**ADVANCED MACHINE LEARNING**

**Assignment 4: Recurrent Neural Networks**

Recurrent neural networks is also know as deep learning model in neural network, Loops in RNNs enable the persistence of data over time. They perform efficiently for tasks involving sequential data processing like time series forecasting, speech recognition, picture captioning, and natural language processing. They develop at identifying the connections between issues in dataset, When it comes to tasks that need word, phrase, and paragraph sequences, RNNs perform. In this study, the IMDb movie review dataset was analyzed using RNNs with embedded layers.

1. Initial training the model using a which consisted of 100 training samples with cutoff reviews of 150 words and consider only the top 10,000 words. This model is testing with 10000 validation samples of both positive and negative inputs, The binary loss function was utilized because the classification model made use of the Adam optimizer. Training the model and finding the Embedding and Pre train model accuracy. We can see below table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cutoff | No.of Words | Training samples | Validation samples | Embedding Accuracy | Pre-Trained Accuracy |
| 150 | 10000 | 100 | 10000 | 57 | 59.07 |

2. Now training using the different training samples without change cutoff review, validation samples and words to determine the which embedding layer gives better performance. We can see below table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cutoff | Training samples | Validation samples | No.of Words | Embedding Accuracy | Pre-Trained Accuracy |
| 150 | 100 | 10000 | 10000 | 57.00 | 59.07 |
| 150 | 500 | 10000 | 10000 | 61.65 | 66.94 |
| 150 | 1000 | 10000 | 10000 | 64.01 | 68.67 |
| 150 | 4000 | 10000 | 10000 | 68.98 | 72.23 |
| 150 | 8000 | 10000 | 10000 | 71.42 | 71.01 |
| 150 | 10000 | 10000 | 10000 | 82.42 | 85.73 |
| 150 | 15000 | 10000 | 10000 | 87.88 | 84.96 |

After training the different train sample at last sample size 15000 the Embedding layer accuracy is 87.88 which is best accuracy either than other train sample.

**Final Results:**

\*According to my Observation embedding methods were greatly performed better than by RNNs with embedded layers.

\* Embedded layer-based models are regularly best performed than other models in the model of test loss and accuracy.

\* it shows that when the sample size increase between the values of 100 to 15000 in model, so that the performance of the model improved. when we changing the train sample then parallel the both accuracy also increases but at 8000 sample the model give both accuracy similarity value.

\* Finally, the training samples of the 15000 yielded a the embedding layer test accuracy recorded as Highest accuracy, which the value is 87.88

**Conclusion:**

\*The efficiency of an embedding layer compared to a pre-trained word embedding for text and sequence tasks which depends on a no. of variables, which include the train sample size of the training data, the set of words used, and the assignment at issue. Therefore, it's important to evaluate each approach's positive and negative aspects before selecting which is ideal for a given natural language processing task.

\*For texts and sequences, training samples in deep learning are used to educate the neural network on how to recognize connections and trends in the data. The ideal sample size, however, may change based on the specific task, dataset, and model architecture that is being used. Sample sizes of 100 and 15000 were found to produce good results in terms of test accuracy and test loss in the provided dataset, with lower values showing higher performance. These sample sizes regularly showed improved results for a variety of embedding methods, including pre-trained GloVe embeddings and standard embedded layers.

\*The neural network can develop the ability to identify significant features and patterns within the data by providing a wide range of training samples, allowing it to make accurate forecasts on unknown data. Utilizing training samples can also assist in avoiding overfitting, a typical issue in deep learning when the model gets overly specialized to the training data and performs badly on fresh data. Compared to training embedded layers from scratch, word embeddings, specifically GloVe embeddings, provided models that were more efficient and accurate.