

Fake News Detection Using Deep Learning

CNN-BiLSTM Based Approach

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Table of Contents

- 1 Introduction
- 2 Objectives
- 3 Dataset
- 4 Preprocessing
- 5 Model Architecture
- 6 Evaluation Metrics
- 7 Results
- 8 Conclusion
- 9 Future Work
- 10 References

Introduction

- Fake news is widely spread through online platforms.
- It influences public opinion and spreads misinformation.



- This project uses deep learning to detect fake news using content-based features.

Objectives

- Detect fake news using a deep learning model.
- Combine CNN and BiLSTM architectures for better accuracy.
- Evaluate using Accuracy, Precision, AUC, and EER.

Dataset Description

- Dataset: ISOT Fake News Dataset
- Contains two files:
 - `True.csv` – Real news articles
 - `Fake.csv` – Fake news articles
- Columns: title, text, subject, date

Data Preprocessing

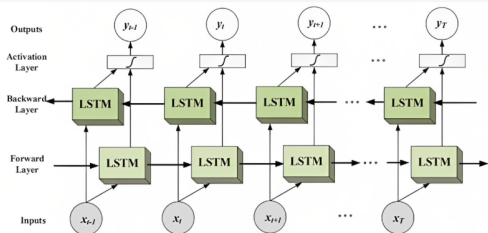
- Combine title and text fields
- Convert text to lowercase
- Remove punctuation and numbers
- Tokenize and pad to fixed length of 300

Model Architecture

- **Embedding Layer** – Converts tokens to 128-D vectors
- **Conv1D Layer** – Extracts local n-gram features
- **BiLSTM Layers** – Captures long-term dependencies
- **Dense Layer** – Fully connected classification
- **Output Layer** – Sigmoid for binary classification

Training Details

Figure 3. Bi-LSTM Model [34].



Optimizer: Adam

Loss: Binary Crossentropy

Epochs: 15, Batch size: 64

EarlyStopping and ModelCheckpoint used

Evaluation Metrics

- **Accuracy:** Overall correctness
- **Precision:** $TP / (TP + FP)$
- **AUC:** Area under the ROC curve
- **EER:** Point where false acceptance = false rejection

Results

```
Accuracy: 0.9879732739420936  
Precision: 0.9890470974808324  
AUC: 0.9985719893470077  
EER: 0.012253233492171545
```

Accuracy: 98.79%

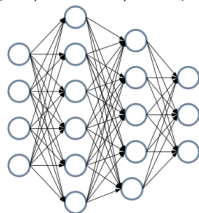
Precision: 98.904%

AUC: 99.85%

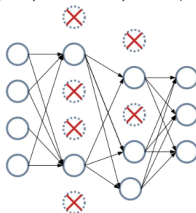
EER: 0.01225

Key Observations

Input layer Hidden layers Output layer



Input layer Hidden layers Output layer



Title + Text outperforms individual fields

Dropout layers help reduce overfitting

BiLSTM captures bidirectional context

CNN captures key local patterns before sequence modeling

Conclusion

- A deep learning-based approach was implemented for fake news detection using content from news articles.
- The hybrid CNN-BiLSTM model effectively captures both local patterns and long-term dependencies.
- The model achieved excellent performance across all evaluation metrics, including Accuracy, Precision, AUC, and EER.
- This architecture outperforms traditional machine learning methods and sets a strong baseline for future multimodal systems.
- The results confirm the potential of deep learning in combating misinformation online.

Future Work

- Use pretrained embeddings (e.g., GloVe, FastText)
- Explore transformer models like BERT
- Add source metadata and image analysis
- Develop a web app for real-time detection

References

- ISOT Dataset:
<https://www.uvic.ca/engineering/ece/isot/datasets/fake-news/>
- TensorFlow Docs: <https://www.tensorflow.org>
- Keras API: <https://keras.io>
- Scikit-learn Docs: <https://scikit-learn.org>
- Chollet, F. *Deep Learning with Python*. Manning