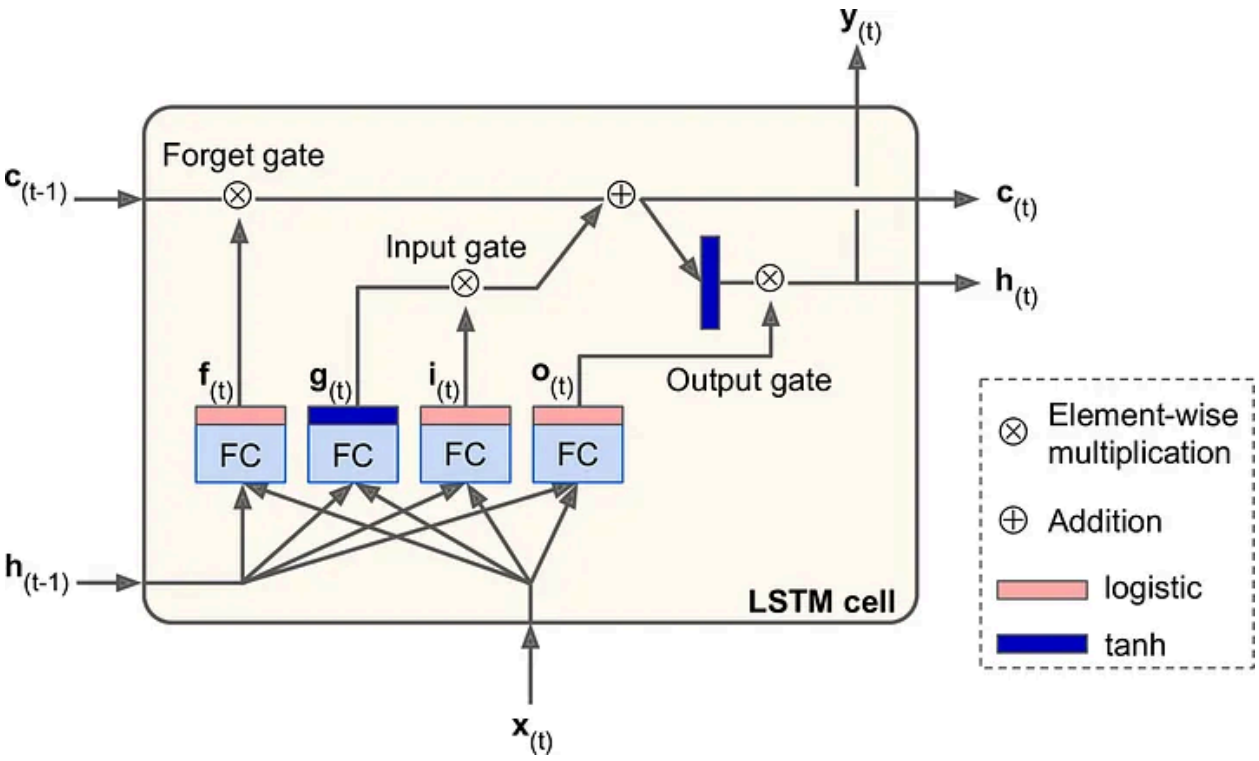
DEEP LEARNING FOR PERCEPTION (8-B)

SARCASM DETECTION

A LOOK INTO BINARY CLASSIFICATION OF TEXT USING THE LSTM ARCHITECTURE



Objective

The primary objective of this project is to leverage the Long Short-Term Memory (LSTM) network architecture, a modified version of recurrent neural networks (RNNs), to effectively identify sarcasm in text, specifically within headlines. The goal is to apply the LSTM's capabilities to process sequential data, such as the words in a headline, where the meaning and presence of sarcasm can depend heavily on the context and order of words. By addressing the gradient vanishing problem found in standard RNNs and facilitating the remembering of past data in memory, the aim is to build a model capable of accurately

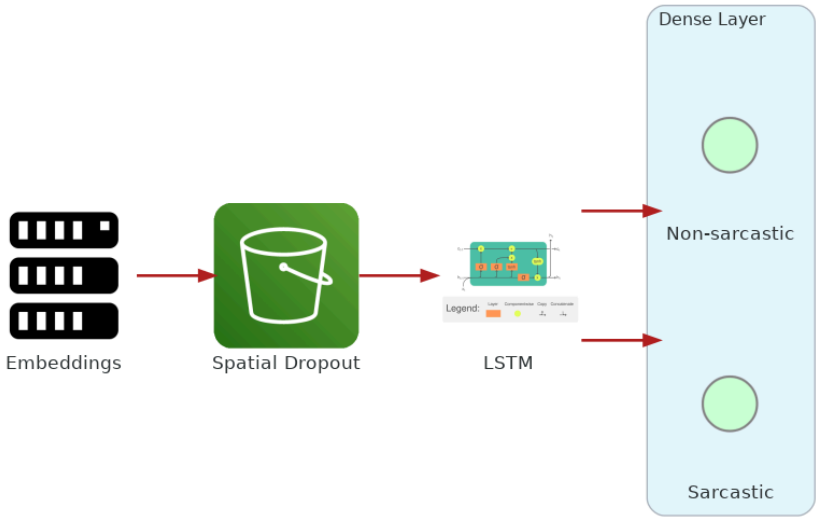
classifying whether a given headline is sarcastic or not, leveraging the LSTM's suitability for tasks involving processing and classification of sequences. [1]

Problem statement

Identifying sarcasm in text is a complex challenge, particularly in short formats like headlines, where context is limited. Sarcasm often involves a discrepancy between the literal meaning of words and the intended meaning, relying on subtle cues, tone (which must be inferred from text), and world knowledge. Traditional neural networks treat inputs independently, which is insufficient for understanding the sequential nature of language and how earlier words can influence the interpretation of later ones within a headline. While standard Recurrent Neural Networks (RNNs) have an internal memory to process sequences, they suffer from gradient vanishing and exploding problems and struggle to process very long sequences when using activation functions like tanh or ReLU. These limitations make it difficult for standard RNNs to effectively remember context over extended sequences, which is crucial for detecting sarcasm that might rely on dependencies or contradictions spread across a headline. The problem addressed is the need for a sequence processing architecture that can effectively retain relevant contextual information over the words in a headline and mitigate the issues of vanishing or exploding gradients to accurately classify headlines as sarcastic or non-sarcastic.

Methodology

A sequential neural network model was built for text classification using Keras. The model begins with an Embedding layer that transforms input word indices into dense vectors. A SpatialDropout1D layer is applied for regularization, followed by an LSTM layer to capture sequential dependencies in the text. The final Dense layer with softmax activation outputs class probabilities. The model was compiled using the Adam optimizer, categorical cross entropy loss, and accuracy as the evaluation metric.



LSTM Model Summary

For training, we utilized the [News Headlines Dataset For Sarcasm Detection] [2], from Kaggle. The sarcastic portion of the dataset consists of headlines gathered from the satirical Onion news, while the non-satirical portion was selected from Huffpost.

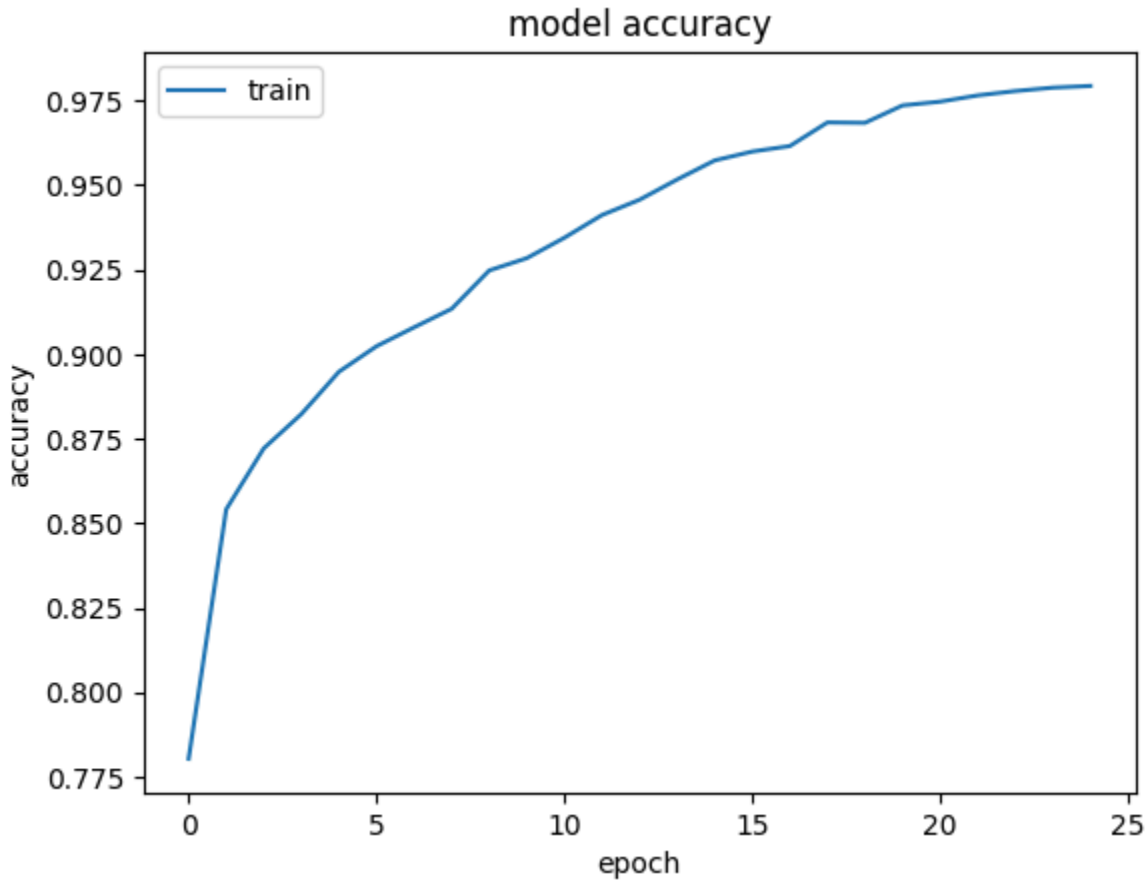
Results

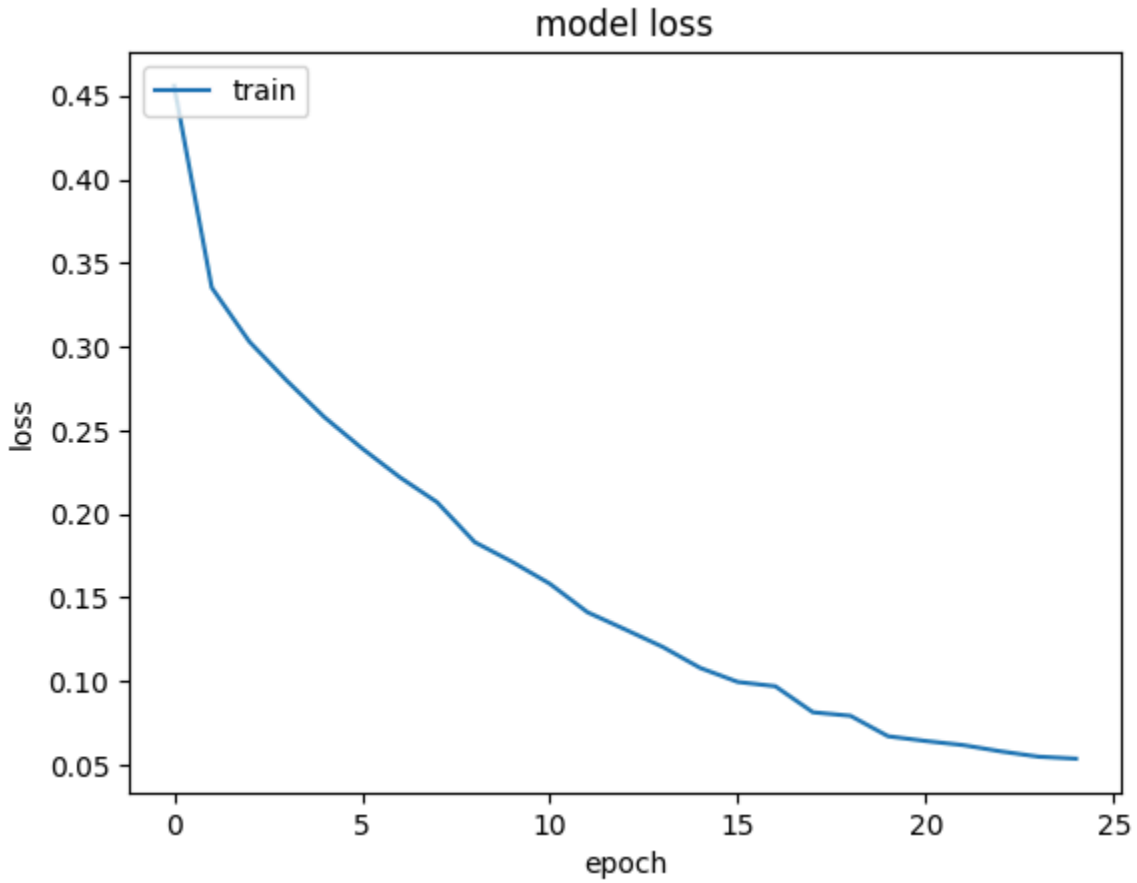
We ran the model for 25 epochs, with a batch size of 32 on the given dataset.

Training metrics:

Training accuracy: 0.9793

Training loss: 0.0535


model accuracy
train
0.975
0.950
0.925
0.900
0.875
0.850
0.825
0.800
0.775
accuracy
0
5
10
15
20
25
epoch



Validation metrics:

Validation accuracy: 0.82

Validation loss: 0.97

References

1. Mittal, A. (2019, October 12). Understanding RNN and LSTM. What is Neural Network? by Aditi Mittal | Medium.
2. Misra, Rishabh and Prahal Arora. "Sarcasm Detection using News Headlines Dataset." AI Open (2023).