Question 3:

Logistic Regression

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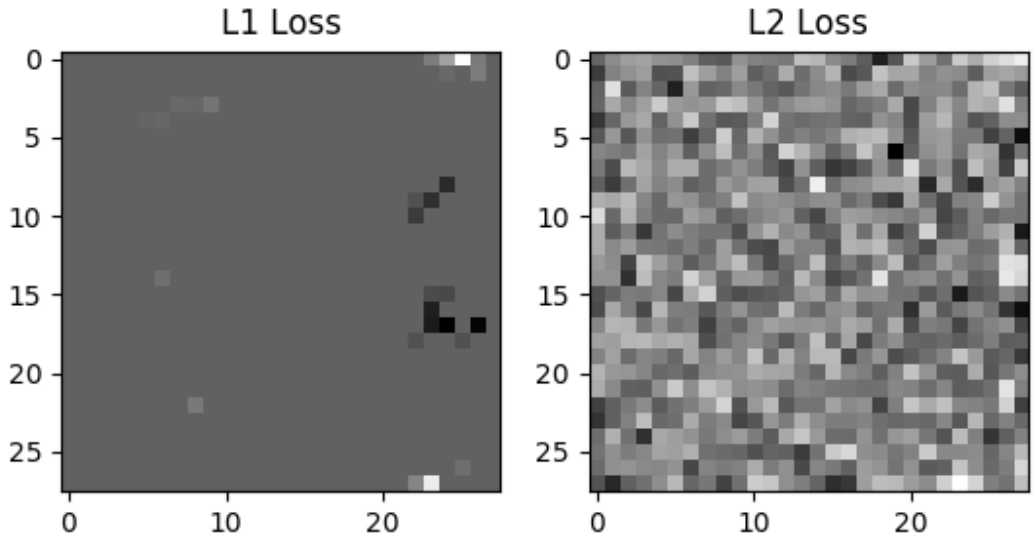
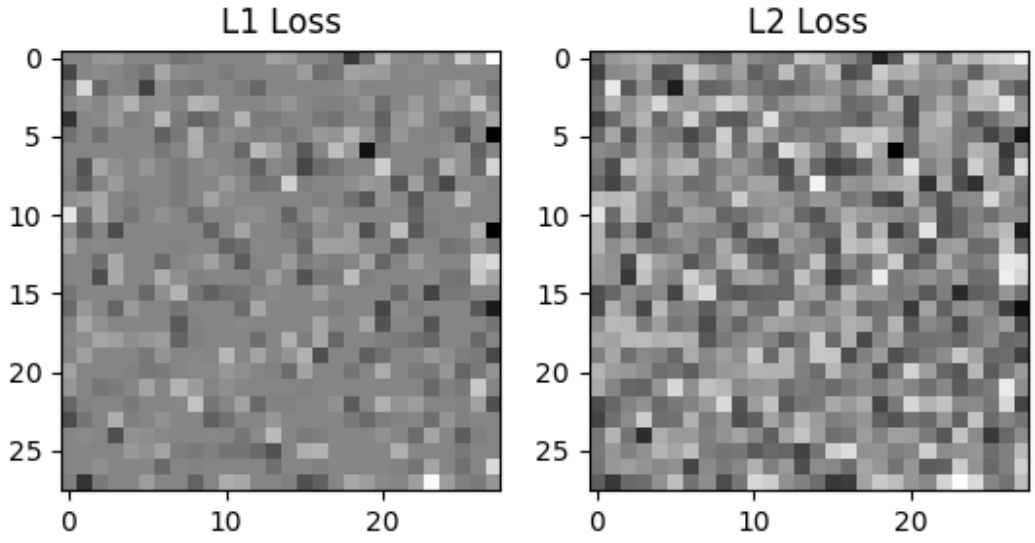
1) When regularisation parameter (λ) = 0.0001 :



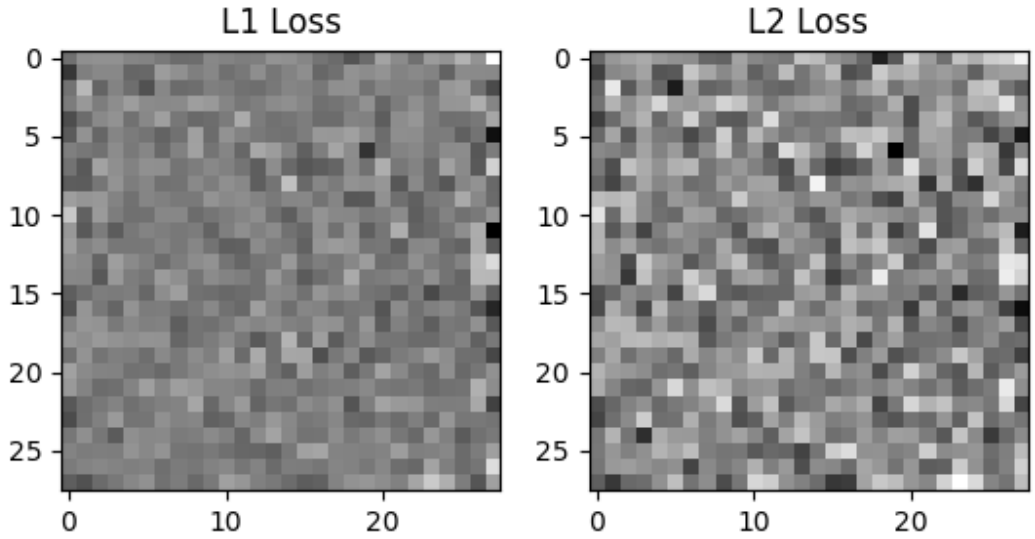
For this value, we are getting the accuracies as follows:
Accuracy for L1 regularisation is 0.946619217082
Accuracy for L2 regularisation is 0.939501779359

2) When regularisation parameter (λ) = 0.1 :



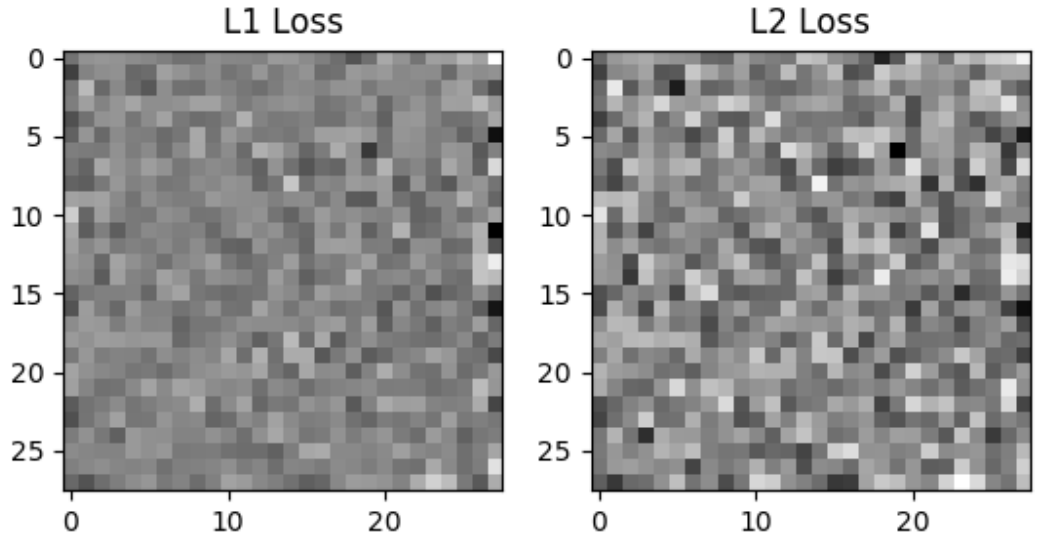
For this value, we are getting the accuracies as follows:
Accuracy for L1 regularisation is 0.94128113879
Accuracy for L2 regularisation is 0.9359430604983

3)When regularisation parameter (λ) = 100 :



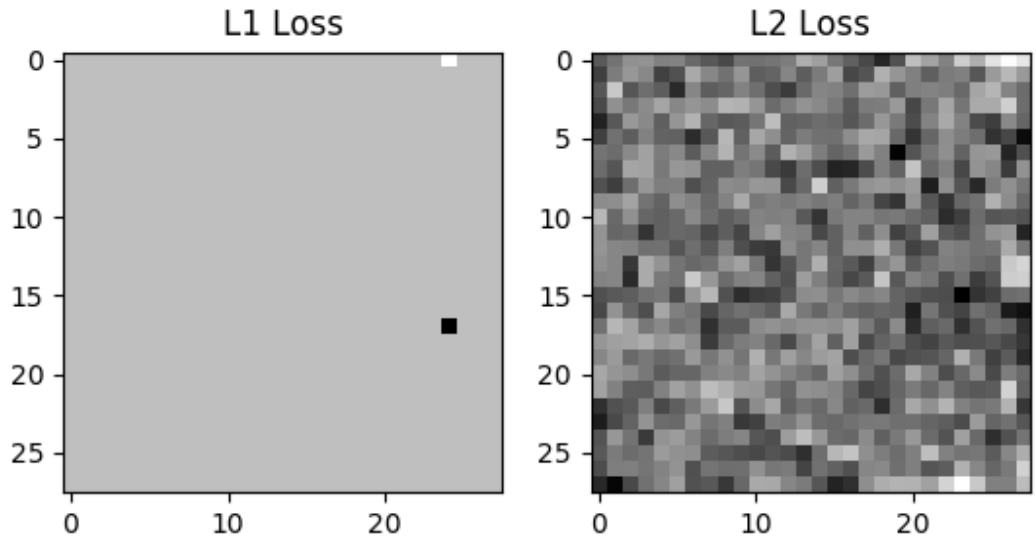
For this value, we are getting the accuracies as follows:
Accuracy for L1 regularisation is 0.940391459075
Accuracy for L2 regularisation is 0.934163701068

4) When regularisation parameter (λ) = 100000000 :



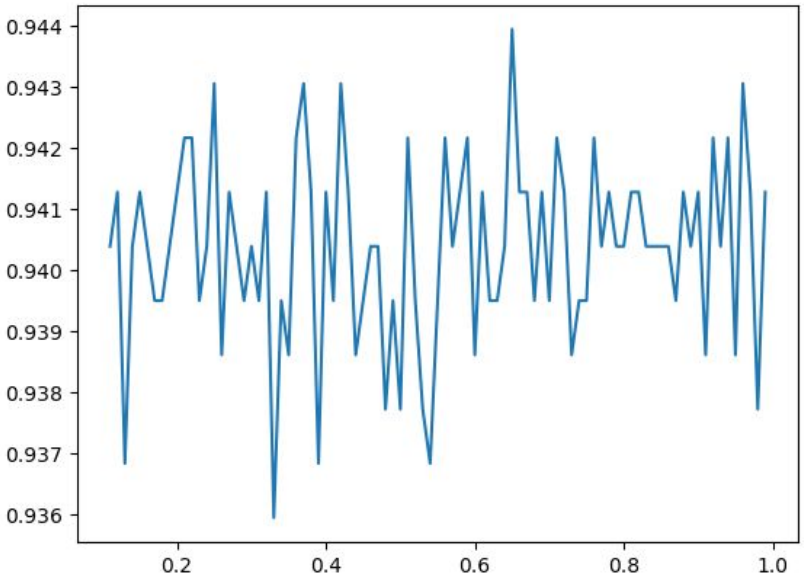
For this value, we are getting the accuracies as follows:
Accuracy for L1 regularisation is 0.939501779359
Accuracy for L2 regularisation is 0.9341637010685

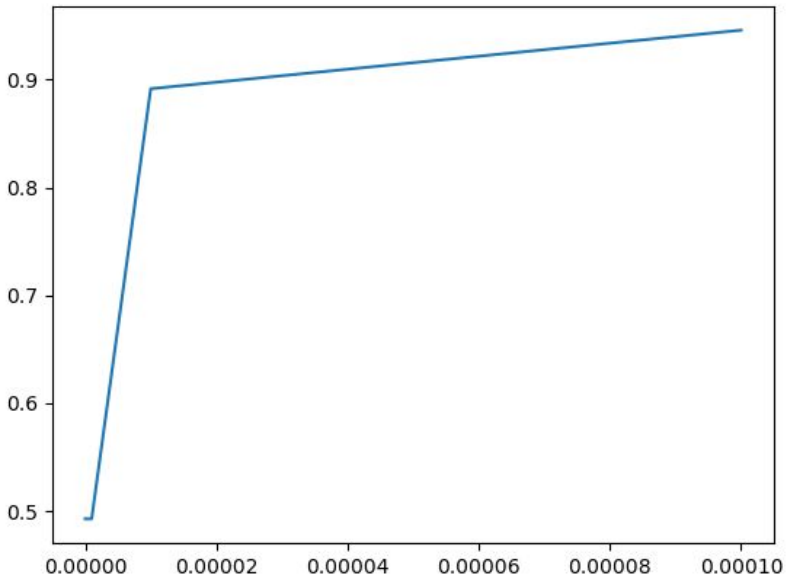
5)When regularisation parameter (λ) = 0.00001 :



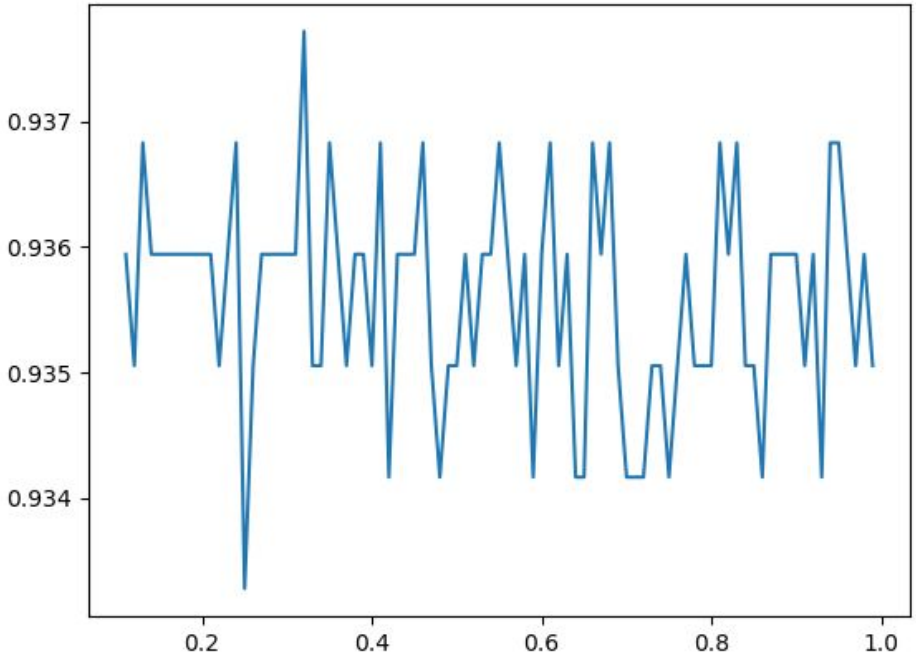
For this value, we are getting the accuracies as follows:
Accuracy for L1 regularisation is 0.891459074733
Accuracy for L2 regularisation is 0.952846975089

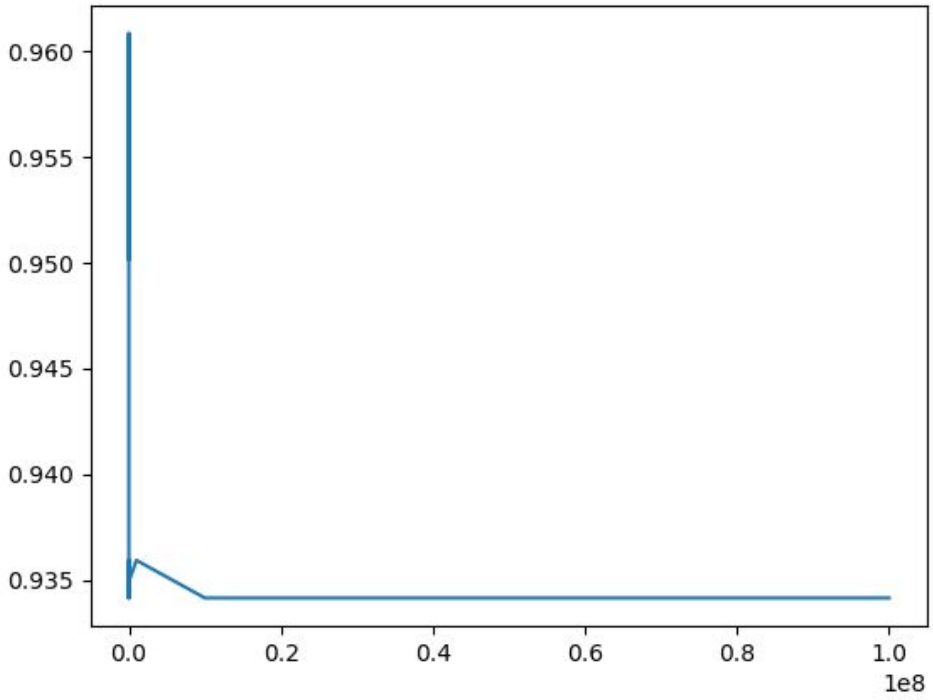
Graphs for L1 accuracies vs regularisation parameter:

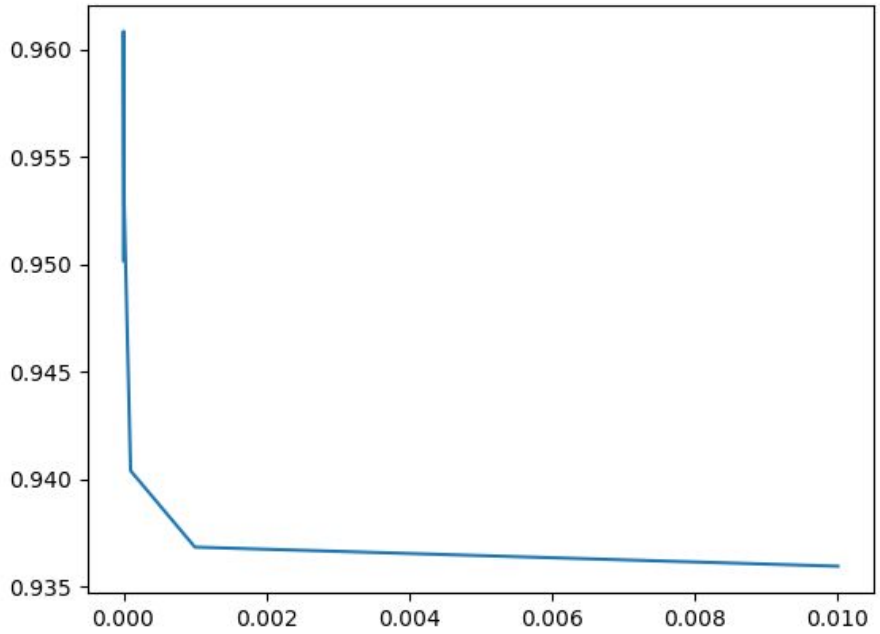


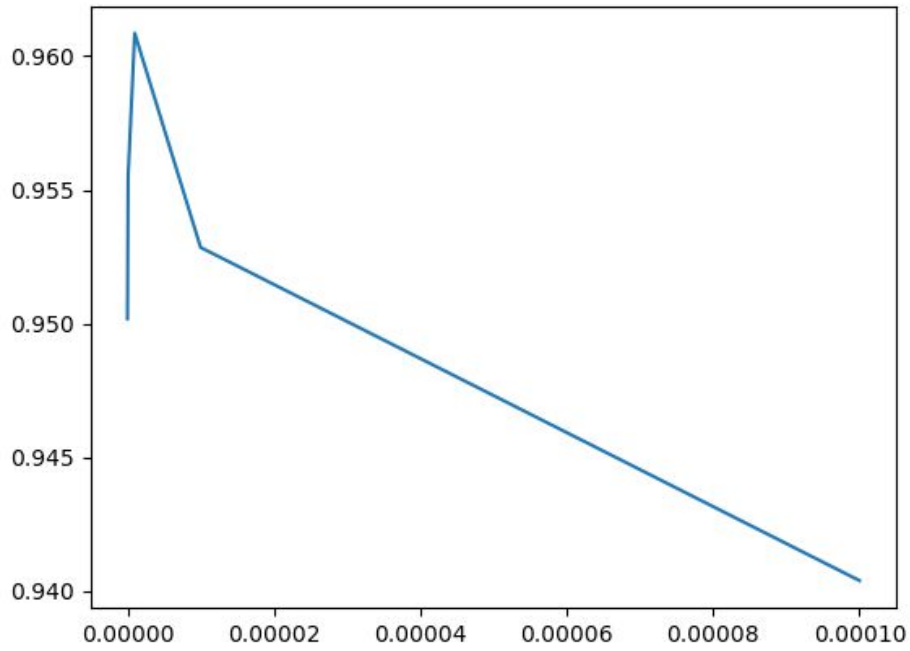


Graphs for L2 accuracies vs regularisation parameter:


0.937
0.936
0.935
0.934
0.2
0.4
0.6
0.8
1.0


0.960
0.955
0.950
0.945
0.940
0.935
0.0
0.2
0.4
0.6
0.8
1.0
1e8


0.960
0.955
0.950
0.945
0.940
0.935
0.000
0.002
0.004
0.006
0.008
0.010


0.960
0.955
0.950
0.945
0.940
0.00000
0.00002
0.00004
0.00006
0.00008
0.00010

Here,
Max accuracy by using L1 Loss occurs when λ=0.001
Max accuracy by using L2 Loss occurs when λ=0.000001

So,
For L1 Regularisation,
We can see that as λ increases accuracy varies in a zig-zag way.
But on a large scale accuracy increases as λ increases from 0 to 0.01 and then it decreases.

For L2 Regularisation,
We can see that as λ increases accuracy varies in a zig-zag way.
But on a large scale accuracy increases as λ increases from 0 to 0.000001 and then it decreases.
The optimum value of λ for both L1 Regularisation and L2 Regularisation is 0.001 to 0.01.