Ahsanullah University of Science and Technology
Department of Computer Science and Engineering

CSE4238: Soft Computing Lab

Assignment-3

Implementation of Text Classification Problem Using Bi-directional LSTM

Submitted by

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Contents

1 Selecting Dataset and Model

Last 3 digit of ID: 119
Now, (Last 3 digit of id%3) = 119%3 = 2. That means the dataset is: **Dataset 3**

(Last 3 digit of id + dataset number)%5 = (119+3)%5 = 2.
That means model is: **Bi-directional LSTM**

2 Hyperparameter and Train Test Data Split

2.1 Hyperparameters

We set the hyperparameters as following:

- **Num of Stacked Layer:** 3
- **Full_Connection_Layer:** 2
- **Epoch:** 20
- **Embedding_Size:** 128
- **Batch_Size:** 32
- **Input_dim:** 12985
- **Output_dim:** 128
- **Activation Function:** ReLU and Sigmoid
- **Optimizer:** Adam
- **Learning_Rate:** 0.01
- **Loss_Function:** BinaryCrossEntropy

2.2 Train Test Split Data

We have kept 80% of our data as training data and 20% of our data as testing data. In the given dataset there are 10314 data. That means we have taken almost 8251 data as training data and 2053 as testing data.

3 Model

The figure 1 is showing the visual representation of the model that is used in this assignment.

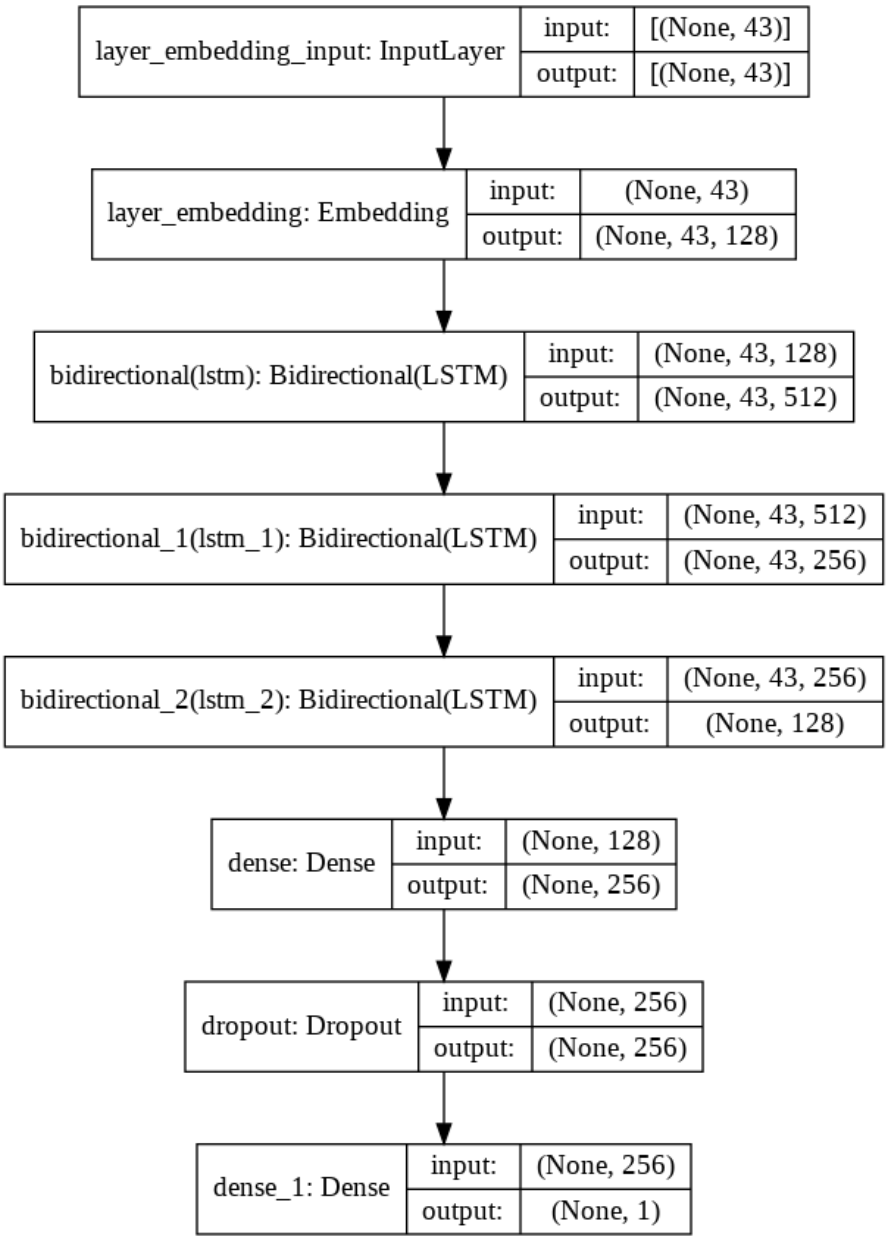

Figure 1: Model of the Experiment

4 Experimental Results Analysis

Epoch No.	Train Loss	Train Accuracy	Val Loss	Val Accuracy
1	0.222071	0.923403	0.155224	0.946680
2	0.081704	0.976972	0.172778	0.949103
3	0.047261	0.986183	0.237837	0.944741
4	0.032817	0.990789	0.198772	0.945225
5	0.023602	0.992971	0.257346	0.943771
6	0.017592	0.994667	0.302552	0.944741
7	0.014923	0.995758	0.322445	0.936500
8	0.014791	0.996122	0.387662	0.940378
9	0.017893	0.994425	0.300933	0.943286
10	0.012636	0.996122	0.348306	0.942317
11	0.011839	0.996485	0.474125	0.943771
12	0.010221	0.997091	0.441402	0.941348
13	0.007767	0.997334	0.595071	0.937954
14	0.015810	0.995394	0.360533	0.941348
15	0.016700	0.994425	0.385665	0.944741
16	0.012807	0.996122	0.348771	0.936985
17	0.011463	0.996970	0.442535	0.936015
18	0.009306	0.997091	0.471715	0.936985
19	0.007742	0.997455	0.486457	0.938439
20	0.007798	0.997455	0.549376	0.934561

Figure 2: Loss and Accuracy for Training and Testing data

Here, we can observe that the model according to the figure 2 (Table of Loss and Accuracy in Training and Testing dataset). The model has achieved the highest training accuracy of 99.74% in epoch number 19, and 20 besides minimum training model loss of 0.77% in epoch number 19. On the other hand the model has achieved the highest testing accuracy of 94.66% in epoch number 1 and minimum testing model loss of 15.52% in epoch number 1 as well.

4.1 Loss Graph

The following figure 3 is the Loss graph for this experiment.

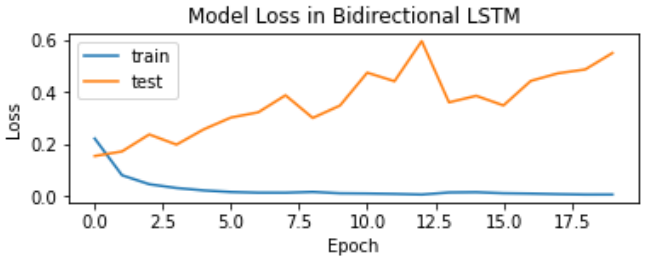

Figure 3: Loss Graph for the Experiment

4.2 Accuracy Graph

The following figure 4 is the accuracy graph for this experiment.

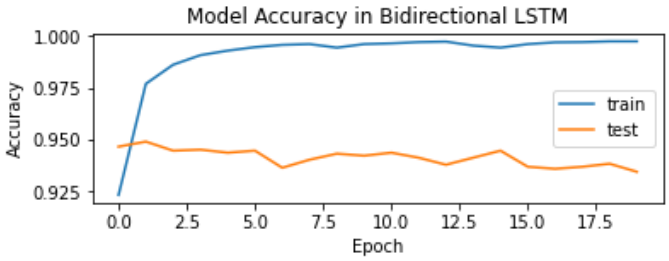

Figure 4: Accuracy Graph for the Experiment

5 Confusion Matrix

The following figure 5 is the demo of the Confusion Matrix used in this experiment.
Where TP, TN, FP, FN means the True-Positives, True-Negatives, False-Positives, and False-Negatives respectively.

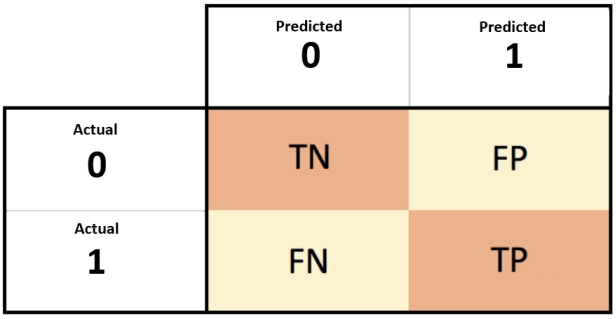

Figure 5: Demo Confusion Matrix

5.1 Confusion Matrix in Training Dataset

The following figure 6 is the Confusion Matrix in the training dataset for this experiment.

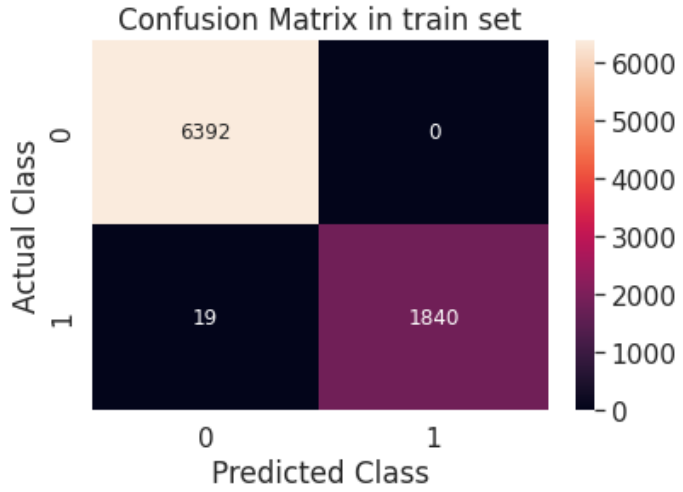

Figure 6: Confusion Matrix in training data

5.2 Confusion Matrix in Testing Dataset

The following figure 7 is the Confusion Matrix in the testing dataset for this experiment.

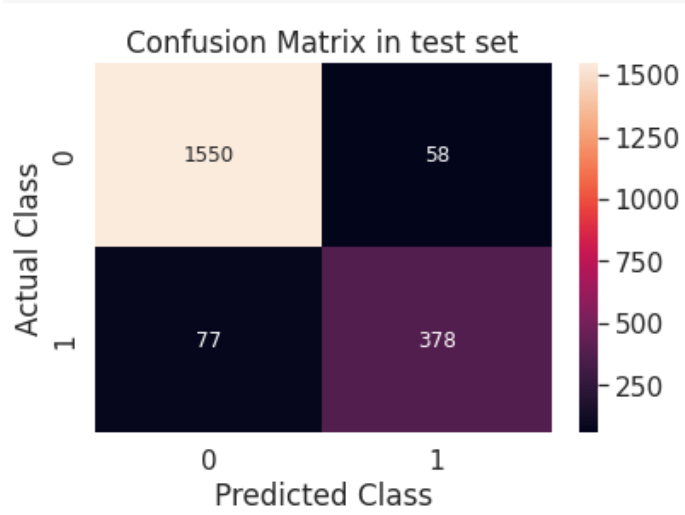

Figure 7: Confusion Matrix in testing data

6 Results of Accuracy, Precision, Recall, F1-Score, and AUC

In the following table 1 we will observe the accuracy, precision, recall, f1-score, and AUC which is achieved in the testing dataset of 2053 data.

Table 1: Performance Evaluation of the Model

	Accuracy	***Precision***	***Recall***	***F1-Score***	***AUC***
Bi-Directional LSTM	93.45%	86.70%	83.08%	84.85%	0.9174

7 Prediction for the Model

```
Number of Mis-classified text in first 1000:  68

Number of classified text in first 1000:  932

First incorrect text index is:  4

First correct text index is:  0

First incorrect text is:  maneater hysterical

First correct text is:  time taste get outside yet antonio

The predicted class for the first incorrect text is:  0.99996305

The actual class for the first incorrect text is:  0

The predicted class for the first correct text is:  0.99999666

The actual class for the first correct text is:  1
```

Figure 8: Prediction of the Model

8 Github Repository

https://github.com/shadhin39/Sentiment_Classification_from_Tweeter_Data_using_Bi-directional_LSTM
The above link is the github repository for the assignment-3.