INDIAN INSTITUTE OF SCIENCE, BANGALORE

TOPICS IN PATTERN RECOGNITION ASSIGNMENT 2

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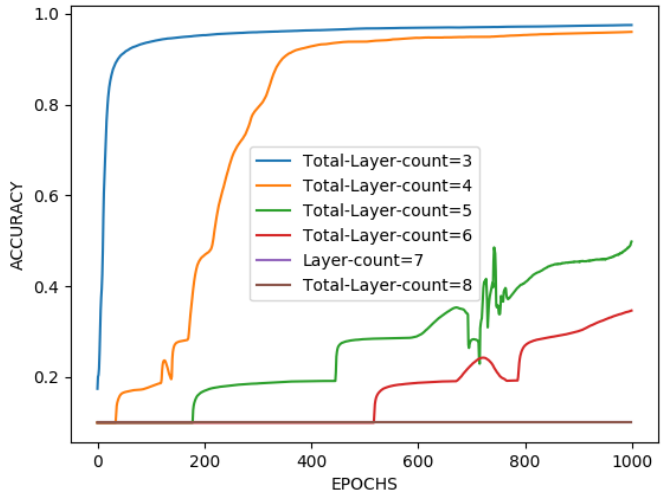
March 4, 2019

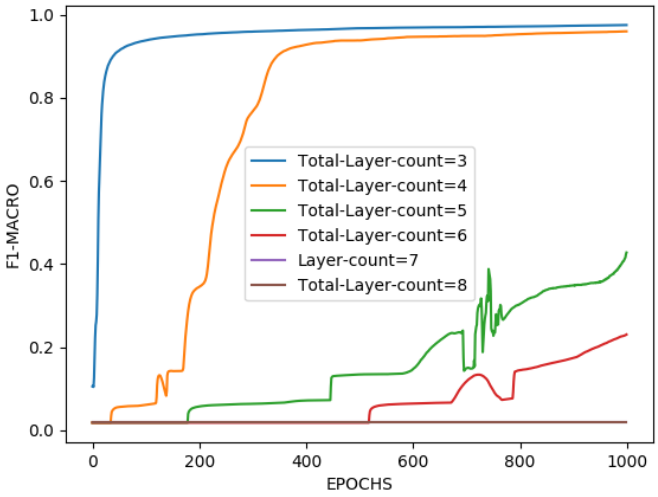
Part 1:

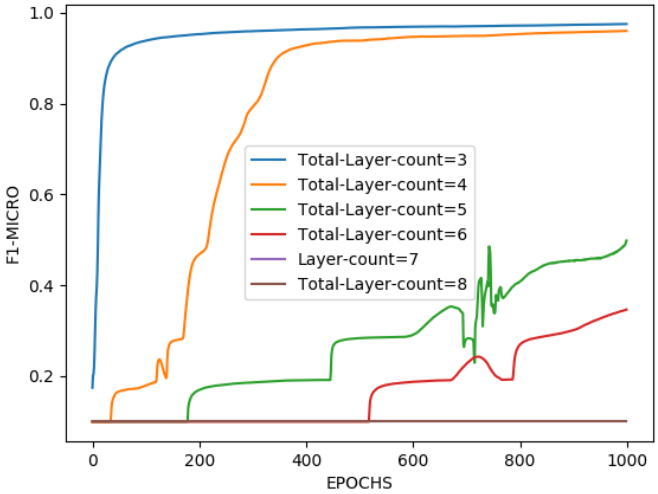
To test the neural net "MNIST_PAR" file, added in the repository, has to be included in the current working directory. This file contains the neural net model parameters for eg, weights matrix, bias, mean, std, list of nodes, activation functions. These all parameters will be required to test the neural net for different sample of MNIST Dataset.

Task 1 plot :

I checked the behaviour of my neural net for minimum of 1 and maximum of 6 hidden layers.

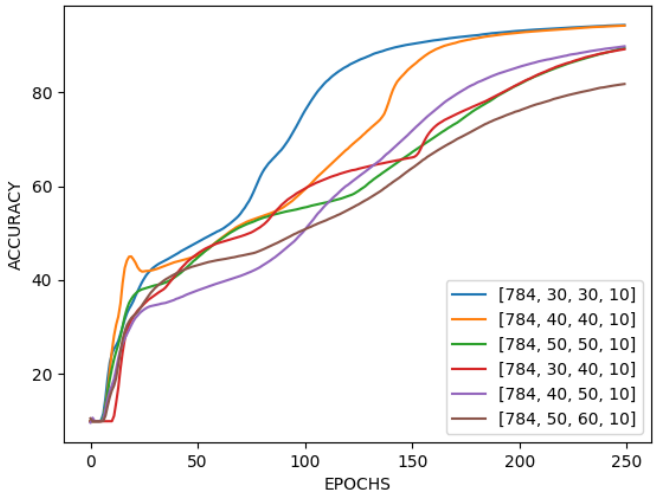


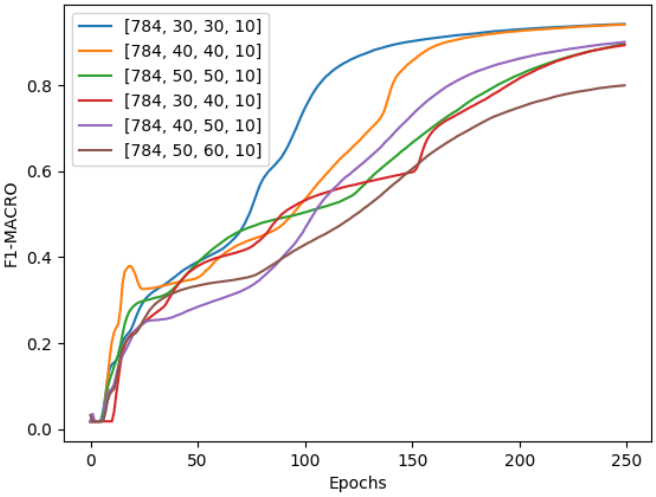


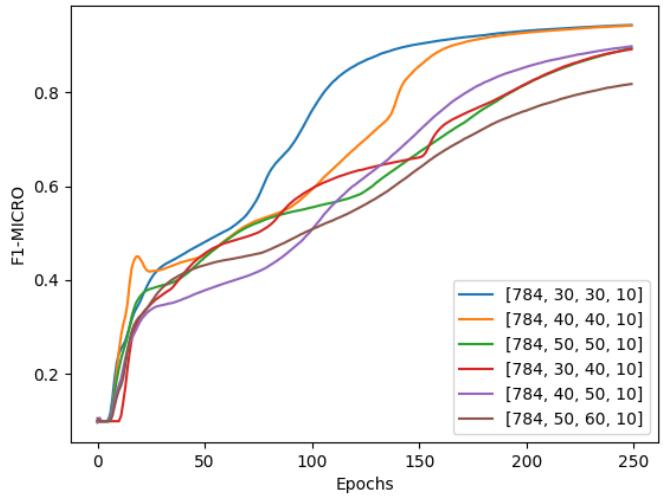


Task 2 plot :

In this I varied the number of neurons in the hidden layers keeping the activation function fixed.

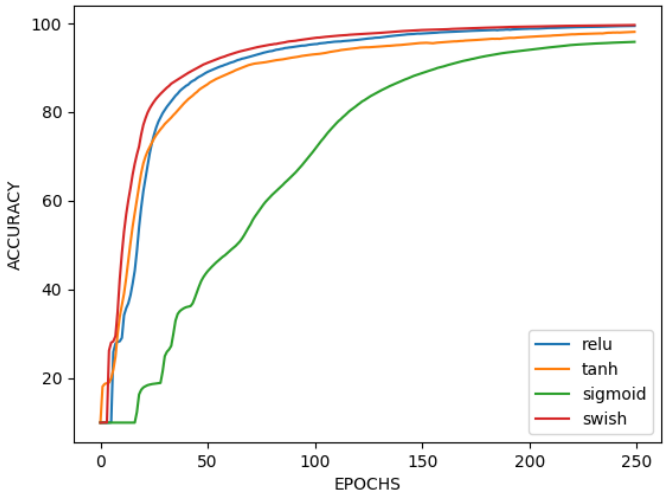

ACCURACY
EPOCHS
[784, 30, 30, 10]
[784, 40, 40, 10]
[784, 50, 50, 10]
[784, 30, 40, 10]
[784, 40, 50, 10]
[784, 50, 60, 10]

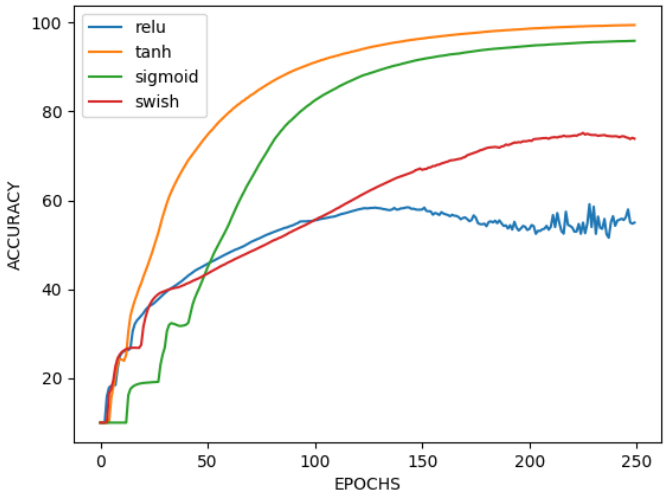

F1-MACRO
Epochs
[784, 30, 30, 10]
[784, 40, 40, 10]
[784, 50, 50, 10]
[784, 30, 40, 10]
[784, 40, 50, 10]
[784, 50, 60, 10]

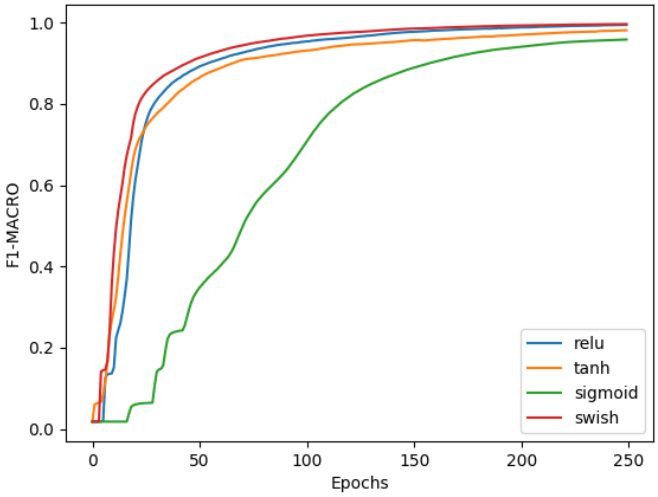


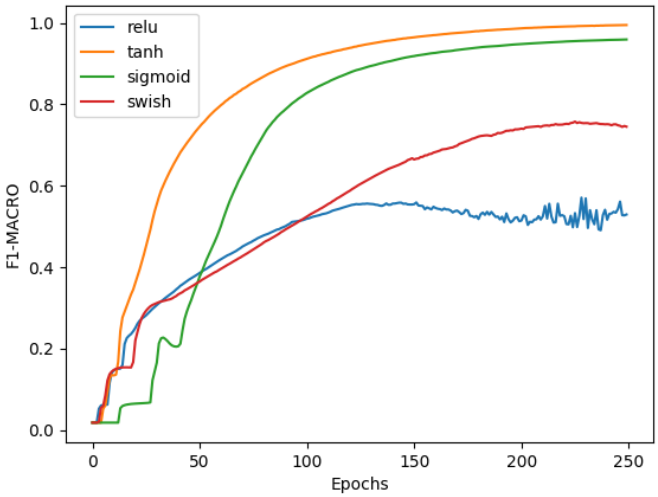
Task 3 plot :

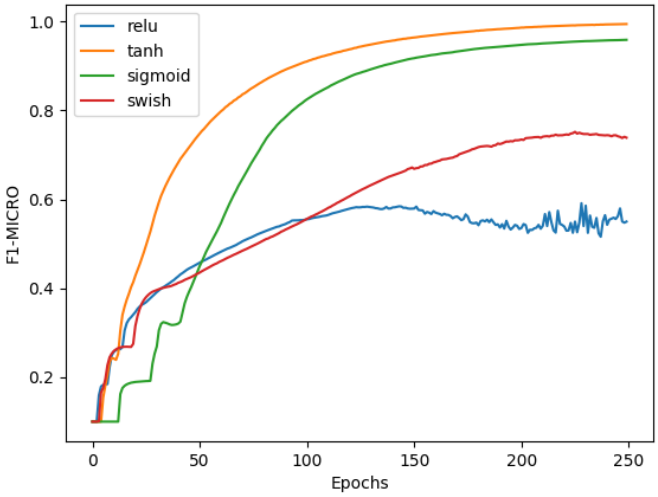
In this task different activation functions need to be tested. For plots under this task, first plot for each measure shows the results when I change the activation function of the first layer keeping the first layer fixed. And second graph shows tests when activation function of second layer is varied.

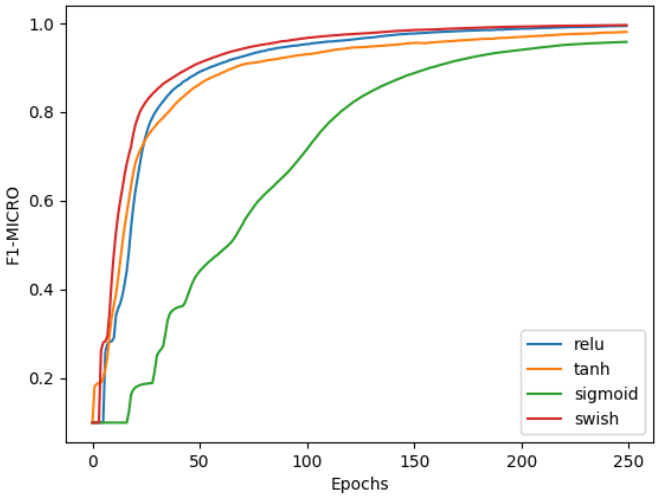



relu
tanh
sigmoid
swish
ACCURACY
EPOCHS
100
80
60
40
20
0
50
100
150
200
250


relu
tanh
sigmoid
swish
F1-MACRO
Epochs
1.0
0.8
0.6
0.4
0.2
0.0
0
50
100
150
200
250

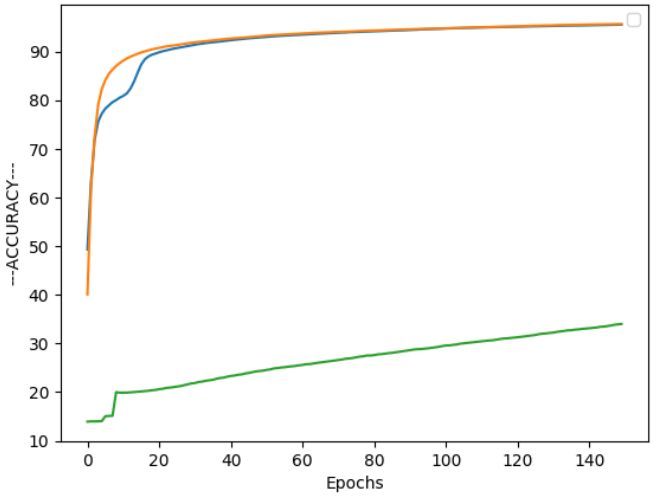

relu
tanh
sigmoid
swish
F1-MACRO
Epochs
0.0
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
250

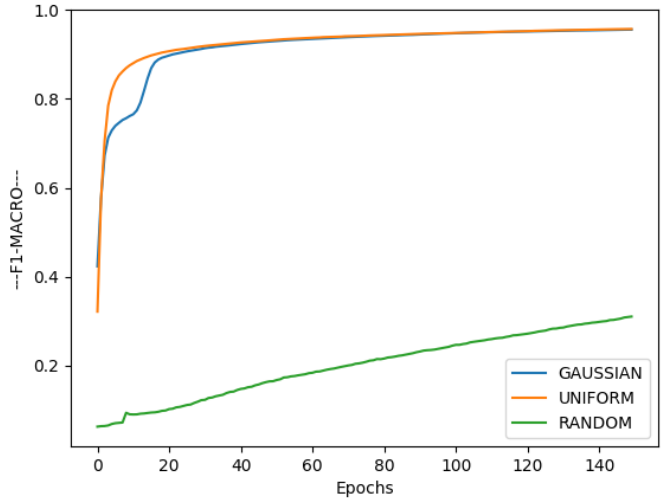

relu
tanh
sigmoid
swish
F1-MICRO
Epochs
0.2
0.4
0.6
0.8
1.0
0
50
100
150
200
250

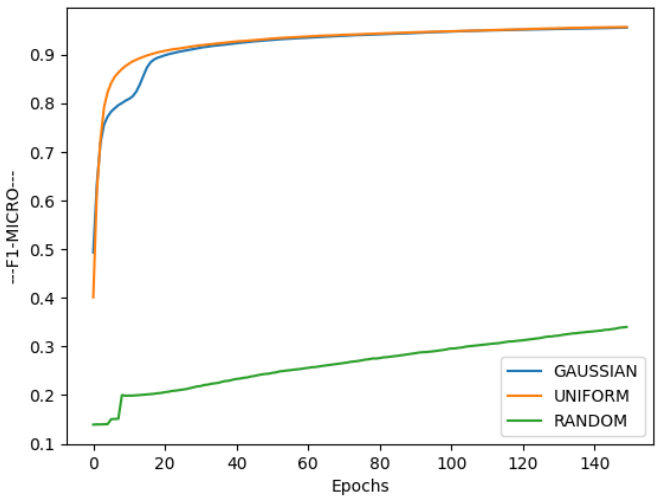


Task 4 plot :

I tried three initialization techniques. 1) UNIFORM 2) GAUSSIAN 3) RANDOM



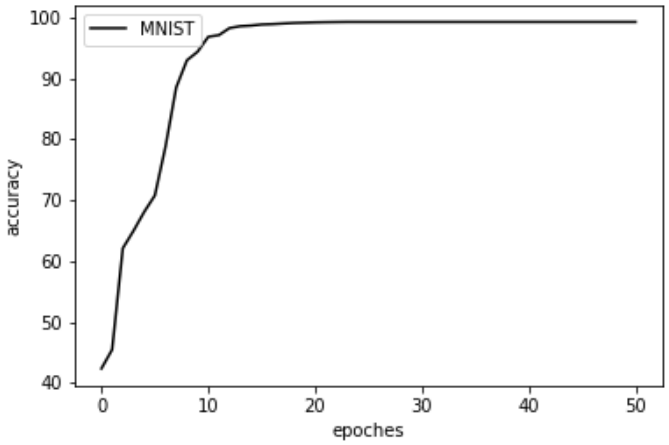




(2).png

Task 5 :

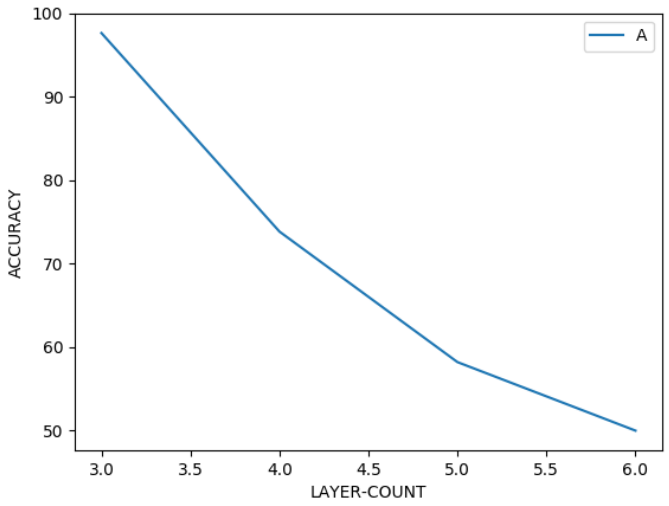
This shows the graph of Keras. I have put the keras code for the reference.

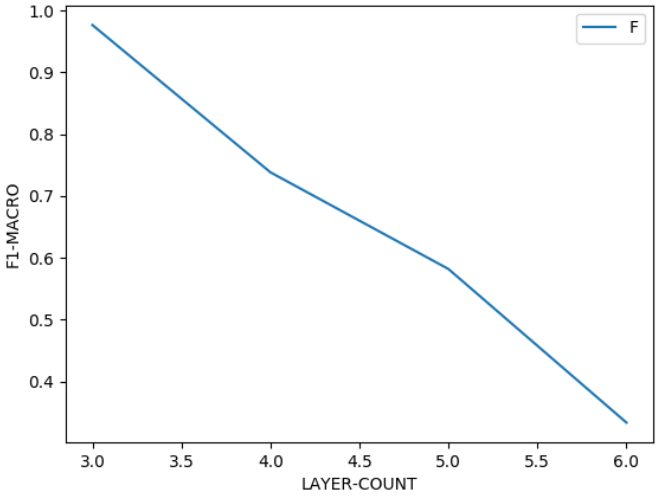


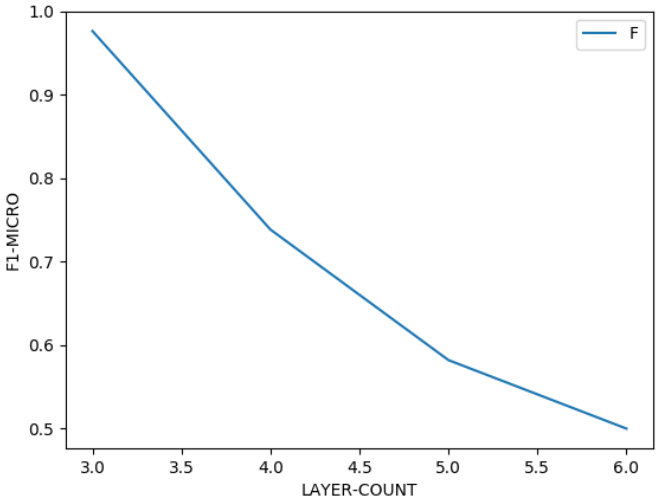
Part 2:

In this same tests are run as that of the MNIST dataset but on Cat-Dog dataset. To test the neural net "CATDOG_PAR" file, added in the repository, has to be included in the current working directory. This file contains the neural net model parameters for eg, weights matrix, bias, mean, std, list of nodes, activation functions. These all parameters will be required to test the neural net for different sample of Cat-Dog Dataset.

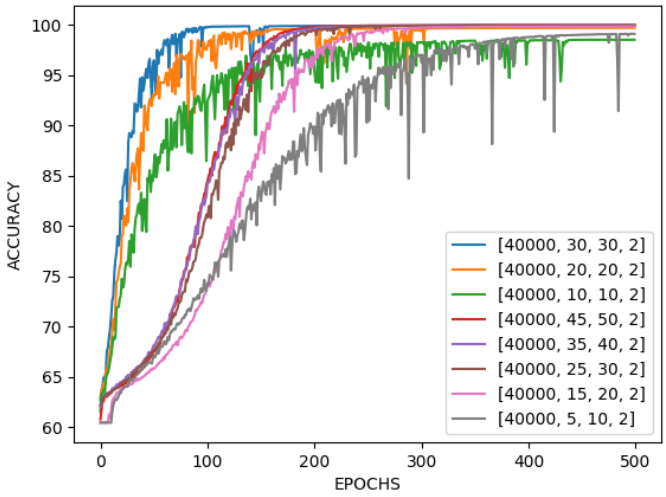
Task 1 plot :

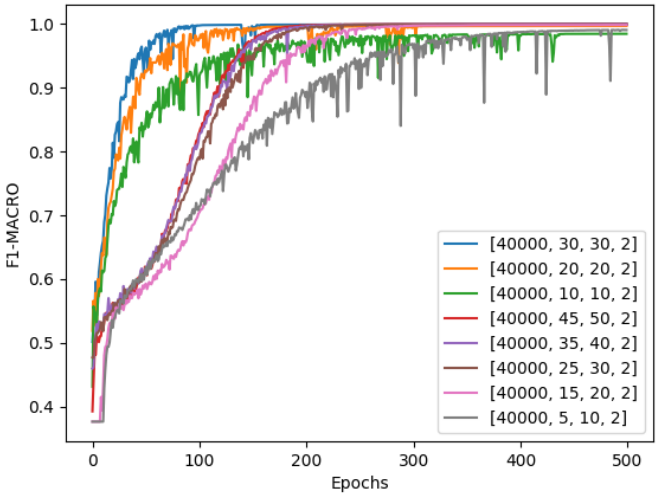


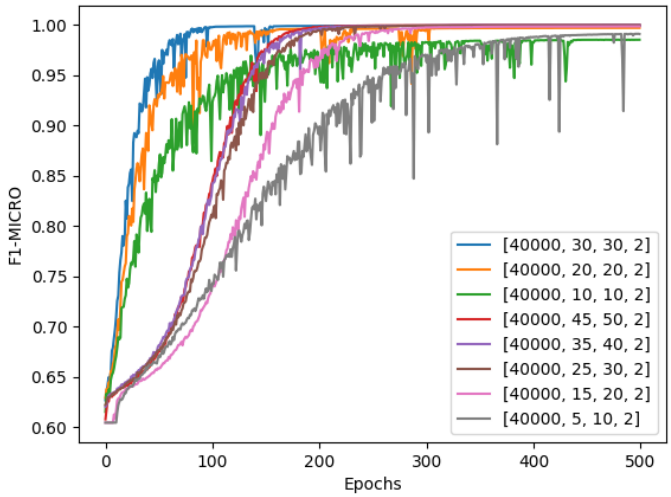

F
1.0
0.9
0.8
0.7
0.6
0.5
0.4
F1-MACRO
3.0
3.5
4.0
4.5
5.0
5.5
6.0
LAYER-COUNT


F
1.0
0.9
0.8
0.7
0.6
0.5
F1-MICRO
3.0
3.5
4.0
4.5
5.0
5.5
6.0
LAYER-COUNT

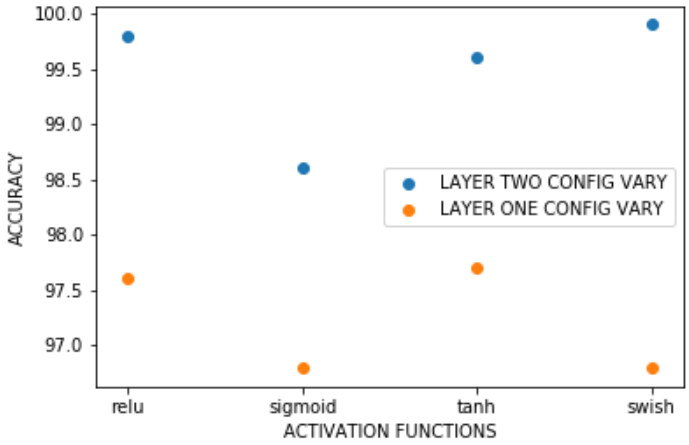
Task 2 plot :

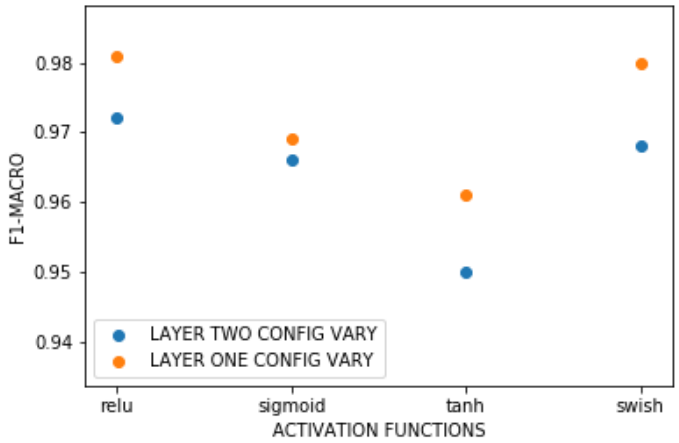

ACCURACY
EPOCHS
[40000, 30, 30, 2]
[40000, 20, 20, 2]
[40000, 10, 10, 2]
[40000, 45, 50, 2]
[40000, 35, 40, 2]
[40000, 25, 30, 2]
[40000, 15, 20, 2]
[40000, 5, 10, 2]

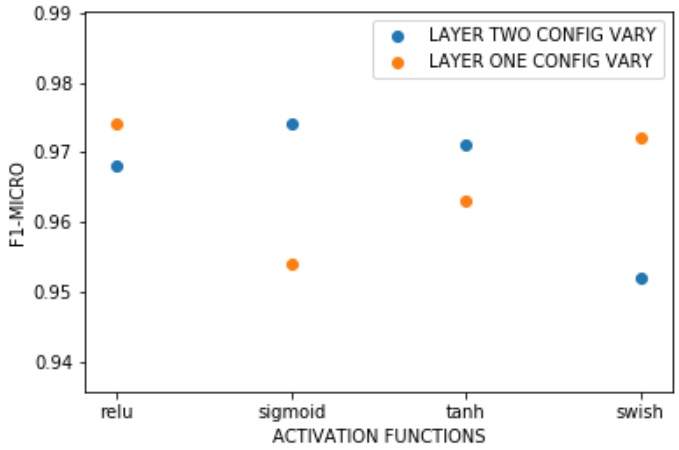

F1-MACRO
Epochs
[40000, 30, 30, 2]
[40000, 20, 20, 2]
[40000, 10, 10, 2]
[40000, 45, 50, 2]
[40000, 35, 40, 2]
[40000, 25, 30, 2]
[40000, 15, 20, 2]
[40000, 5, 10, 2]


F1-MICRO
Epochs
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0
100
200
300
400
500
[40000, 30, 30, 2]
[40000, 20, 20, 2]
[40000, 10, 10, 2]
[40000, 45, 50, 2]
[40000, 35, 40, 2]
[40000, 25, 30, 2]
[40000, 15, 20, 2]
[40000, 5, 10, 2]

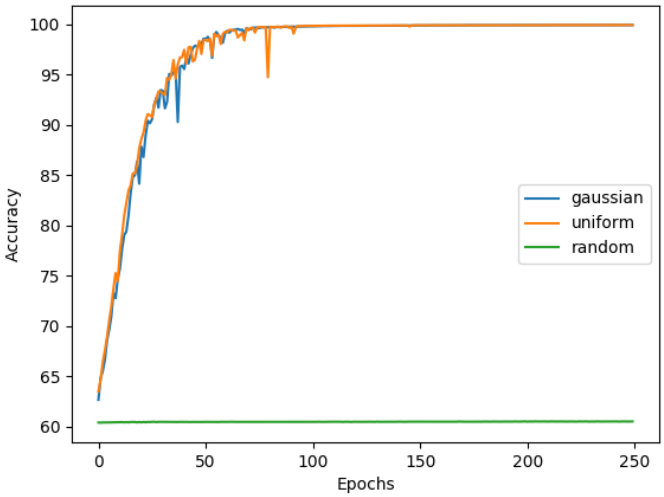
Task 3 plot :

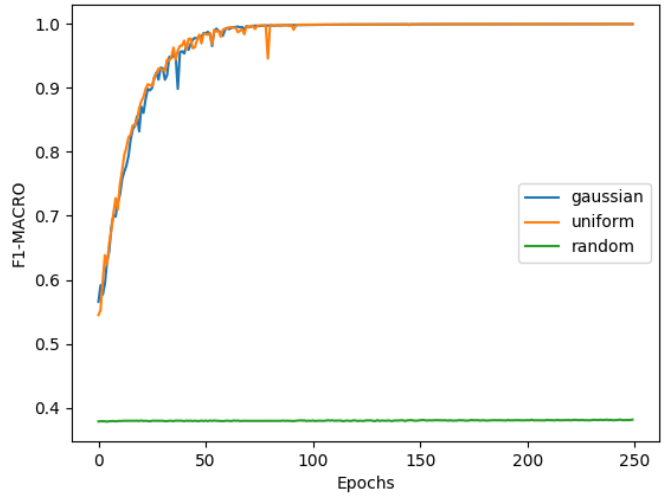

ACCURACY
ACTIVATION FUNCTIONS
100.0
99.5
99.0
98.5
98.0
97.5
97.0
relu
sigmoid
tanh
swish
LAYER TWO CONFIG VARY
LAYER ONE CONFIG VARY

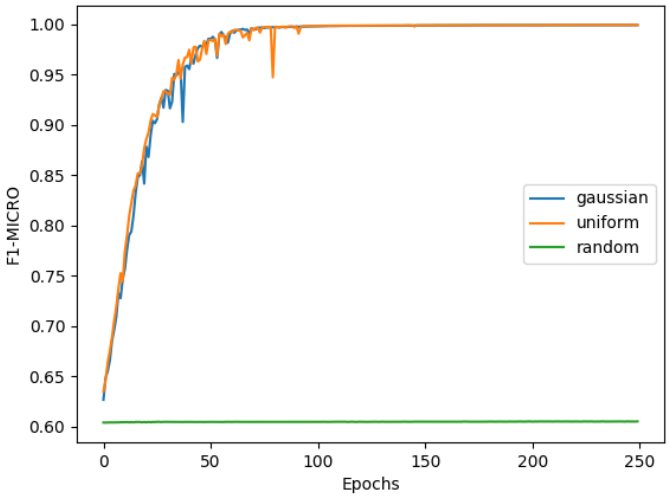

0.98
0.97
0.96
0.95
0.94
F1-MACRO
LAYER TWO CONFIG VARY
LAYER ONE CONFIG VARY
relu
sigmoid
tanh
swish
ACTIVATION FUNCTIONS


0.99
0.98
0.97
0.96
0.95
0.94
F1-MICRO
LAYER TWO CONFIG VARY
LAYER ONE CONFIG VARY
relu
sigmoid
tanh
swish
ACTIVATION FUNCTIONS

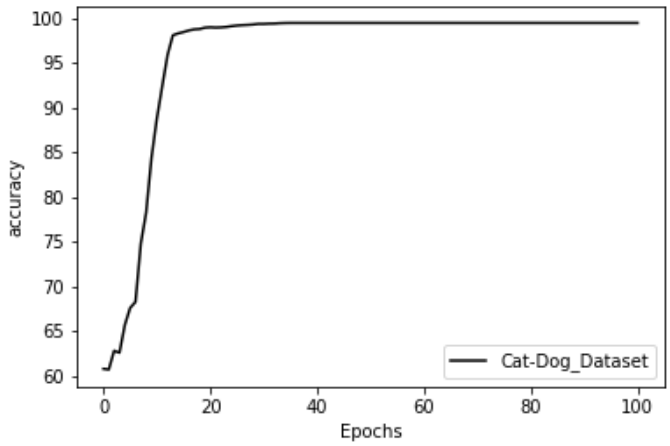
Task 4 plot :


Accuracy
Epochs
gaussian
uniform
random


F1-MACRO
Epochs
gaussian
uniform
random



Task 5 :

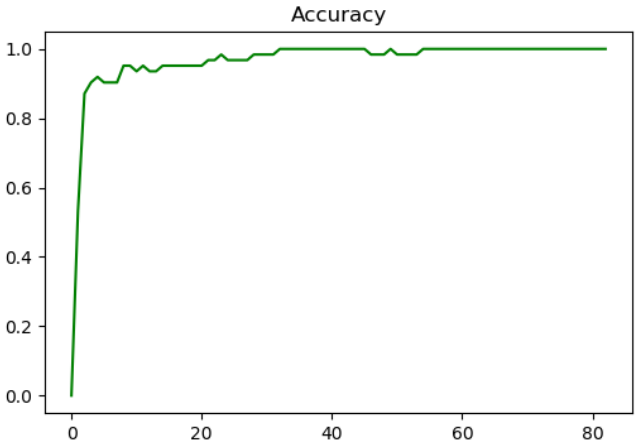


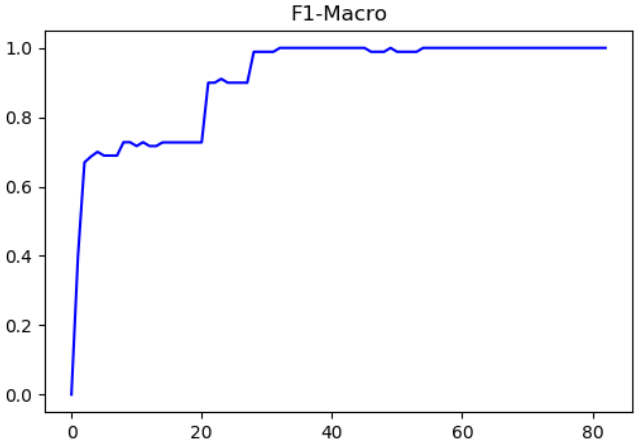
PART- THREE:

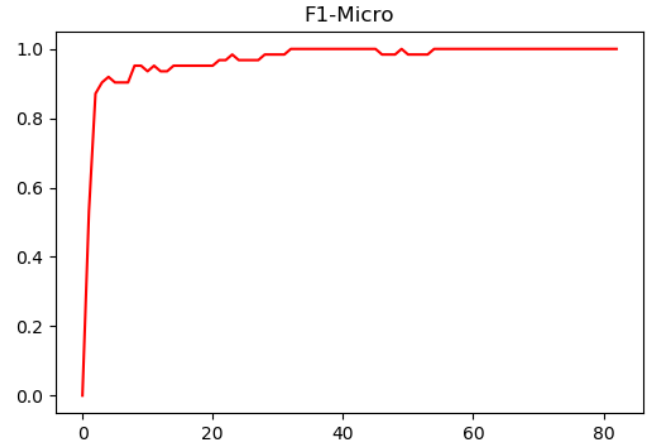
Previous 3 Dataset :-

I tested the same neural net on three datasets that were given for the first assignment and the tests results are depicted by the graph.

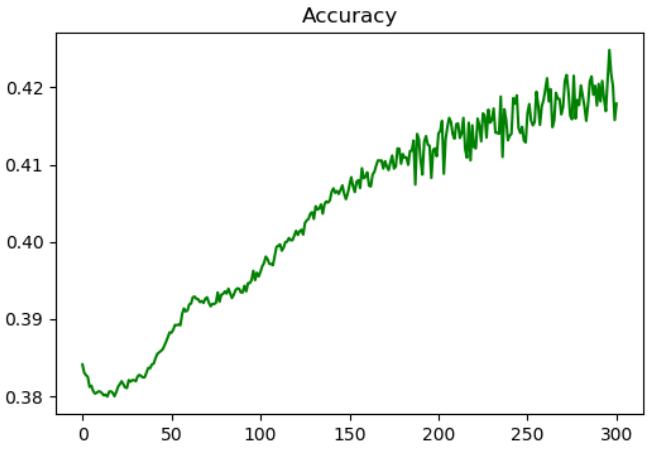
Dolphin:-

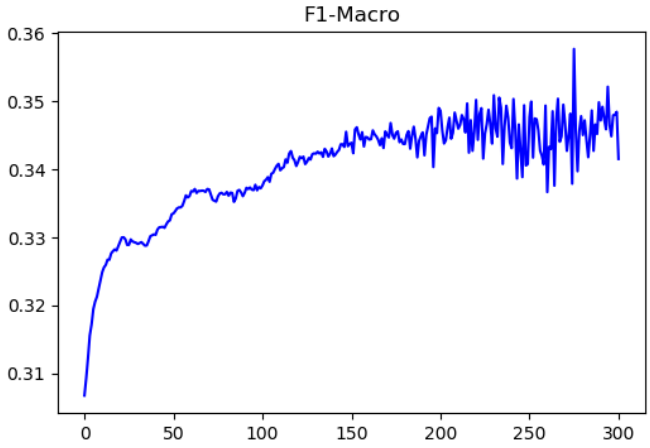

Accuracy
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80

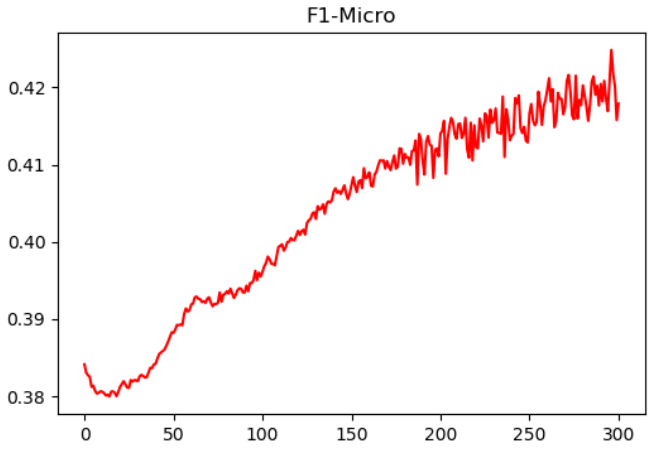

F1-Macro
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80


F1-Micro
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80

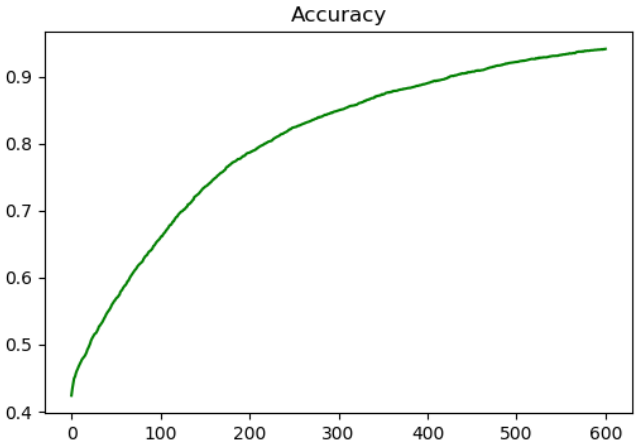
Pubmed:-

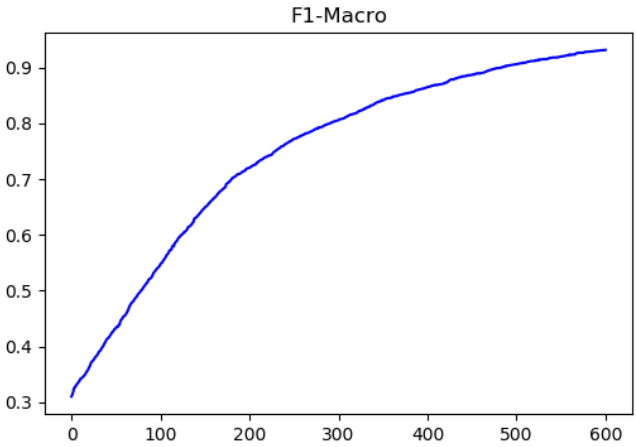

Accuracy
0.42
0.41
0.40
0.39
0.38
0
50
100
150
200
250
300

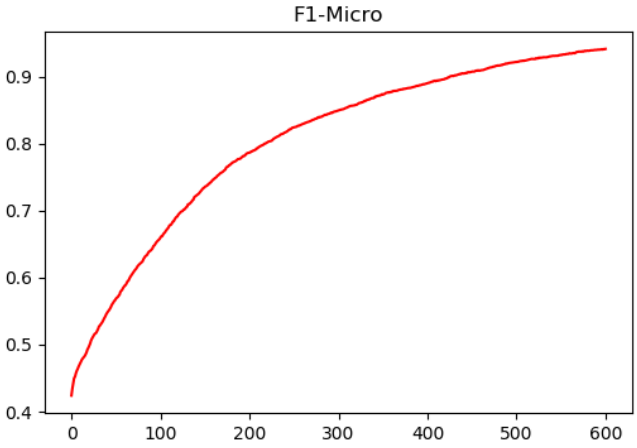

F1-Macro
0.36
0.35
0.34
0.33
0.32
0.31
0
50
100
150
200
250
300


F1-Micro
0.42
0.41
0.40
0.39
0.38
0
50
100
150
200
250
300

Twitter:-


Accuracy
0.9
0.8
0.7
0.6
0.5
0.4
0
100
200
300
400
500
600


F1-Macro
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0
100
200
300
400
500
600



(Some text file are included in the repository for checking the executions of the tasks.)