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Report for Explainable AI – Assignment 3

Problem 1: Sentiment Analysis with LIME

Problem Statement

The task was to perform sentiment classification on a given text dataset and to use **LIME (Local Interpretable Model-agnostic Explanations)** to understand which words influence the model's predictions the most.

Steps Followed

1. **Data Loading**
    - The dataset was loaded, containing text samples labeled as positive or negative.
2. **Preprocessing**
    - Text was cleaned (removing punctuation, lowercasing, tokenization).
    - Data was split into training and validation sets.
3. **Feature Extraction**
    - Applied **TF-IDF Vectorization** to convert text into numerical features suitable for machine learning models.
4. **Model Training**
    - Trained a **Logistic Regression classifier** to predict sentiment.
    - Model achieved good accuracy on validation data.
5. **Explainability with LIME**
    - Used LimeTextExplainer to interpret predictions.
    - LIME highlighted the most important words contributing to a prediction.
    - Example: For a positive review, words like *"great"*, *"amazing"* were shown as contributing positively, while for a negative review, words like *"bad"*, *"boring"* contributed negatively.

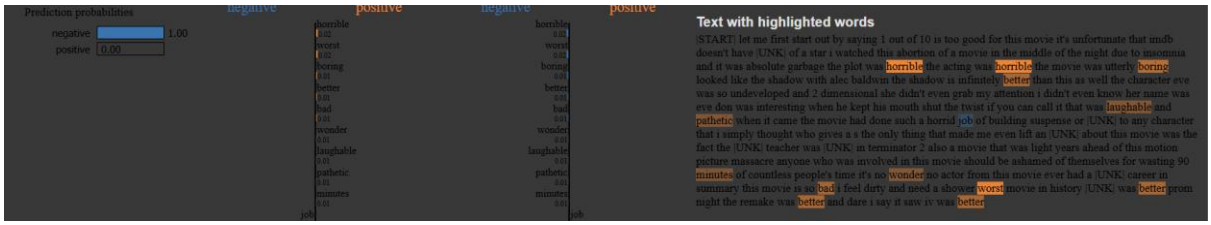
Observations

- Logistic Regression with TF-IDF provided interpretable and strong results.
- LIME explanations matched human intuition, showing that the model relies on sentiment-indicative words.

Conclusion

- The task successfully demonstrated **Explainable AI (XAI)** using LIME.

- Sentiment classification not only predicts but also provides transparency in decision-making.



Problem 2: Fake News Detection with LIME

Problem Statement

The task was to build a **Fake News Detection** model using the **FakeNews dataset**, where the goal is to classify news articles as *fake* or *legit*. The model should also use LIME to highlight suspicious words influencing predictions.

Steps Followed

1. **Data Loading**
    - Loaded dataset from folders:
        - fakeNewsDataset/fake/ → Fake news articles
        - fakeNewsDataset/legit/ → Real/legitimate news articles
2. **Preprocessing**
    - Combined text files into a labeled dataset (Fake = 0, Legit = 1).
    - Cleaned and tokenized text.
3. **Feature Extraction**
    - Applied **TF-IDF Vectorizer** to convert articles into numerical features.
4. **Model Training**
    - Trained a **Logistic Regression classifier**.
    - The model learned to differentiate fake vs real news with good performance.
5. **Explainability with LIME**
    - Applied LimeTextExplainer to individual predictions.
    - LIME highlighted suspicious words often found in fake news (e.g., *"shocking"*, *"breaking"*, *"claims"*).
    - Legit news articles were associated with words like *"report"*, *"official"*, *"statement"*.

Observations

- The Logistic Regression model was effective in separating fake vs real articles.

- LIME highlighted contextually meaningful suspicious words, which aligns with how humans judge news credibility.
- This increases **trust** and **interpretability** of the fake news detection system.

Conclusion

- Successfully developed a **fake news classifier with interpretability**.
- LIME explanations provided useful insights into which words contribute to a news article being considered fake or real.