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INLP ASSIGNMENT 2 REPORT

Hyperparameters

After training and testing, the hyperparameters which I found the best working for the model and the given dataset were

```
EMBEDDING_DIM = 128
HIDDEN_DIM = 128
LEARNING_RATE = 0.2
NUM_EPOCHS = 10
```

Where,
EMBEDDING_DIM : The dimension of the input (the sentence) given to the LSTM model
HIDDEN_DIM : The dimension of the output (the POS tag) given by the model
LEARNING_RATE : The learning rate which is used to update the weights by the optimizer
NUM_EPOCHS : The number of times the model is trained on the entire dataset
Number of layers : 2 (LSTM and Forward)

The analysis section gives a reasoning to why these were selected

Scores

Analysis

I first ran an analysis by running the model for different combinations of the HIDDEN_DIM and EMBEDDING_DIM for a fixed combo of learning rate and number of epochs (0.2* 5) upon which I saw that the best combination that was coming was

HIDDEN_DIM : 2048
EMBEDDING_DIM : 512

But there wasn't much change in the F1 score after 128x 128 (in decimals) , therefore I chose the final combination as ***128x128***

 (had the maximum F1 score), since adding more dimensions to both the hidden output layer and the input embedding layer might be resulting in overfitting and thus reduced accuracies and F1 score for the latter combination of dimensions.

After selecting the best combination of these dimensions, I then ran the analysis to find the best combination of LEARNING_RATE and NUM_EPOCHS such that there is a decent tradeoff between both the accuracy of the model and the time it will take to train.

I found the best combo to be :

LEARNING_RATE : 0.2
NUM_EPOCHS : 10

I kept the layers to be two and the model to be a simple LSTM model, although having more layers or having a totally different model like a Bi-LSTM could have possibly given a better accuracy, but I decided to go for a simpler model.

The following list is the result of trying different combos of EMBEDDING_DIM and HIDDEN_DIM on the model :

EMBEDDING_DIM	HIDDEN_DIM	F1 Score
2048	512	96.23100161552429
512	32	96.10942006111145
512	128	96.10942006111145
1024	256	96.04862928390503
1024	512	96.04862928390503
1024	1024	96.01823687553406
512	64	96.00303769111633
512	1024	95.98784446716309

EMBEDDING_DIM	HIDDEN_DIM	F1 Score
2048	256	95.98784446716309
1024	128	95.97264528274536
256	512	95.95744609832764
512	512	95.94224691390991
1024	2048	95.92705368995667
2048	128	95.89665532112122
2048	1024	95.89665532112122
2048	2048	95.88145613670349
64	128	95.86626291275024
256	32	95.86626291275024
256	256	95.86626291275024
16	2048	95.82067131996155
512	256	95.82067131996155
2048	64	95.80547213554382
128	64	95.77507376670837
512	2048	95.77507376670837
128	256	95.75988054275513
128	1024	95.6990897655487
128	512	95.68389058113098
128	32	95.66869139671326
256	1024	95.66869139671326
256	128	95.65349817276001
256	2048	95.60790061950684
128	128	95.59270739555359
32	2048	95.54710984230042
64	256	95.54710984230042
128	2048	95.54710984230042
1024	64	95.54710984230042
256	16	95.48632502555847
128	16	95.47112584114075
256	64	95.47112584114075

EMBEDDING_DIM	HIDDEN_DIM	F1 Score
8	1024	95.4407274723053
64	64	95.4407274723053
2048	32	95.4407274723053
64	2048	95.42553424835205
1024	32	95.42553424835205
8	2048	95.31915187835693
32	1024	95.30395269393921
16	512	95.25836110115051
32	128	95.22796273231506
64	512	95.19757032394409
16	32	95.18237113952637
64	32	95.18237113952637
512	16	95.15197277069092
32	256	95.10638117790222
16	128	95.09118795394897
1024	16	95.01519799232483
64	16	94.92401480674744
32	32	94.90881562232971
32	64	94.84802484512329
16	256	94.77203488349915
16	1024	94.77203488349915
64	1024	94.77203488349915
32	16	94.74164247512817
32	8	94.72644329071045
16	8	94.68085169792175
32	512	94.66565251350403
8	256	94.6504533290863
8	128	94.63526010513306
16	64	94.62006092071533
64	8	94.58966851234436
16	16	94.57446932792664

EMBEDDING_DIM	HIDDEN_DIM	F1 Score
8	64	94.37689781188965
8	32	94.20972466468811
128	8	94.20972466468811
8	16	94.13374066352844
8	512	93.99695992469788
8	8	93.9665675163269
2048	16	93.58662366867065
256	8	93.2218849658966
512	8	91.32218956947327
1024	8	87.11246252059937
2048	8	80.75987696647644

While keeping,
EMBEDDING_DIM : 128
HIDDEN_DIM : 128
NUM_EPOCHS : 10
Since they give the maximum F1 Score.

LEARNING_RATE	F1 Score
0.2	96.12461924552917
0.1	96.10942006111145
0.15	96.07902765274048
0.3	96.01823687553406
0.02	95.98784446716309
0.05	95.98784446716309
0.25	95.97264528274536
0.5	95.97264528274536
0.08	95.97264528274536
0.01	95.95744609832764
0.4	95.86626291275024

LEARNING_RATE	F1 Score
0.001	93.95136833190918

Therefore, the best learning rate was found to be 0.2.

LEARNING_RATE	F1 Score