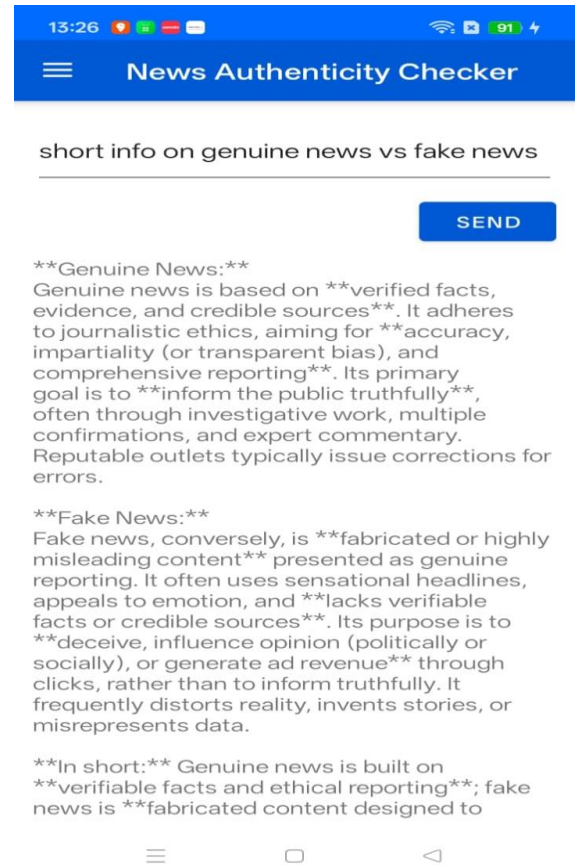


Fig 3.10 AI-Based News Awareness Assistant

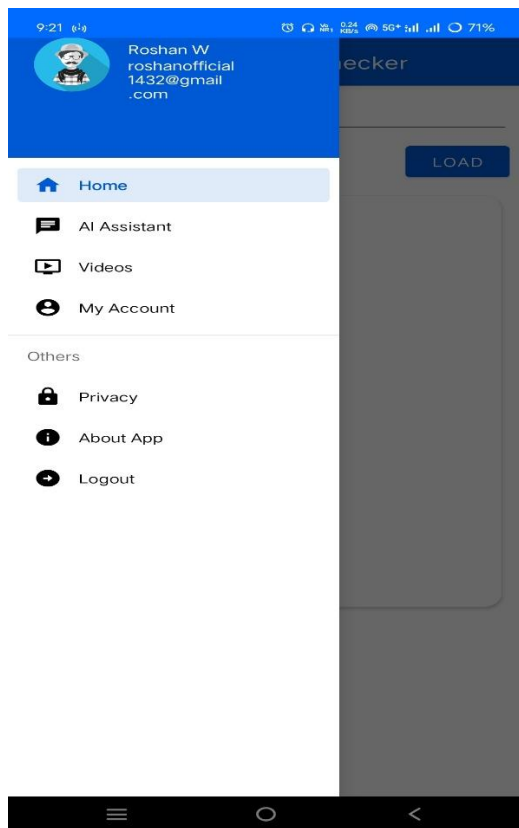


Fig 3.9 Application Navigation Panel

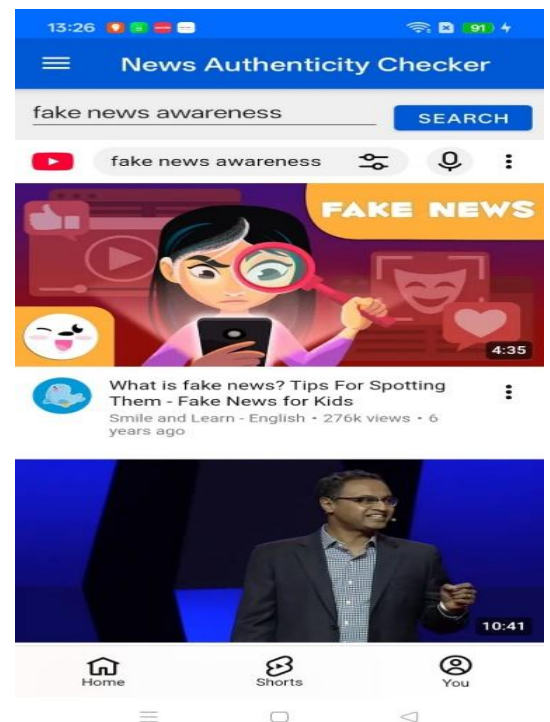


Fig 3.11 Fake News Awareness Video Module

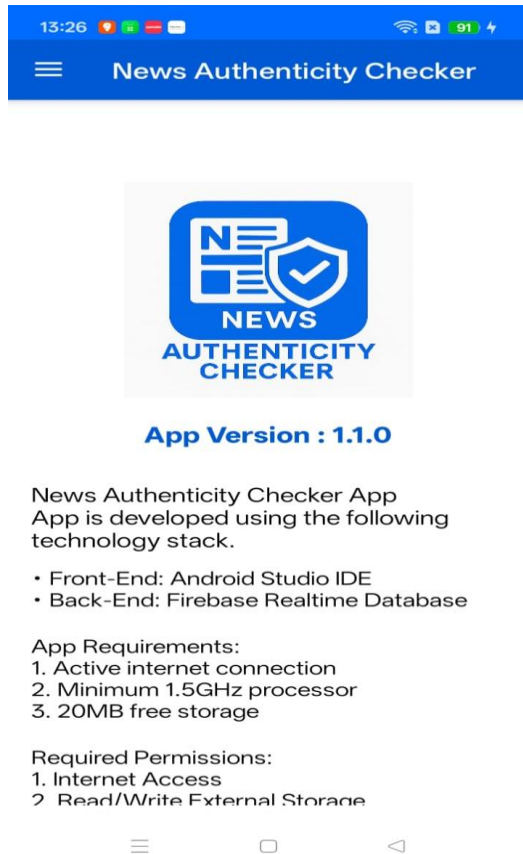


Fig 3.12 About Application Interface

4. CONCLUSION

The Project 'AI-enabled Fake News Detection Using BERT language model and LightGBM Classifier' is an intelligent method for recognizing a false news articles through the application of sophisticated technologies such as AI, NLP, and ML. The system relies on the BERT language model to interpret the context of the news, while the LightGBM classifier predicts whether the news is fake or not. By combining deep learning and machine learning techniques, the application achieves improved accuracy and reliability in fake news classification. The integration of Firebase Realtime Database, Firebase Generative AI, and WebView-based content extraction enables real-time news analysis and smooth user interaction within the Android application. The Generative AI verification mechanism further enhances the prediction process by comparing the analysed article with trusted online news sources to ensure factual consistency.

In addition, the AI-powered chatbot assistant helps users understand the analysis results and provides simplified explanations, making the system more interactive and user-friendly.

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