

Report :: TIPS Assignment - II

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1 Part 1: MNIST database

The following experiments were carried out on MNIST dataset

1.1 Task I: Number of layers

Number of layers were varied from 3 to 8, with all the other parameters being held same. Fig. 1 gives the plot of accuracy, F1 macro and micro score vs number of layers. The performance increases with increase in layers, but it decreases for 7 and 8 (Fig. 1)

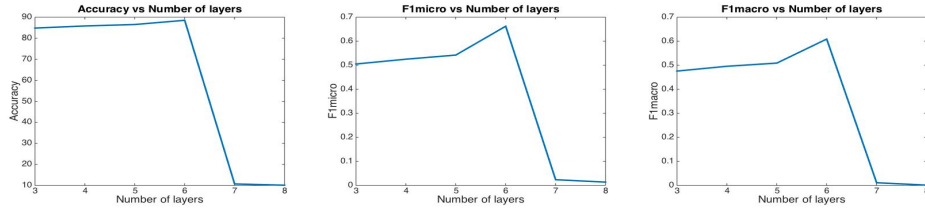


Figure 1: MNIST: Performance of MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

1.2 Task 2: Number of Neurons

Number of layers was kept constant as 4. Number of neurons in the middle 2 layers is varied as [5,10], [10,5], [20,20] and [30,30] (Fig. 2)

1.3 Task 3: Activation Functions

The various activation functions tried were sigmoid, tanh, ReLu and swish. The last layer was always segmax. The number of layers was 3 (Fig. 3)

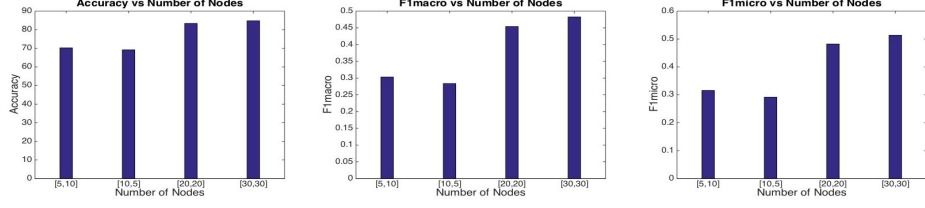


Figure 2: MNIST: Performance of MLP vs number of nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

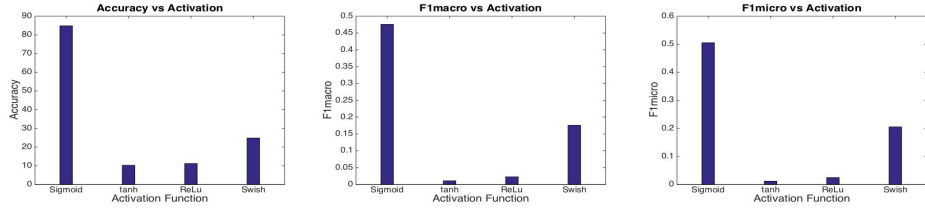


Figure 3: MNIST: Performance of MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

1.4 Task 4: initialization

The various initialization techniques followed were Uniform distribution with zero mean, Gaussian with variance 0.001, constant value and Gaussian with variance proportional to the number of neurons in each layer (Fig. 4)

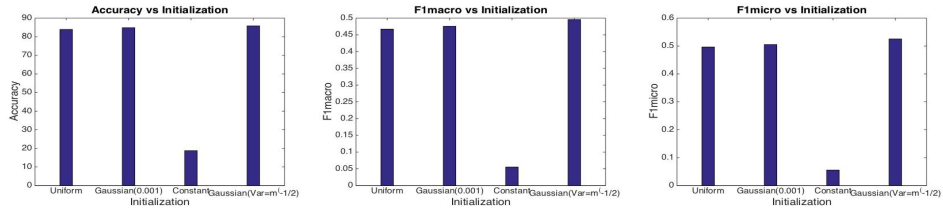


Figure 4: MNIST: Performance of MLP vs Initialization. Left: Accuracy, Middle: F1 macro, Right: F1 micro

1.5 Task 5: Comparison with Keras

This section shows the comparison of the implemented MLP with Keras implementation of MLP. The comparison was done with 5000 images, with approximately 500 images from each category. They were compared in terms of

number of layers, number of nodes, different activation functions and different initializations. (Fig. 5, 6, 7, 8)

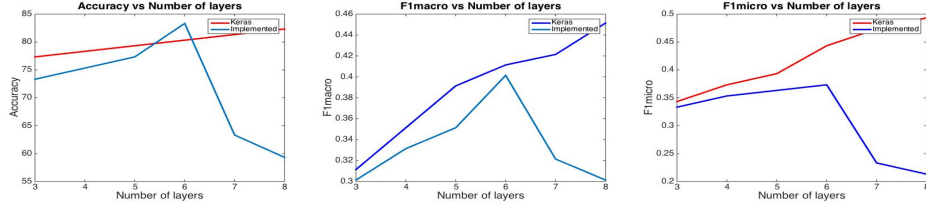


Figure 5: MNIST: Comparison of Performance of Keras and implemented MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

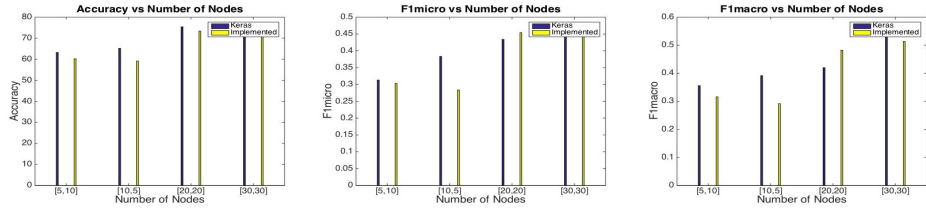


Figure 6: MNIST: Comparison of Performance of Keras and implemented MLP vs number of nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

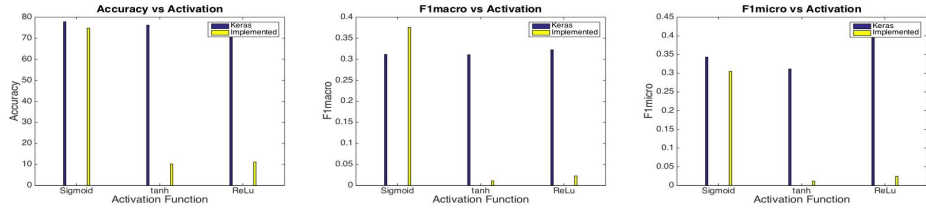


Figure 7: MNIST: Comparison of Performance of Keras and implemented MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2 Part 2: Cat-Dog database

The following experiments were conducted with Cat Dog database

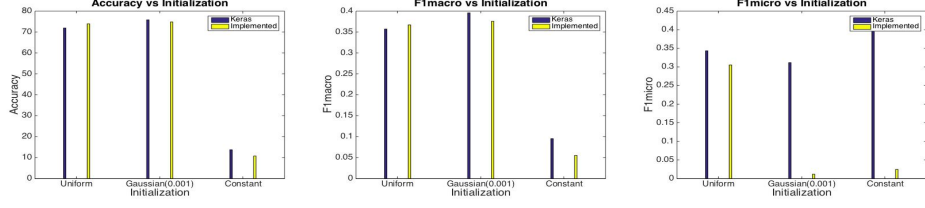


Figure 8: MNIST: Comparison of Performance of Keras and implemented MLP vs initializations. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2.1 Task I: Number of layers

Number of layers was varied from 3 to 8, with all the other parameters being held same. Fig. 9 gives the plot of accuracy, F1 macro and micro score vs number of layers. The performance increases with increase in layers, but it decreases for higher number of layers (Fig. 9)

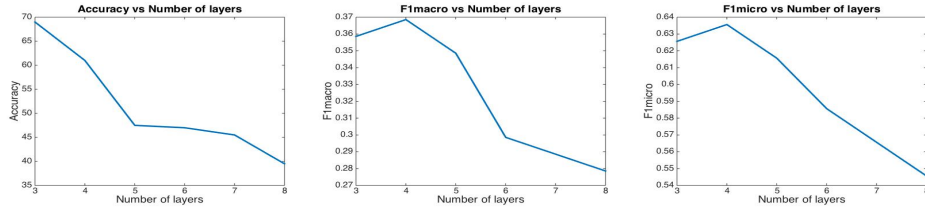


Figure 9: Cat-Dog: Performance of MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2.2 Task 2: Number of Neurons

Number of layers was kept constant. Number of neurons in the middle 2 layers is varied as [5,10], [10,5], [20,20] and [30,30] (Fig. 10)

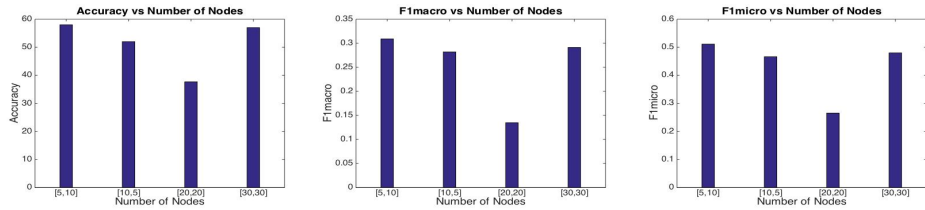


Figure 10: Cat-Dog: Performance of MLP vs number of nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2.3 Task 3: Activation Functions

The various activation functions tried were sigmoid, tanh, ReLu and swish. The last layer was always segmax. (Fig. 11)

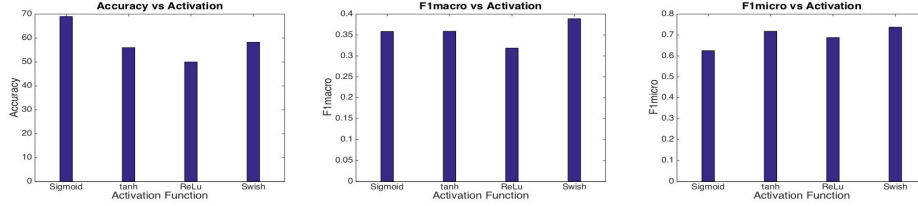


Figure 11: Cat-Dog: Performance of MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2.4 Task 4: initialization

The various initialization techniques followed were Uniform distribution with zero mean, Gaussian with varaince 0.001, constant value and Gaussisan with variance proportional to the number of neurons in each layer (Fig. 12)

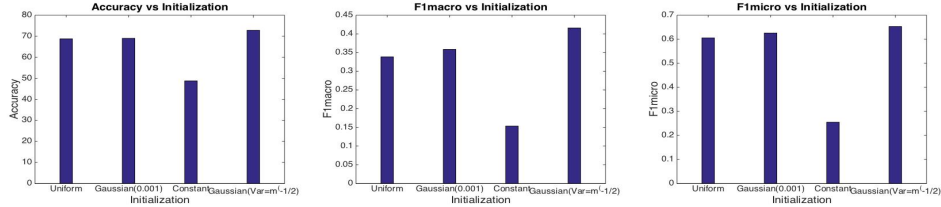


Figure 12: Cat-Dog: Performance of MLP vs Initialization. Left: Accuracy, Middle: F1 macro, Right: F1 micro

2.5 Task 5: Comparison with Keras

This section shows the comparison of the implemented MLP with Keras implementation of MLP. The comaparison was done with 5000 images, with approximately 500 images from each category. They were compared in terms of number of layers, number of nodes, different activation functions and different initializations. (Fig. 13, 14, 15, 16)

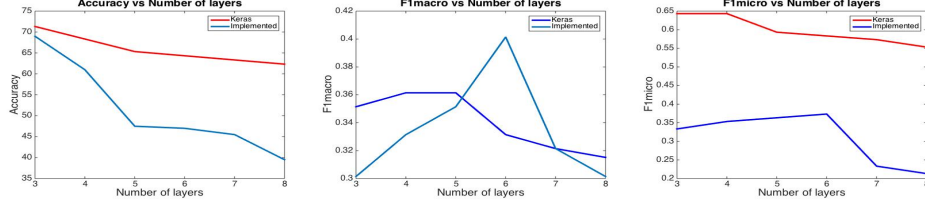


Figure 13: Cat-Dog: Comparison of Performance of Keras and implemented MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

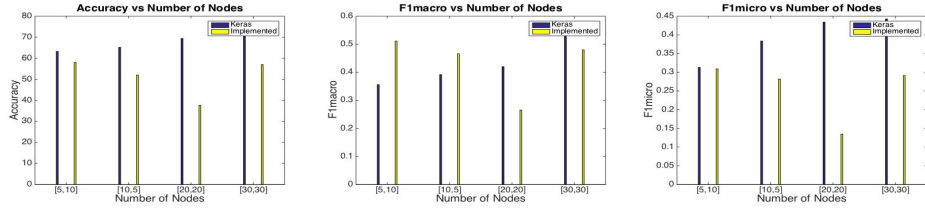


Figure 14: Cat-Dog: Comparison of Performance of Keras and implemented MLP vs number of nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

3 Part 3: Comparison with Bayes and NN

Bayes classifier was giving accuracy of approximately 85%, 35% and 50% on Dolphin, Pubmed and Twitter dataset. Nearset Neighbor classifier was providing an accuracy of approximately 90%, 35% and 40% on Dolphin, Pubmed and Twitter dataset

3.1 Task I: Number of layers

Number of layers was varied from 3 to 8, with all the other parameters being held same. Fig. 17, 18 and 19 give the plot of accuracy, F1 macro and micro score vs number of layers. The performance increases with increase in layers, but it decreases for higher number of layers (Fig. 17, 18, 19)

3.2 Task 2: Number of Neurons

Number of layers was kept constant. Number of neurons in the middle 2 layers is varied as [5,10], [10,5], [20,20] and [30,30] (Fig. 20, 21, 22)

3.3 Task 3: Activation Functions

The various activation functions tried were sigmoid, tanh, ReLu and swish. The last layer was always segmax. (Fig. 23, 24, 25)

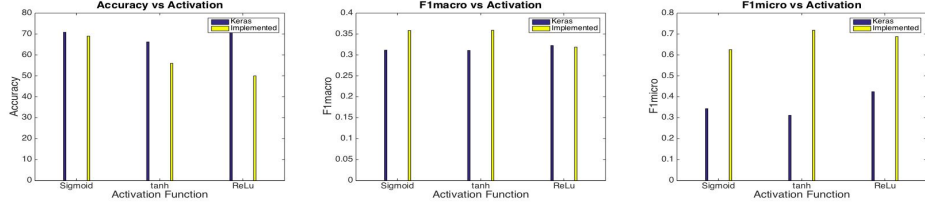


Figure 15: Cat-Dog: Comparison of Performance of Keras and implemented MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

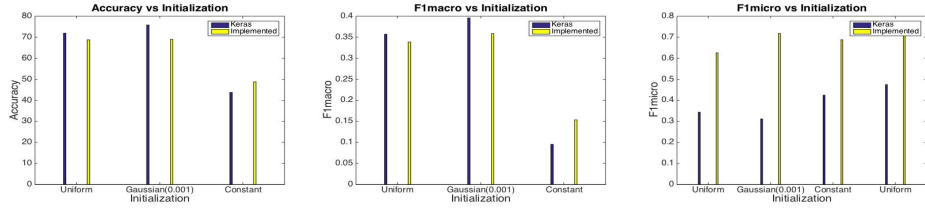


Figure 16: Cat-Dog: Comparison of Performance of Keras and implemented MLP vs initializations. Left: Accuracy, Middle: F1 macro, Right: F1 micro

3.4 Task 4: initialization

The various initialization techniques followed were Uniform distribution with zero mean, Gaussian with variance 0.001, constant value and Gaussian with variance proportional to the number of neurons in each layer (Fig. 26, 27, 28)

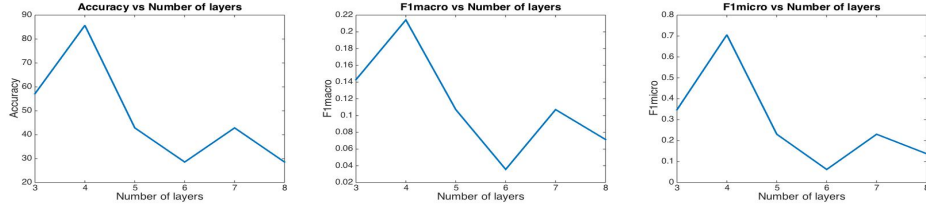


Figure 17: Dolphin: Performance of MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

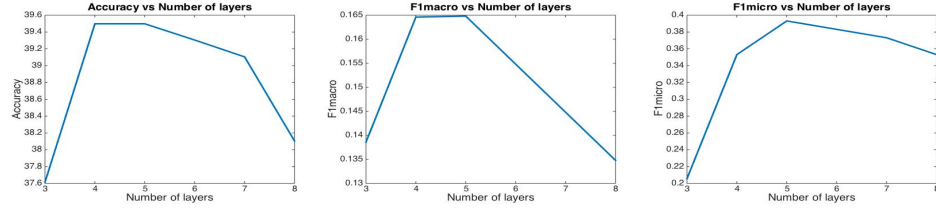


Figure 18: Pubmed: Performance of MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

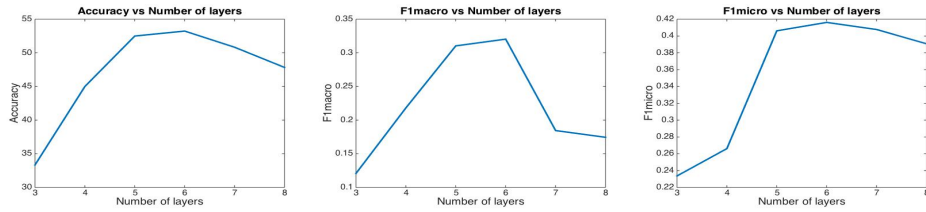


Figure 19: Twitter: Performance of MLP vs number of layers. Left: Accuracy, Middle: F1 macro, Right: F1 micro

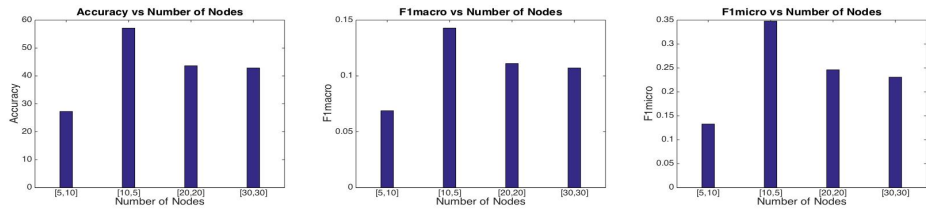


Figure 20: Dolphins: Performance of MLP vs number of Nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

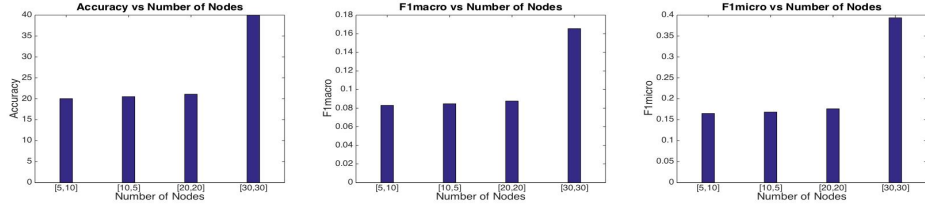


Figure 21: Pubmed: Performance of MLP vs number of Nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

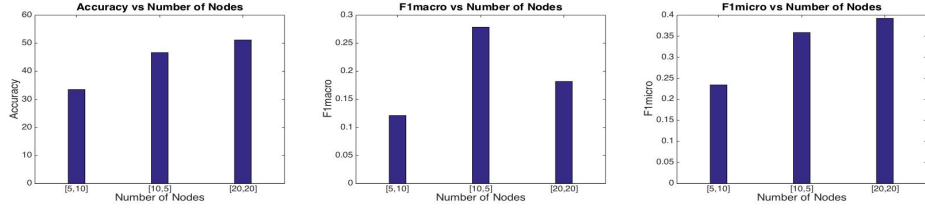


Figure 22: Twitter: Performance of MLP vs number of Nodes. Left: Accuracy, Middle: F1 macro, Right: F1 micro

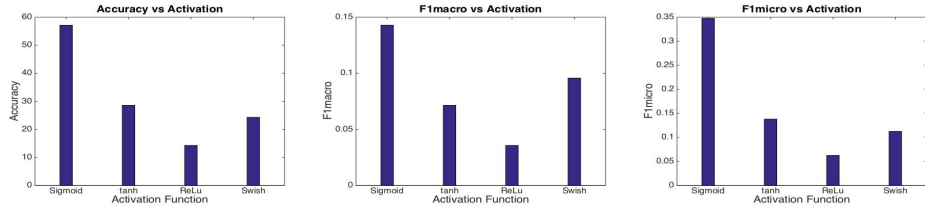


Figure 23: Dolphins: Performance of MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

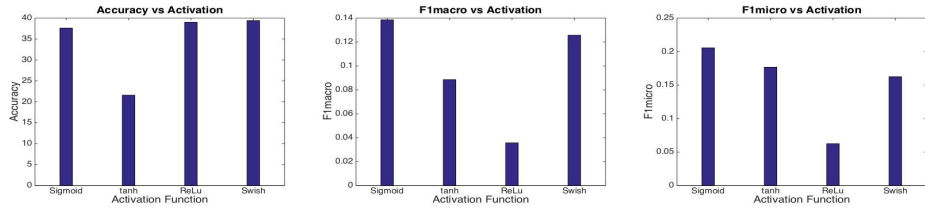


Figure 24: Pubmed: Performance of MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

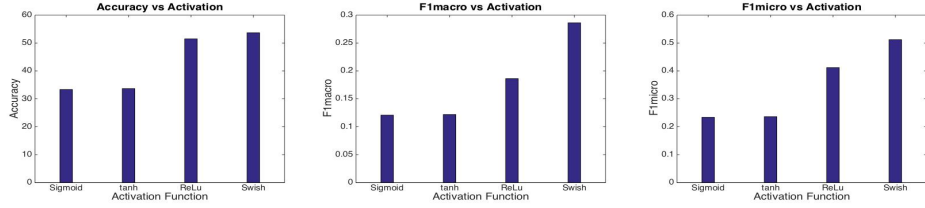


Figure 25: Twitter: Performance of MLP vs Activation functions. Left: Accuracy, Middle: F1 macro, Right: F1 micro

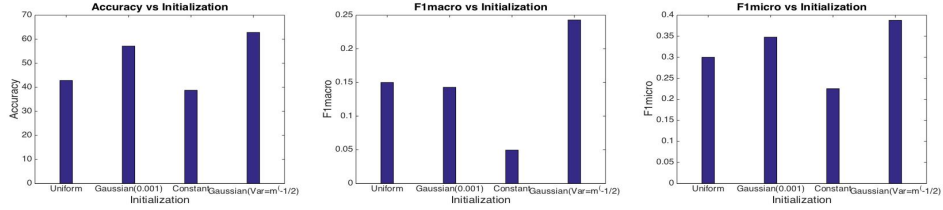


Figure 26: Dolphins: Performance of MLP vs Initialization. Left: Accuracy, Middle: F1 macro, Right: F1 micro

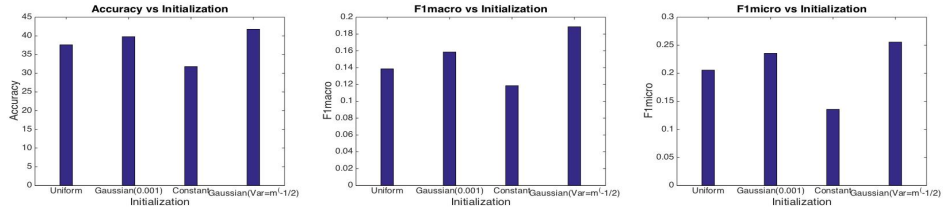


Figure 27: Pubmed: Performance of MLP vs Initialization. Left: Accuracy, Middle: F1 macro, Right: F1 micro

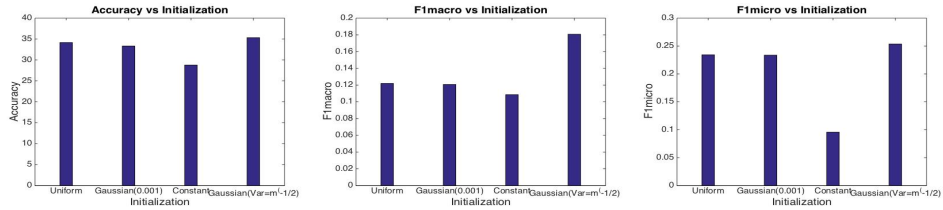


Figure 28: Twitter: Performance of MLP vs Initialization. Left: Accuracy, Middle: F1 macro, Right: F1 micro