Ahsanullah University of Science and Technology

Department of Computer Science and Enineering

CSE4238: Soft Computing Lab

Assignment-3

Implementation of Text Classification using Bi-directional RNN

Submitted by

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Contents

1 Selecting Dataset and Model

Last 3 digit of ID: 142
Now, (Last 3 digit of id%3) = 142%3 = 1. That means the dataset is: **Dataset 2**

(Last 3 digit of id + dataset number)%5 = (142+2)%5 = 4.
That means model is: **Bi-directional RNN**

2 Hyperparameter and Train Test Data Split

2.1 Hyperparameters

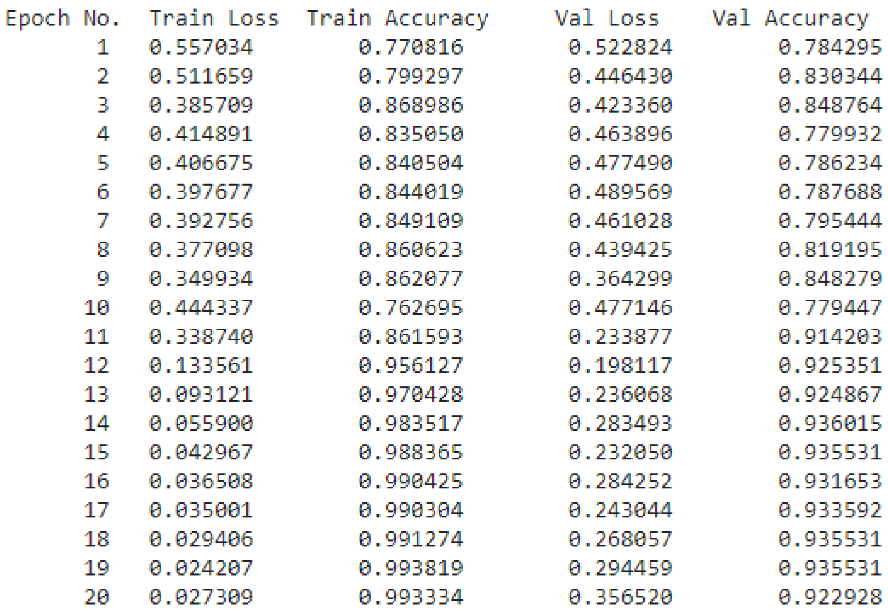
We set the hyperparameters as following:

- **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 Experimental Results Analysis



```
Epoch No.  Train Loss  Train Accuracy    Val Loss    Val Accuracy
        1  0.557034        0.770816      0.522824        0.784295
        2  0.511659        0.799297      0.446430        0.830344
        3  0.385709        0.868986      0.423360        0.848764
        4  0.414891        0.835050      0.463896        0.779932
        5  0.406675        0.840504      0.477490        0.786234
        6  0.397677        0.844019      0.489569        0.787688
        7  0.392756        0.849109      0.461028        0.795444
        8  0.377098        0.860623      0.439425        0.819195
        9  0.349934        0.862077      0.364299        0.848279
       10  0.444337        0.762695      0.477146        0.779447
       11  0.338740        0.861593      0.233877        0.914203
       12  0.133561        0.956127      0.198117        0.925351
       13  0.093121        0.970428      0.236068        0.924867
       14  0.055900        0.983517      0.283493        0.936015
       15  0.042967        0.988365      0.232050        0.935531
       16  0.036508        0.990425      0.284252        0.931653
       17  0.035001        0.990304      0.243044        0.933592
       18  0.029406        0.991274      0.268057        0.935531
       19  0.024207        0.993819      0.294459        0.935531
       20  0.027309        0.993334      0.356520        0.922928
```

Figure 1: Loss and Accuracy for Training and Testing data

Here, we can observe that the model according to the figure 1 (Table of Loss and Accuracy in Training and Testing dataset). The model has achieved the highest training accuracy of 99.38% in epoch number 19 and minimum training model loss of 24.20% in epoch number 19 as well. On the other hand the model has achieved the highest testing accuracy of 93.36% in epoch number 17 and minimum testing model loss of 19.81% in epoch number 12.

3.1 Loss Graph

The following figure 2 is the Loss graph for this experiment.

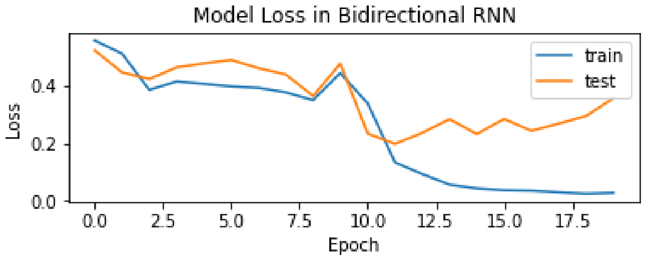


Figure 2: Loss Graph for the Experiment

3.2 Accuracy Graph

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

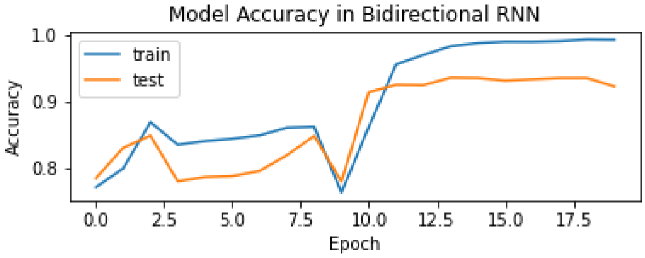
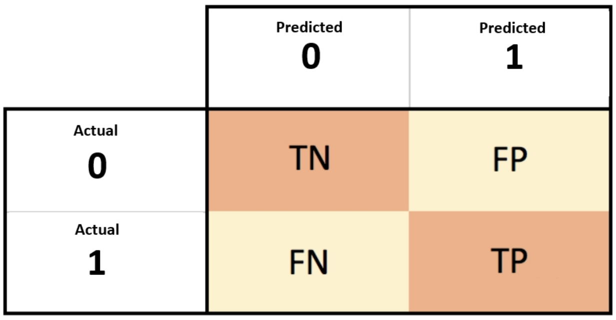


Figure 3: Accuracy Graph for the Experiment

4 Confusion Matrix

The following figure 4 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.



	Predicted 0	Predicted 1
Actual 0	TN	FP
Actual 1	FN	TP

Figure 4: Demo Confusion Matrix

4.1 Confusion Matrix in Training Dataset

The following figure 5 is the Confusion Matrix in the training dataset for this experiment.

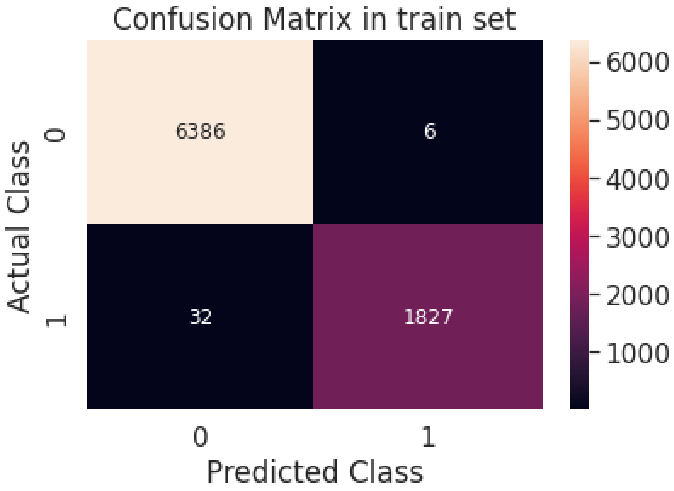


Figure 5: Confusion Matrix in training data

4.2 Confusion Matrix in Testing Dataset

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

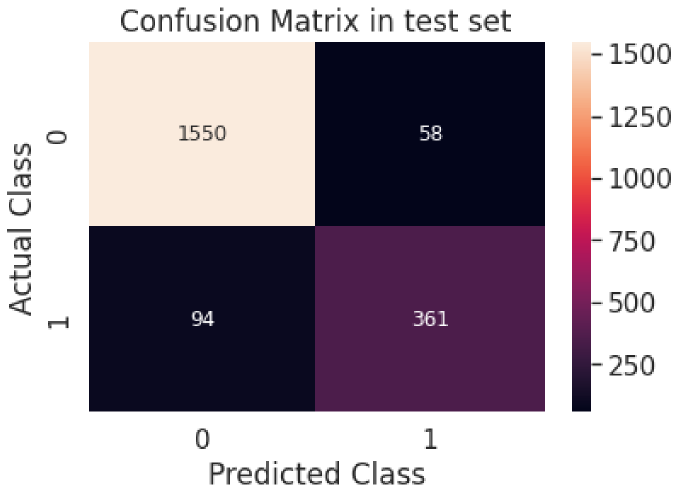


Figure 6: Confusion Matrix in testing data

5 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 RNN	92.29%	84.58%	79.56%	81.99%	92.57%

6 Github Repository

https://github.com/silvia-98/Text_Classifier-Detection-using-Bi-directional-RNN
The above link is the github repository for the assignment-3.