

MSCI 641: Text Analytics: Custom Project Milestone

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Problem Description: What is the problem you are investigating?

The project investigates sentiment analysis of IMDB movie reviews using Long Short-Term Memory (LSTM) neural networks. The primary objective is to develop a system that can automatically classify the sentiment of these reviews on a scale from -1 to 1. In this scale, -1 represents very negative sentiment, 1 represents very positive sentiment, and 0 indicates neutral sentiment. By employing LSTM neural networks, the project aims to accurately capture and analyze the sentiments expressed in movie and TV show reviews. This analysis will provide valuable insights into customer opinions and emotions, which can be beneficial for movie producers, marketers, and consumers in understanding public perception and improving decision-making processes.

Data: What dataset are you using? How did you collect it?

Dataset:

- The project uses movie/TV show reviews scraped from the IMDB website.

Data Collection:

- The reviews are collected through web scraping using the BeautifulSoup Python library.
- The collected data includes the review text and relevant metadata, such as Title, Author, Stars, and date.
- The goal is to gather at least 20,000 reviews which will be fed to VADER to generate continuous sentiment scores between -1 and 1 for training data.

Baseline: What is your baseline algorithm?

The baseline algorithm for this project is a basic Long Short-Term Memory (LSTM) neural network. The LSTM model is chosen for its ability to capture temporal dependencies in sequential data, making it well-suited for sentiment analysis tasks. The basic LSTM model will be implemented with a single LSTM layer. The model will use **dropout (0.5)** for regularization, **Bidirectional**, and the **Adam** optimizer for training.

Evaluation Methodology: How are you evaluating your baseline?

Evaluating the Baseline:

- The performance of the baseline LSTM model will be evaluated using a hold-out validation set.
- Evaluation metrics will include validation accuracy, precision, recall, and F1 Scores to measure how well the LSTM model predicts sentiment.
- A Loss Graph will be used to visualize the model's performance and gain insights into its strengths and weaknesses.

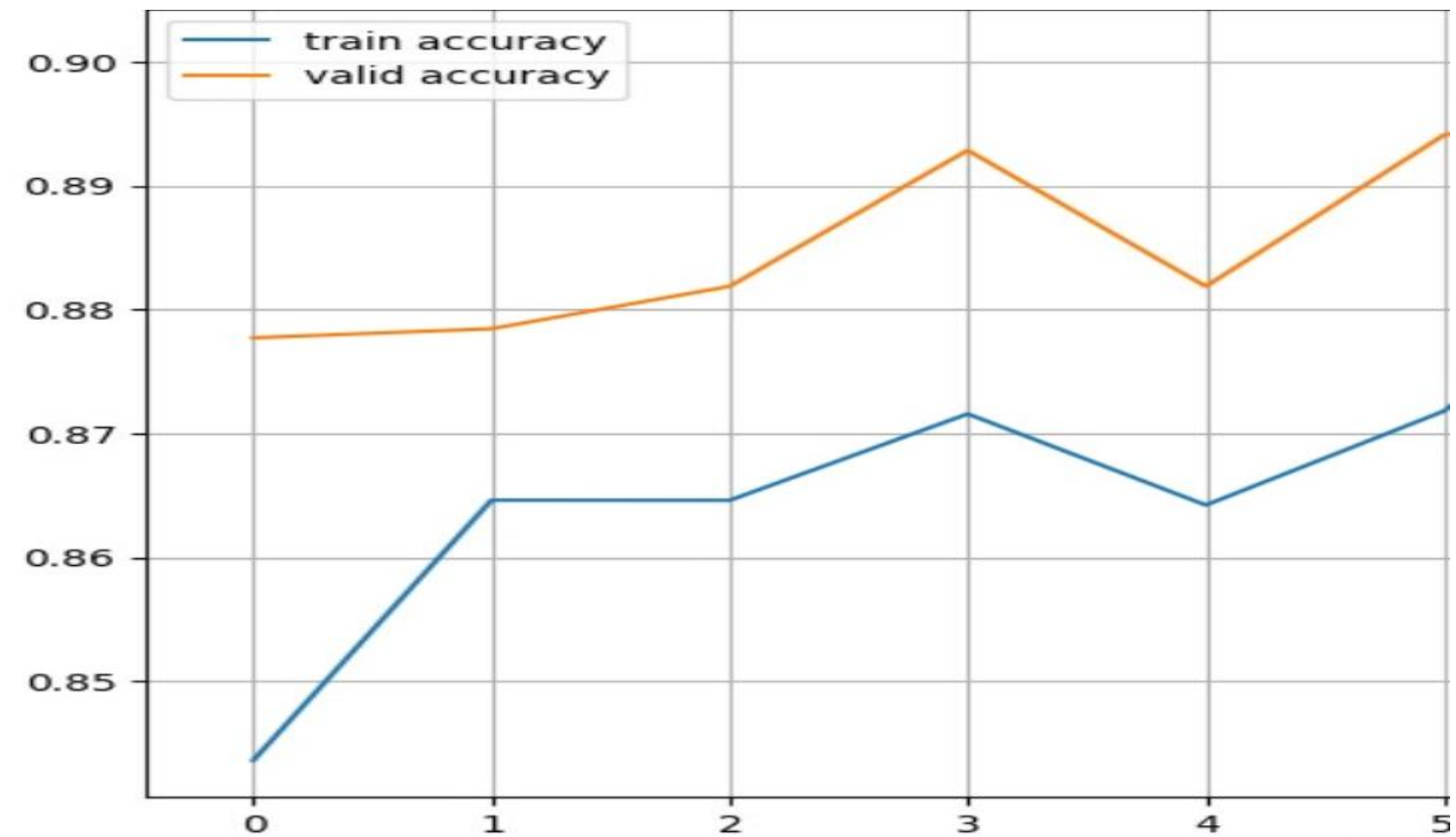
Results: How well does your baseline work?

- The baseline LSTM model's performance metrics were:
 - **Validation Accuracy: 89.4%**
 - **Validation Precision: 88.1%**
 - **Validation Recall: 88.4%**
 - **Validation F1 Score: 88.2%**
- These results serve as a benchmark for comparison when developing and testing more sophisticated versions of the LSTM model, such as models with additional LSTM layers, different activation functions, or other architectural enhancements.
- The analysis of the baseline performance provides insights into the initial effectiveness of the LSTM approach for sentiment analysis and guides further improvements and iterations of the model.

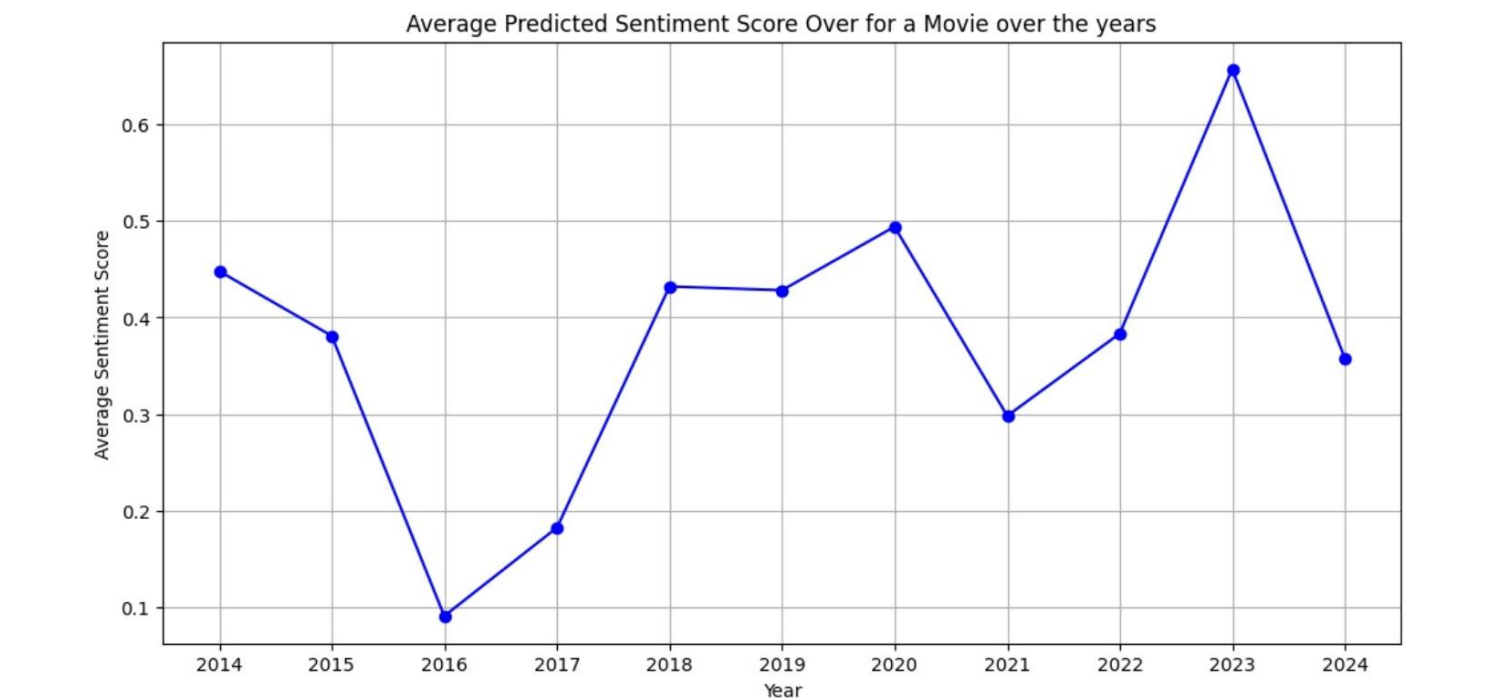
Appendix:

```
LSTM(  
  (embedding): Embedding(8910, 300, padding_idx=1)  
  (lstm): LSTM(300, 300, num_layers=2, batch_first=True, dropout=0.5, bidirectional=True)  
  (fc): Linear(in_features=600, out_features=2, bias=True)  
  (dropout): Dropout(p=0.5, inplace=False)  
)
```

Baseline Model Architecture



Epoch vs Training and Validation Accuracy Plot of Model



Average Predicted Sentiment Score over Time of Movie Equalizer (Test Set)