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Development of a Logistic Regression Model for Fake News Detection in Nigerian Social Media

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Abstract: The rapid growth of the use of social media is posing a significant rate of social, political and economic threats in Nigeria. Communication done online has the nature of being informal, especially in platforms like Instagram, thus complicating the verification of information. It is against this background that this study developed and evaluated a machine learning–based framework for fake news detection on the Instagram social media platform within the Nigerian context. The objectives of the study were to: (i) design a machine learning–based framework for fake news detection on Instagram; (ii) implement the designed framework using Term Frequency–Inverse Document Frequency (TF-IDF) feature extraction and Logistic Regression classification techniques; and (iii) evaluate the performance of the developed model using accuracy, precision, recall, and F1-score metrics. This work adopted an experimental research design. FakeNewsNet repository was utilized to get publicly available benchmark datasets, which contains political and entertainment news - PolitiFact and GossipCop, where data was labeled as fake or real. Nigerian Pidgin English dataset was incorporated into the training process so as to improve contextual relevance and show transfer learning. Under data preprocessing, applied in this research were techniques such as text cleaning, label normalization, and stratified data splitting. TF-IDF, and a Logistic Regression model with class weight balancing was executed under the feature extraction process, where the model was trained and evaluated using an 80:20 train-test split. To simulate Instagram message input and provide instant fake or real news predictions that had confidence scores, a chat model for news verification was implemented. The results showed that the model achieved an overall accuracy of approximately 82%, with satisfactory precision, recall, and F1-score values, indicating effective classification performance. Pidgin English inputs were successfully classified, a key indicator that the model is adaptable to local linguistics patterns. This study concluded that machine learning techniques, when combined with appropriate feature extraction and contextual data, can effectively support Nigerian fake news detection on social media platforms. Recommended in this study is the involvement of larger Nigerian-language datasets, the exploration of advanced deep learning models, and full integration with social media APIs to enhance real-time deployment and enhance the rate of accuracy of detection.

Keywords: *Term Frequency–Inverse Document Frequency (TF-IDF).*

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I. INTRODUCTION

Social media shapes the mode of information creation, sharing and consumption, as it poses the benefit of instant communication. However it has become the fastest way of spreading misinformation and fake news. In Nigeria, the proliferation of fake news has resulted in serious social, political, and economic consequences, including public panic, electoral misinformation, ethnic tensions, and the circulation of health-related rumors (Adewole et al., 2023; Esan et al., 2023).The worsening of this problem is heightened by the low rate of fact checking among people, as well as the increasing rate of social media use.

There is a high rise in social media interactions within the sphere of short captions, headlines, and instant chat messages for the spread of fake information, especially in platforms like Instagram, by users. These communication channels, in most cases, lack context and verification, which further increases the rate of user vulnerability to information that is misleading. Due to the wide use of the most common Nigerian language - pidgin english, code-mixed language, and regional slang online, current fake news detection systems are not fully efficient within the Nigerian environment.

Artificial Intelligence (AI) techniques—especially Machine Learning (ML) and Natural Language Processing (NLP)—have demonstrated strong potential in automating

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fake news detection by analyzing linguistic patterns, textual features, and contextual cues present in online content (Kaliyar et al., 2021; Wang et al., 2023). Most fake news detection models and datasets are not effective when applied to a local setting(Nigeria) due to their application within western contexts, which depicts a limitation to existing research. This limitation is particularly evident when handling informal language styles, including Nigerian Pidgin English and other indigenous expressions commonly used on social media platforms (Muhammad et al., 2022; Oyewusi et al., 2020).

This study therefore aims to develop a logistic regression based fake news detection framework tailored to the Nigerian social media environment, focusing on verification of information shared in Instagram. The study examines the application of TF-IDF feature extraction and Logistic Regression to improve contextual relevance and accuracy of classification, by utilizing benchmark datasets alongside Nigerian Pidgin English pre-data. From a localized lens, this work is aimed at enhancing efforts in fact-checking, improving digital literacy and reducing the spread of misinformation on Nigerian social media platforms.

II. METHODOLOGY

Data collection, data preprocessing, feature extraction, model construction, and model evaluation make up the structured machine learning framework used in this study. Python and the Scikit-learn library were used to create the framework. Data from FakeNewsNet was used for model training, then a Nigerian Pidgin language pre data set for transfer learning. Articles published between 2018 to 2025 were prioritised. A modular architecture was created to mimic how textual messages shared on Instagram chats can be quickly validated as fraudulent or real in order to accomplish the initial goal of creating a machine learning-based framework for fake news identification on Instagram.

III. LITERATURE SYNTHESIS

- *Understanding Fake News in Nigerian Social Media*

Especially among the younger Nigerian population, platforms such as X and Instagram remain the major channels for news consumption, with an increasing rate of adoption and use. Unverified information spreads quickly due to the nature of social media lacking strict editorial oversight. Adewole et al. (2023) observed that misinformation related to politics and public health spreads faster than verified information on Nigerian social media platforms, largely due to emotional appeal it gives as well as the sensational headlines.

Esan et al. (2023) further noted that fake news in Nigeria often exploits ethnic, religious, and political sentiments, causing amplification of social divisions. Due to the enhancement of reliability and trust the Nigerian Pidgin and local expressions offer, deceptive content is made to be more persuasive. These characteristics highlight the need for localized detection models that account for Nigeria's unique linguistic and cultural context.

- *Machine Learning and Natural Language Processing for Fake News Detection*

Machine learning is a subset of artificial intelligence that enables systems to learn patterns from data and make predictions without having to explicitly program. In fake news detection, ML algorithms are trained on labeled datasets to classify news content as fake or real based on extracted features (Pandey et al., 2022). Natural Language Processing (NLP) focuses on techniques that enable machines to understand and process human language. These techniques, such as tokenization, stop-word removal, stemming, and vectorization are commonly employed to convert raw text into machine-readable representations. Feature extraction methods like Term Frequency–Inverse Document Frequency (TF-IDF) and word embeddings play a crucial role in text classification tasks (Kumar & Singh, 2020).

TF-IDF is particularly effective for traditional machine learning models, due to its focus on important terms and reduction in the impact caused by commonly occurring words. Studies have consistently shown that combining TF-IDF with classifiers such as Logistic Regression and Support Vector Machines yields competitive performance in fake news detection tasks (Pandey et al., 2022; Olowononi et al., 2022).

- *Machine Learning Algorithms for Fake News Detection*

Logistic Regression is a widely used supervised learning algorithm. It is used for binary classification problems in which it, using a logistics function, estimates the probability that a given input belongs to a particular class. Despite its simplicity, Logistic Regression has demonstrated strong performance in text classification tasks, particularly when combined with TF-IDF features (Pandey et al., 2022). Its interpretability and computational efficiency make it suitable for real-time fake news detection systems.

Support Vector Machines (SVM) have been widely used to detect fake news because they work well in high-dimensional spaces. According to Adewole et al. (2023), SVM applied to Nigerian Twitter data employing TF-IDF characteristics produced good accuracy. However, compared to logistic regression, SVM models can be less interpretable and computationally costly.

Contextual and semantic information can be captured more effectively by deep learning models like Long Short-Term Memory (LSTM) networks and transformer-based designs like BERT (Kaliyar et al., 2021; Wang et al., 2023). Kaliyar et al. (2021) proposed FakeBERT, which achieves good accuracy on benchmark datasets by combining convolutional layers with BERT embeddings. These models are successful, but their application in low-resource settings is limited since they require huge labelled datasets and substantial computational resources.

- *Transfer Learning for Low-Resource Languages*

Applying knowledge from one task or domain to another related task is known as transfer learning. Smaller, domain-specific datasets can be used to adjust models learnt on big benchmark datasets, like FakeNewsNet, to local

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contexts in false news detection (Abikoye & Abdulsalam, 2024).

NaijaSenti, a multilingual Nigerian Twitter dataset that includes Hausa, Igbo, Yoruba, and Pidgin, was presented by Muhammad et al. in 2022. The dataset shows that language-adaptive transfer learning is feasible for Nigerian social media apps, while being primarily created for sentiment analysis. For Nigerian Pidgin, Oyewusi et al. (2020) underlined the significance of semantic enrichment and language-specific preprocessing.

IV. DISCUSSION

The suggested framework was successfully created and put into practice; the system showed verification capability appropriate for Instagram chats; transfer learning improved adaptability to Nigerian Pidgin English; class balancing improved fake news recall; and logistic regression with TF-IDF features proved effective for text-based fake news detection. The following tasks are successfully completed by the developed system:

- Loads and prepares datasets from FakeNewsNet for both fake and real news.
- Uses transfer learning to include Nigerian Pidgin English pre-data
- Uses TF-IDF to transform textual data into numerical vectors.
- Uses class balancing to train a logistic regression classifier.
- User input is accepted, and messages are authenticated.
- Provides uncertainty alarms and forecast confidence scores.

Table 1 Performance Evaluation Metrics

Metric	Value
Accuracy	0.824
Precision (Fake News)	0.62
Recall (Fake News)	0.73
F1-Score (Fake News)	0.67

Table 2 Classification Report

Class	Precision	Recall	F1-Score	Support
Real News(0)	0.91	0.86	0.88	3489
Fake News(1)	0.62	0.73	0.67	1151
Overall Accuracy			0.82	4640

With an overall accuracy of 82.4%, the created false news detection model accurately recognised most news samples. This demonstrates that the suggested approach works well for identifying false information on social media platforms.

With a high precision of 0.91 and recall of 0.86, the model performed well in detecting actual news. This suggests that genuine news was rarely mistakenly labelled as fake by the system, which is crucial for preserving user confidence on social media platforms..

The model's recall for detecting fake news was 0.73, which indicates that almost 73% of real false news messages were accurately identified. This is an important result because it's usually harder to spot bogus news than authentic news. The use of class weight balancing enhanced the sensitivity to false information.

On the other hand, the precision for fake news was 0.62, meaning that some legitimate news messages were mistakenly labelled as fraudulent. This trade-off between memory and precision is typical in tasks involving the detection of fake news and emphasises how difficult it is to discern between false and accurate information, particularly in casual Instagram chats.

The F1-score of 0.67 for fake news demonstrates a reasonable balance between precision and recall, making the model suitable for academic research and real-time monitoring applications.

V. CONCLUSION AND RECOMMENDATION

The study's findings show that machine learning methods can be successfully used to identify bogus news on social media sites like Instagram. The created system performed well in identifying actual news and quite well in detecting fake news, with an accuracy of about 82%. By including social media APIs, the framework may be expanded into a real-time system that allows for real-time monitoring and the identification of fake news as it is published.

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