

Ahsanullah University of Science and Technology

Department of Computer Science and Engineering

Soft Computing Lab

CSE 4238

Assignment 03

Submitted To

Nibir Chandra Mandal **Sanzana Karim Lora**
Lecturer, CSE, AUST Lecturer, CSE, AUST

Submitted By

Fairuz Nawar
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1. Dataset Processing

$122 \% 3 = 2$, Hence the Dataset used has been Dataset 3. The dataset contained some tweets and the corresponding Sentiment 0 or 1 where 0 represents Positive and 1 negative sentiment.

For example,

"Good morning everybody!" is labled 0

"@tacobell what taco do you recommend to stop my crippling depression" is labled 1

"stopwords" was used to get rid of the single / double lettered words like a, ok etc.

"punkt" for getting rid of the punctuations and Emojis.

"wordnet" was the used Lematizer.

After ignoring punctuation, urls, articles, frequent words with little meaning, and generating the root word, the dataset included tweets such as -

"Good morning" - label 0

"More one US children teens anxiety depression" - label 1

The ratio between 1 and 0 labels were 1:3.45.

2. Model Creation

$(122+3)\% 5 = 0$, hence the model used is CNN, with 3 Convolutional Layers. The summary of the model is given in Figure 1.

The following hyperparameters have been used to train the model and 30% of data has been used to validation and test.

Hyperparameters	Values
Number of hidden layers	7
Epochs	100
Batch size	128
Learning Rate	0.001
Optimizer	Adam, sigmoid
Loss	Binary Crossentropy

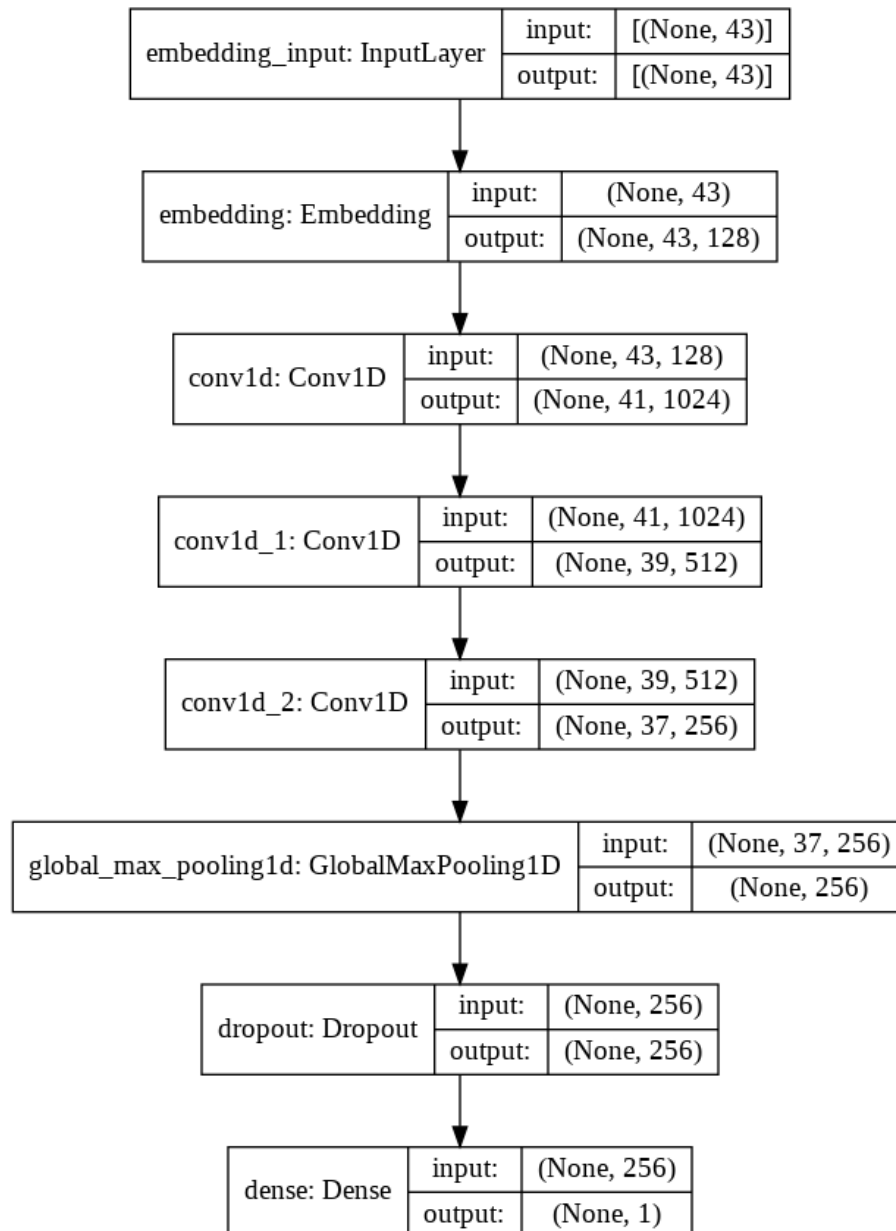


Figure 1: Model Summary

3. Performance Evaluation

The average performances of the model is given in the table below, following Epoch Vs Metrics comparisons for Train and Validation dataset.

Metrics	Average Value Test	Average Value Train
Accuracy	99.16%	94.08%
Precision	98.73%	88.42%
Recall	96.71%	83.82%
F1 Score	5.83	4.94

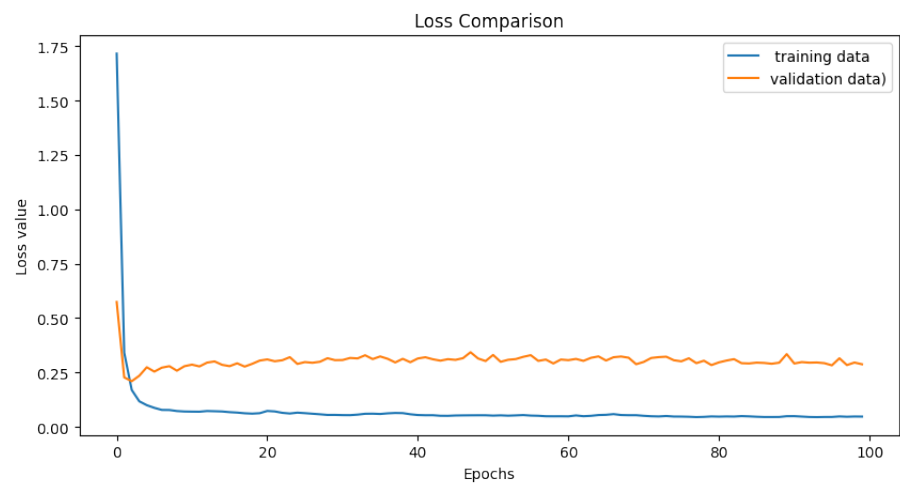


Figure 2: Epoch Vs Loss

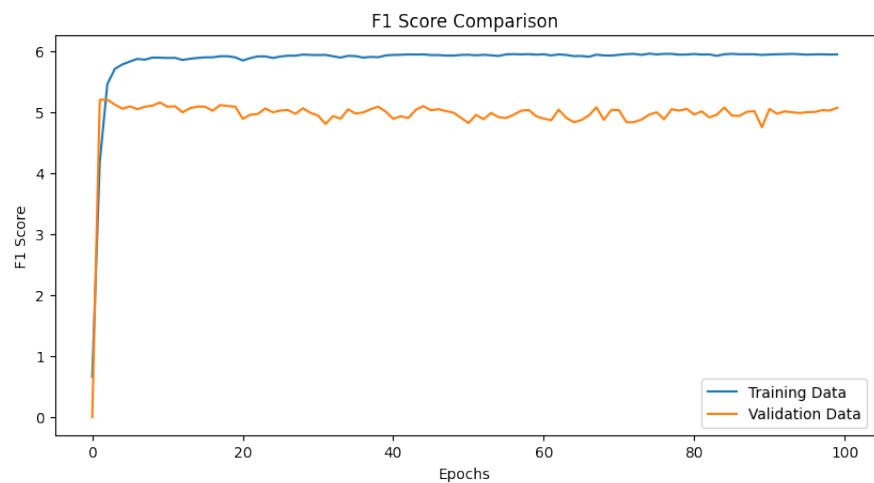


Figure 3: Epoch Vs F1 Score

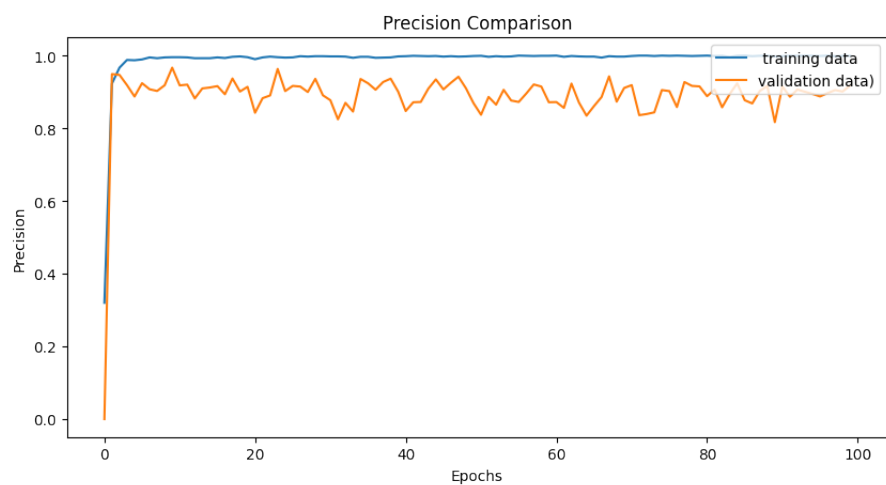


Figure 4: Epoch Vs Precision

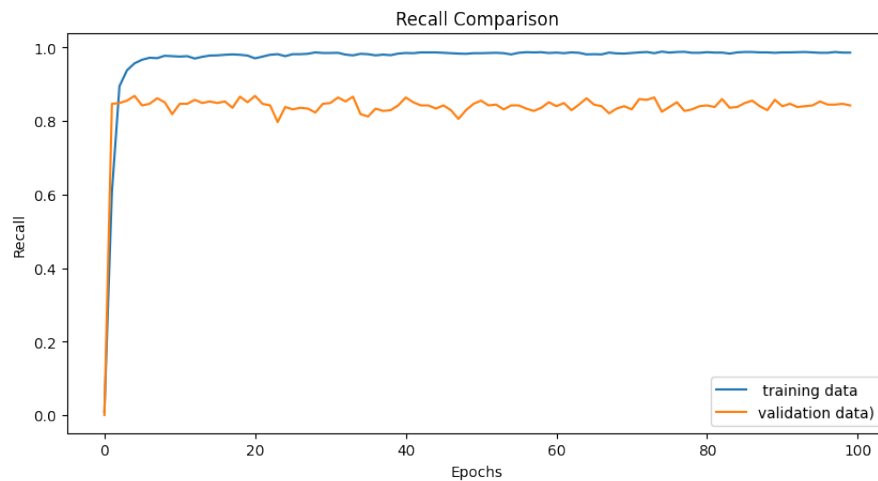


Figure 5: Epoch Vs Recall

3.1 Confusion Matrix

The confusion matrix generated was -

True Positive = 1825

False Positive = 1

False Negative = 26

True Negative = 6399

Following is the heatmap of the confusion matrix.

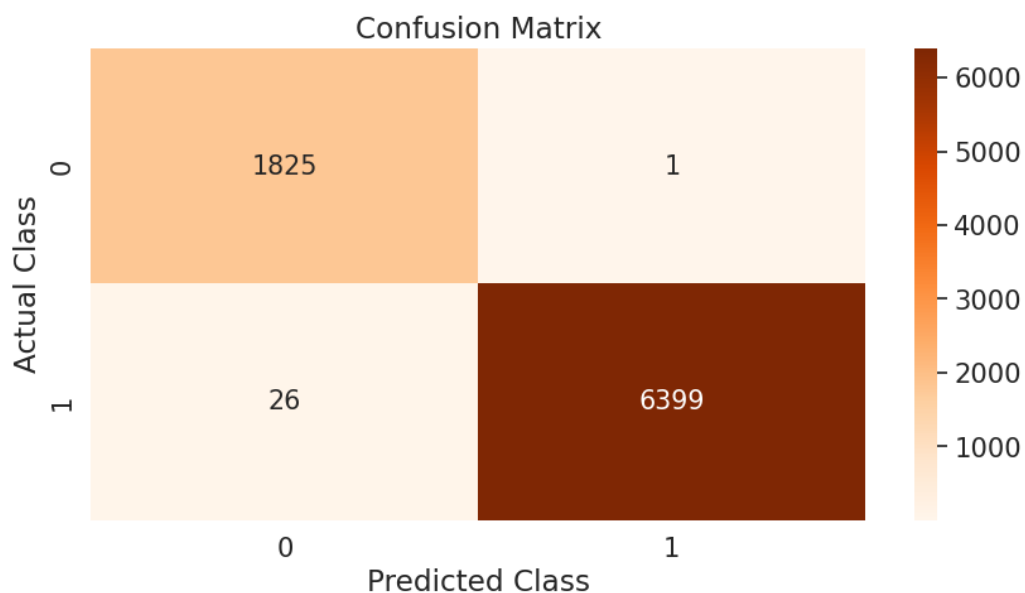


Figure 6: Confusion Matrix

4. Discussion

From the experiment it is evident that the performance for training is much better than the performance of validation, the reason behind that could be that the model is slightly overfitting the data.

To reduce the overfitting, number of layers could be decreased, dropout layer can be introduced after mode layers, the regulizers can be updated.

The accuracy, precision, recall scores all were above 92%, hence it can be said the model is not biased or erroneous and can perform well. As the dataset included different ratios for the labels, it was imbalanced hence, along with accuracy, precison, recall and f1 score all were required to understand the model's performance well.

Some of the data were mislabeled after lematizing, such as, after data processing, a tweet like "always darling" was labled 1 or Negative, it might reduce the performance.

Overall, Convolutional Neural Network, even though used for images mostly, can also be used in NLP and provide great results.

GitHub Link - <https://github.com/FairuzNawarUpoma122/Sentiment-Analysis-With-CNN>