Fake News Detection System Report

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Domain: AI/ML

Project: Fake News Detection System

Objective

The primary goal of this project is to develop an AI-based system that classifies news articles as real or fake. The project incorporates both traditional machine learning algorithms and deep learning techniques like LSTM to improve accuracy and generalization.

1. Approach Used

The Fake News Detection System follows a structured approach, including data preprocessing, model training, and evaluation.

Data Preprocessing

To ensure high-quality input for the models, the following preprocessing steps were performed:

- Removal of punctuation, stopwords, and special characters.
- Tokenization and stemming for standardizing text data.
- Conversion of text into numerical vectors using TF-IDF for traditional models.
- Word embeddings using Word2Vec for deep learning models.

Model Training

Three different models were trained to classify news articles:

- Logistic Regression: A baseline model for binary classification.
- Naive Bayes: A probabilistic classifier suitable for text classification.
- LSTM (Long Short-Term Memory): A deep learning model capable of capturing sequential dependencies in text.

Evaluation & Testing

The trained models were evaluated using performance metrics such as accuracy, precision, recall, and F1-score. LSTM, being a deep learning model, was also tested for overfitting and optimized using techniques like dropout regularization.

2. Challenges Faced

• Handling Misinformation: Some fake news articles used misleading but well-structured language.
• Feature Representation: Traditional models required effective text vectorization techniques, whereas LSTM used embeddings.
• Computational Complexity: LSTM required more processing power and hyperparameter tuning to avoid overfitting.
• Data Imbalance: The dataset contained an unequal distribution of fake and real news articles, impacting model performance.

3. Model Performance & Improvements

Performance Metrics

• Logistic Regression: Provided a baseline accuracy but struggled with complex sentences.
• Naive Bayes: Worked well with text classification but performed poorly on highly contextual news articles.
• LSTM: Achieved the highest accuracy and was better at capturing long-term dependencies in text.

Potential Improvements

• Using Transformer-based models like BERT or GPT for improved contextual understanding.
• Expanding the dataset with more diverse fake news sources to improve generalization.
• Fine-tuning hyperparameters of LSTM, including dropout rate and batch size, for better efficiency.

Conclusion

This project successfully implemented a Fake News Detection System using both machine learning and deep learning models. While Logistic Regression and Naïve Bayes provided baseline performance, LSTM outperformed them by effectively understanding the context of news articles. Future improvements can include transformer models and more robust datasets to enhance accuracy.