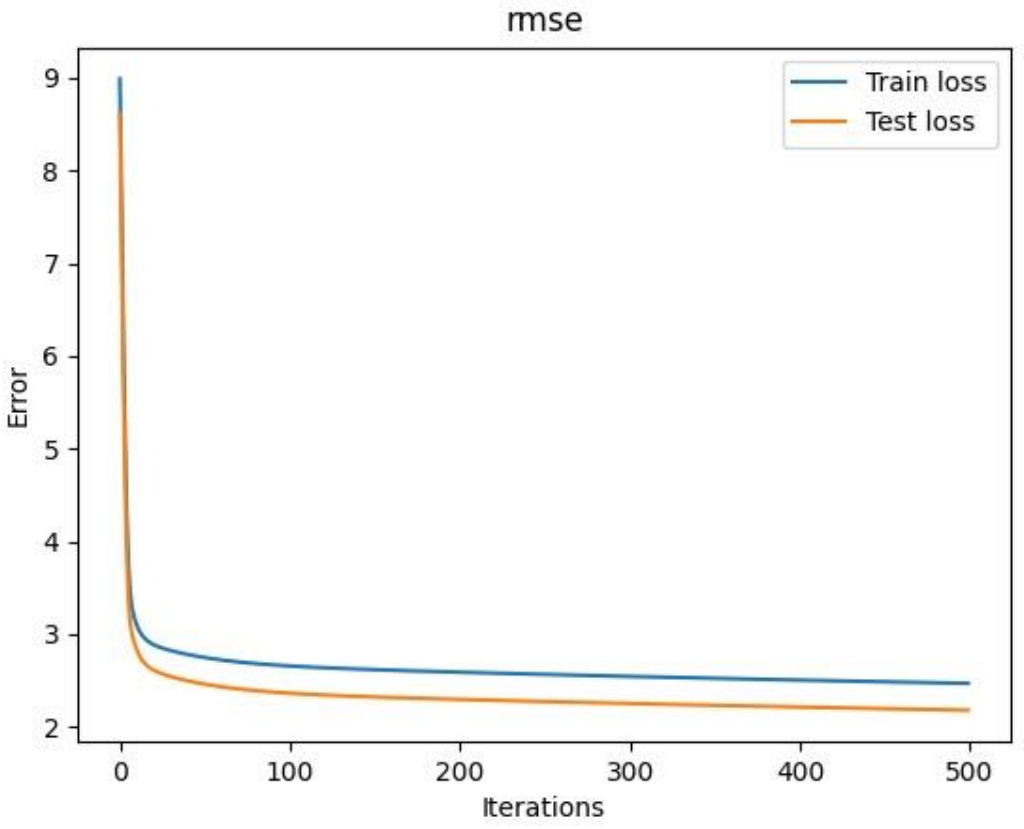
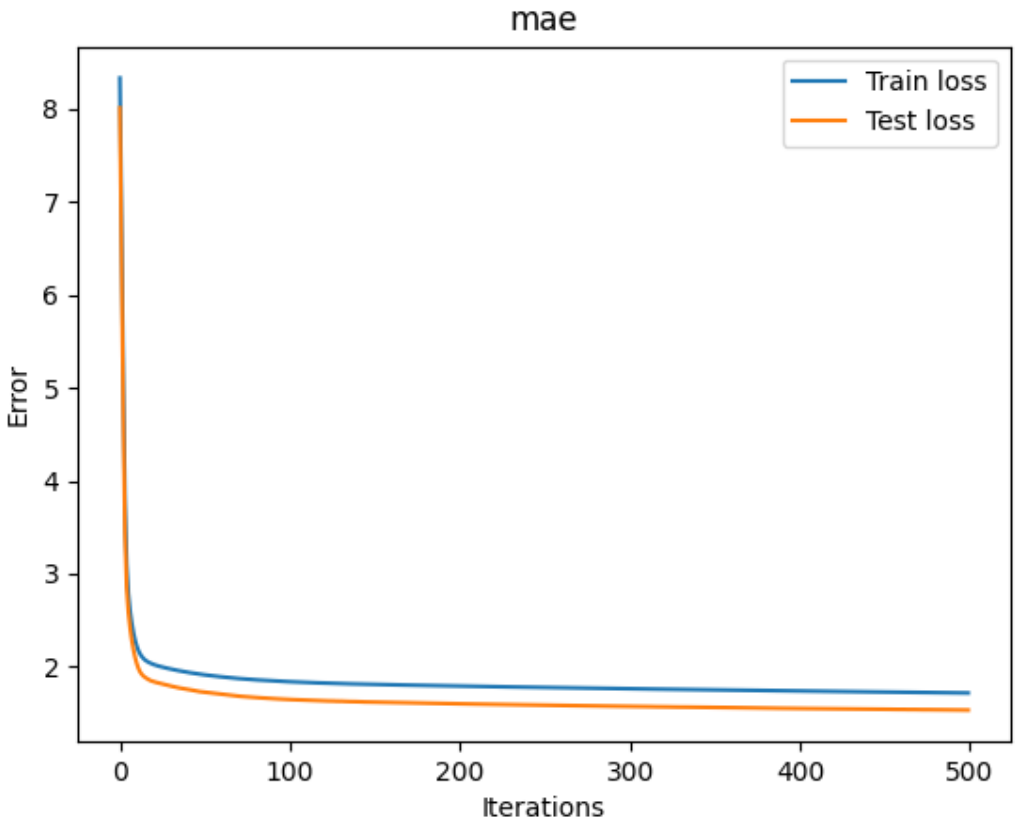
1. Here I have chosen K=10 comparing all the avg testing error on all the values of the K from 2 to 10. Screenshots of the same have been put in the folder.

Dataset-0

- Learning Rate=0.5, Iterations=500
- K=10
- Best MAE error on fold 9 = 1.5361122
- Avg MAE error with (K=10) = 1.7043154
- Best RMSE error on fold 9 = 2.18025189
- Avg RMSE error with (k=10) = 2.4393020765



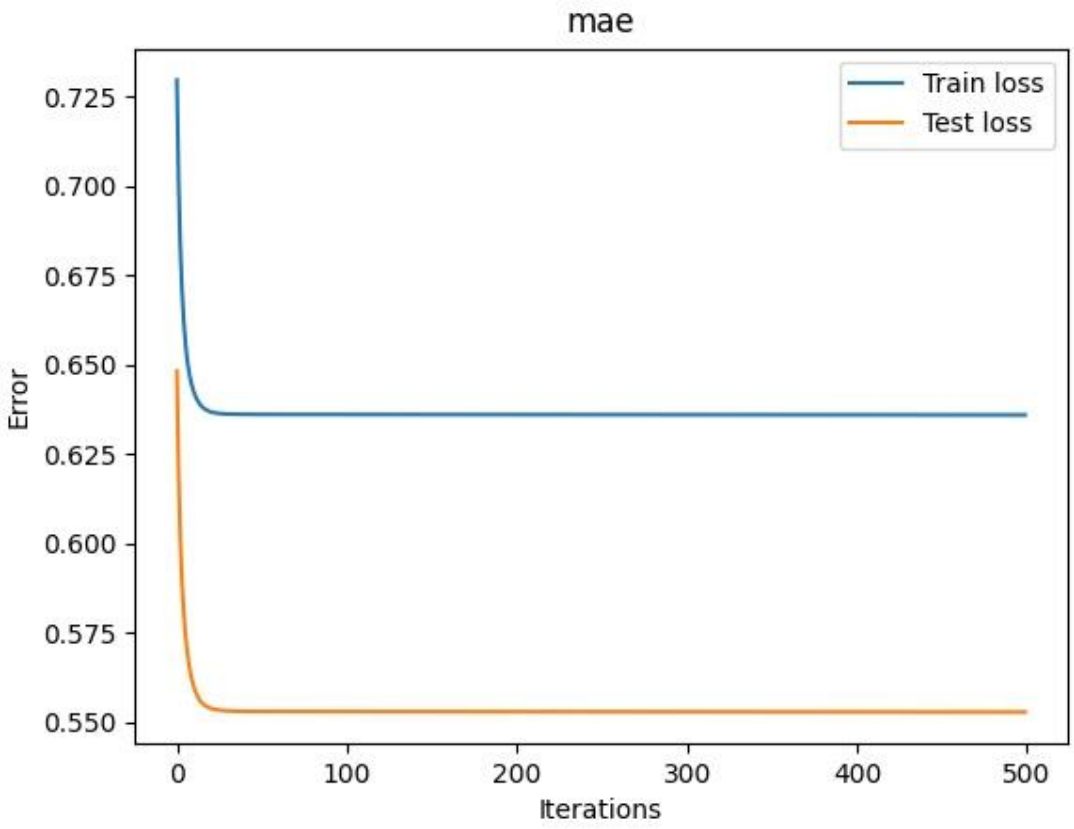
Saksham Dhull 2018186



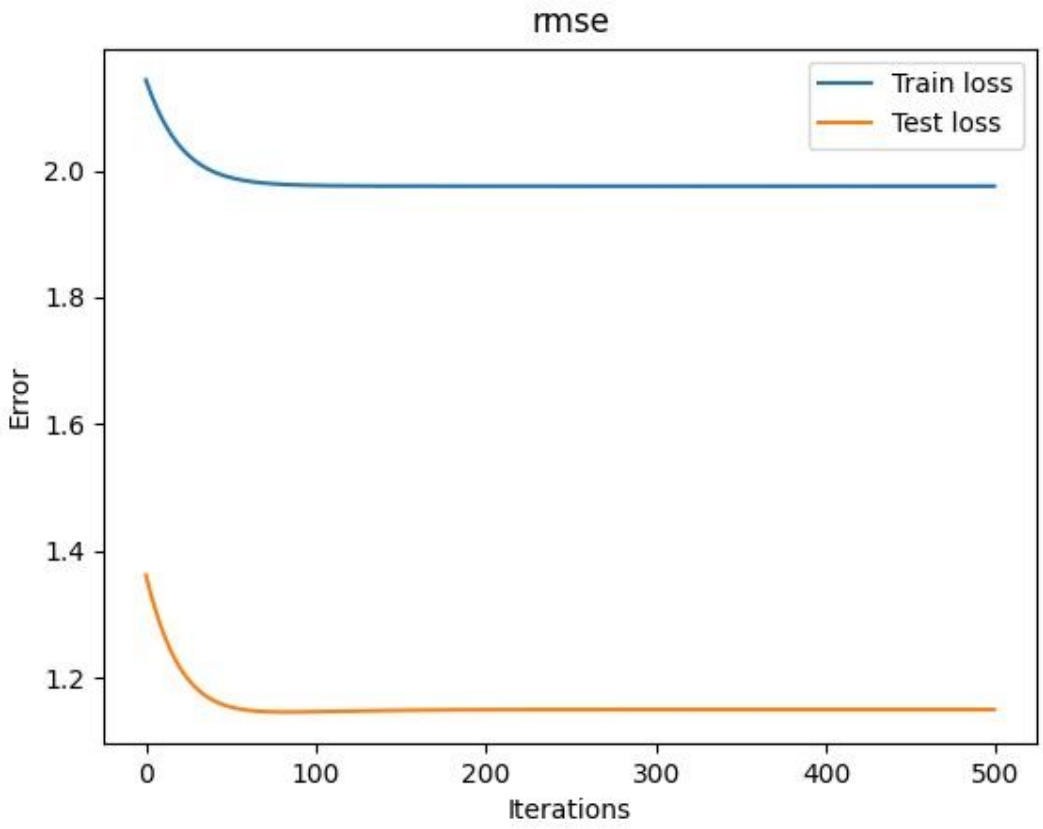
Saksham Dhull 2018186

Dataset-1

- Learning Rate=0.00001, Iterations=500
- K=10
- Best MAE error on fold 8 = 0.546223206495
- Avg MAE error with (K=10) = 0.6277619473
- Best RMSE error on fold 9 = 1.1499730746906007
- Avg RMSE error with (k=10) = 1.7836102244359928



Saksham Dhull 2018186



1d)

I. [MAE]<=[RMSE]

II. RMSE and MAE are expected to have similar values in case of a low variance , when all the errors have same manitude.

III. MAE would be preffered in such a case as when MAE=RMSE the only thing we do is optimise the functions. And we know that MAE is harer to optimise as it is non-differentiable piecewise function. Also MAE is computationaly expensive.

1e)

DataSet-1

- Test Cost= 0.6826994305873468
- Train Cost= 0.77620795

DataSet-0

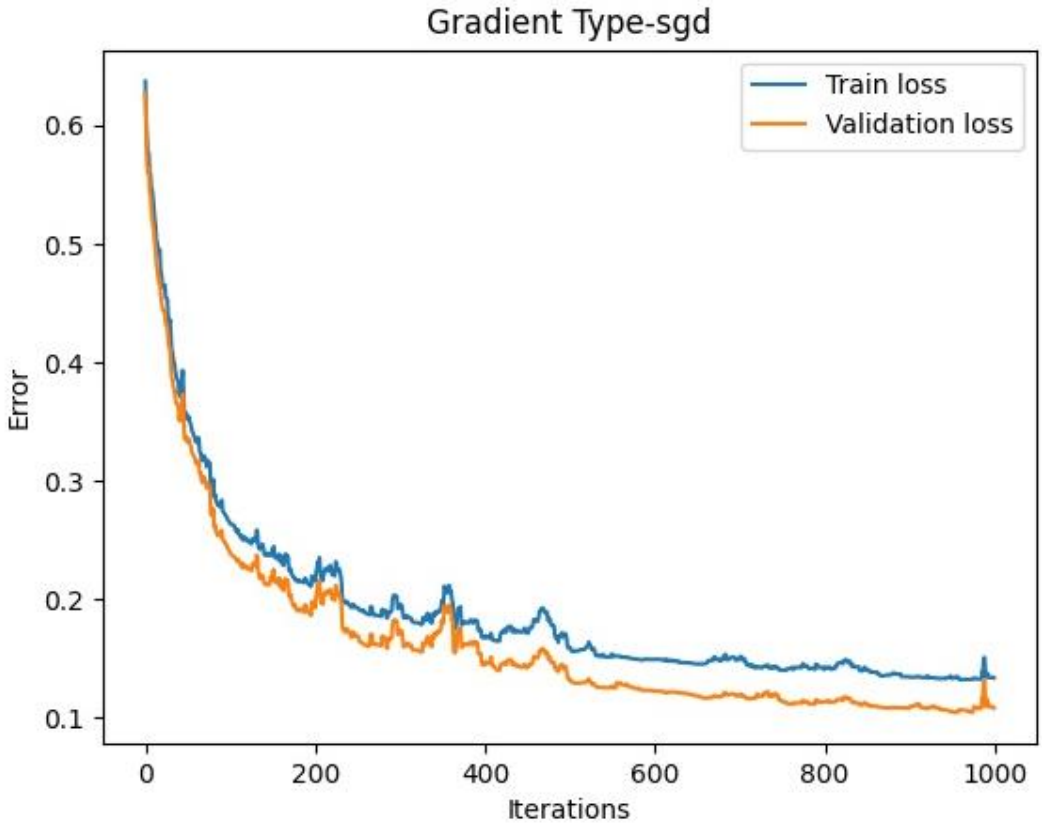
- Test Cost = 1.5482838865468944
- Train Cost = 1.641424797219717

Saksham Dhull 2018186

Q2.

SGD

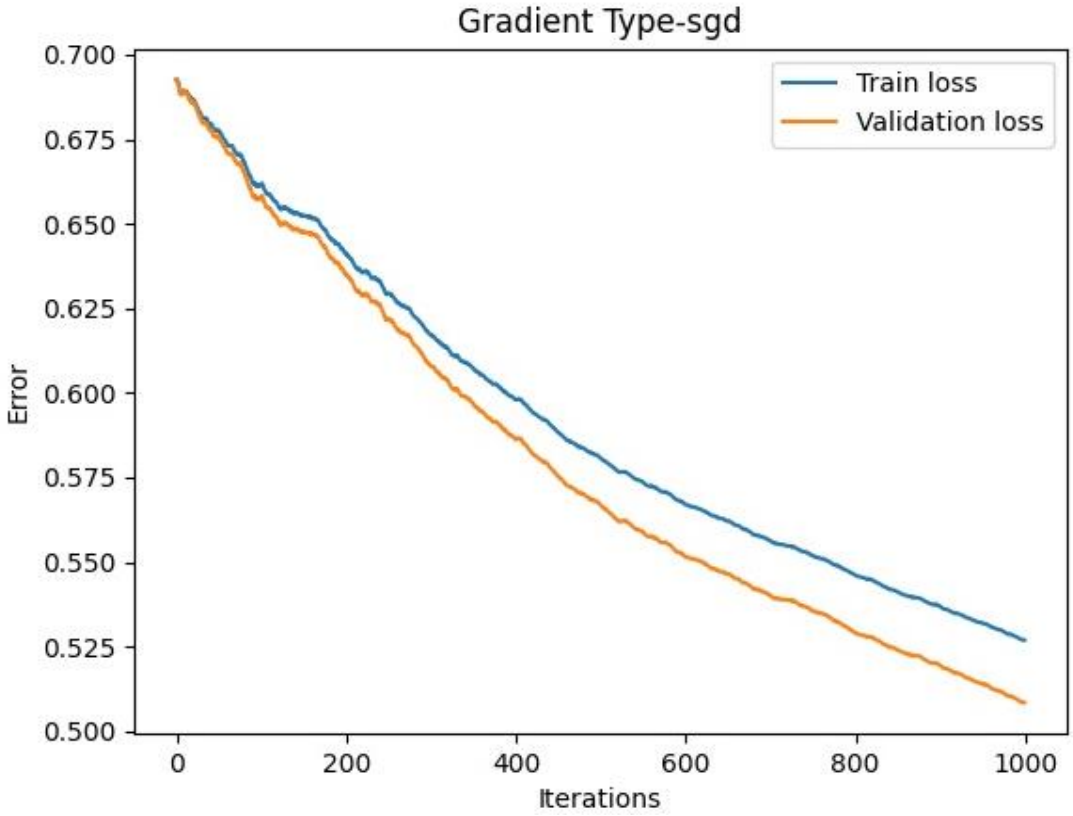
- Learning Rate=0.01
- Iterations=1000
- Training Loss= 0.1339008657965337
- Test Loss= 0.14438876843579787
- Accuracy on Test Set= 93.43065693430657
- Accuracy on Train Set= 94.89583333333333



Saksham Dhull 2018186

SGD

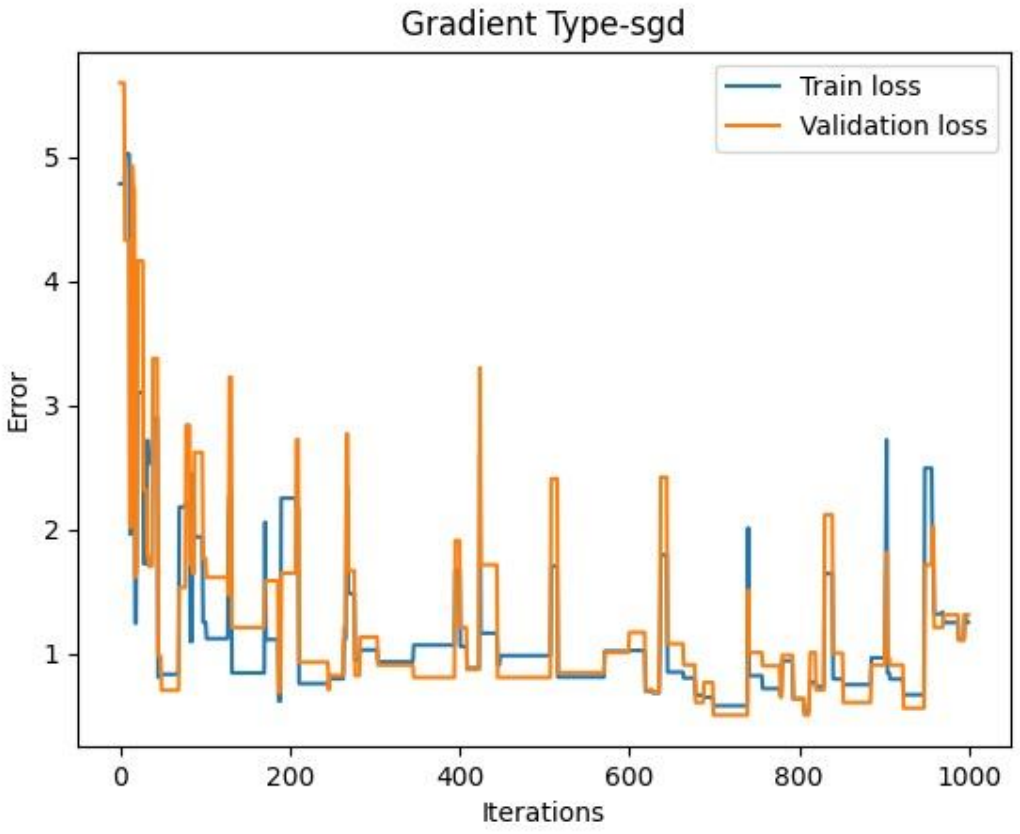
- Learning Rate=0.0001
- Iterations=1000
- Training Loss= 0.5247066673918643
- Test Loss= 0.5329540839051679
- Accuracy on Test Set= 73.72262773722628
- Accuracy on Train Set= 77.00312174817898



Saksham Dhull 2018186

SGD

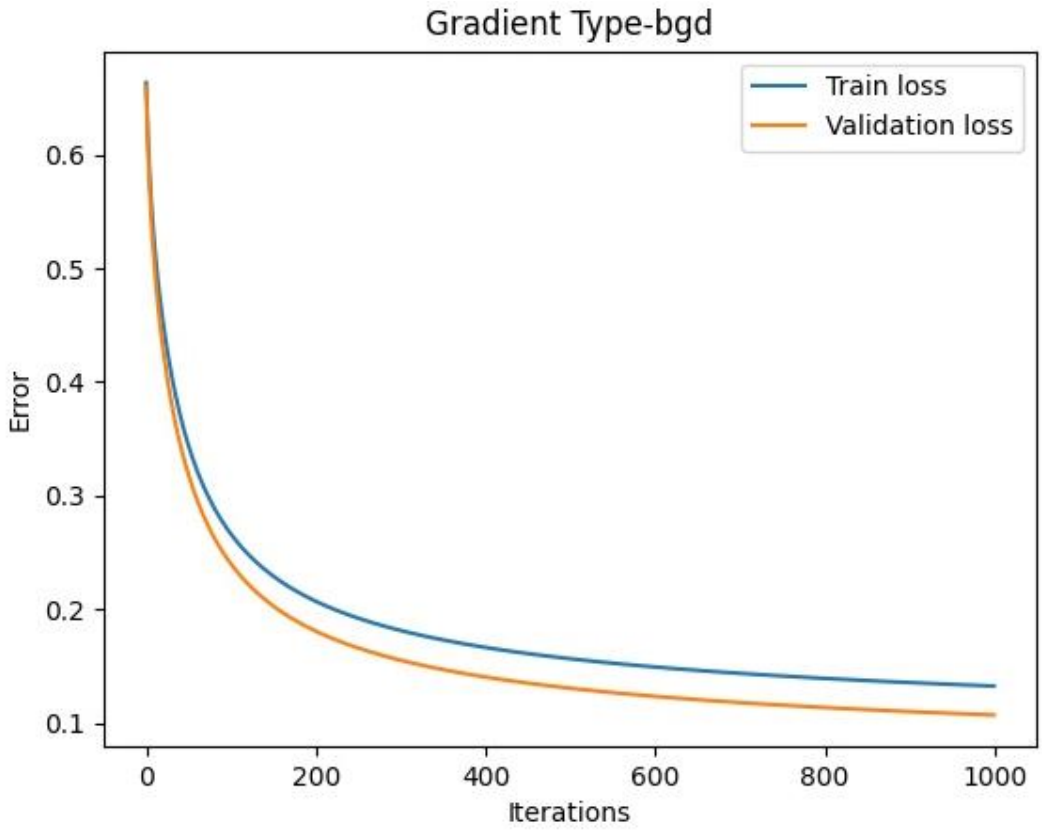
- Learning Rate=10
- Iterations=1000
- Training Loss = 1.250569919394072
- Test Loss= 1.5201584770735714
- Accuracy on Test Set= 88.6861313868613
- Accuracy on Train Set = 90.6347554630593



Saksham Dhull 2018186

BGD

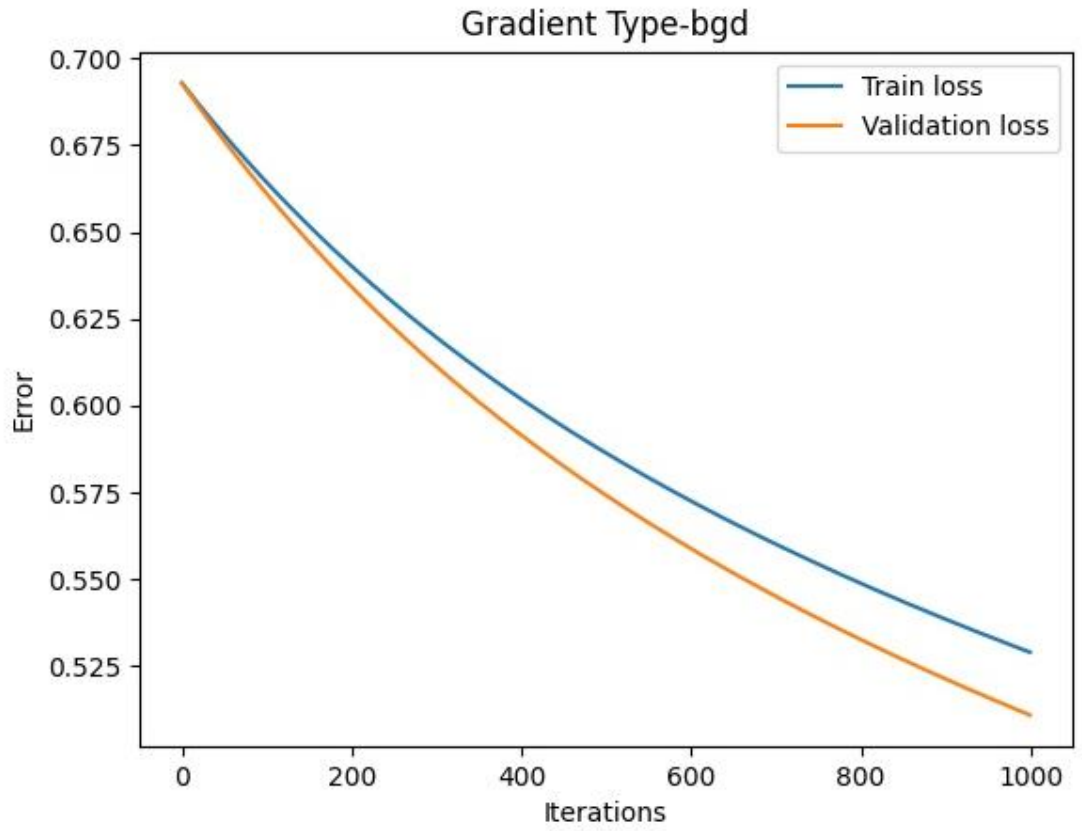
- Learning rate =0.01
- Iterations=1000
- Training Loss= 0.13258924925210067
- Test Loss= 0.1429357222216019
- Accuracy on Test Set= 94.16058394160584
- Accuracy on Train Set= 95.72916666666667



Saksham Dhull 2018186

BGD

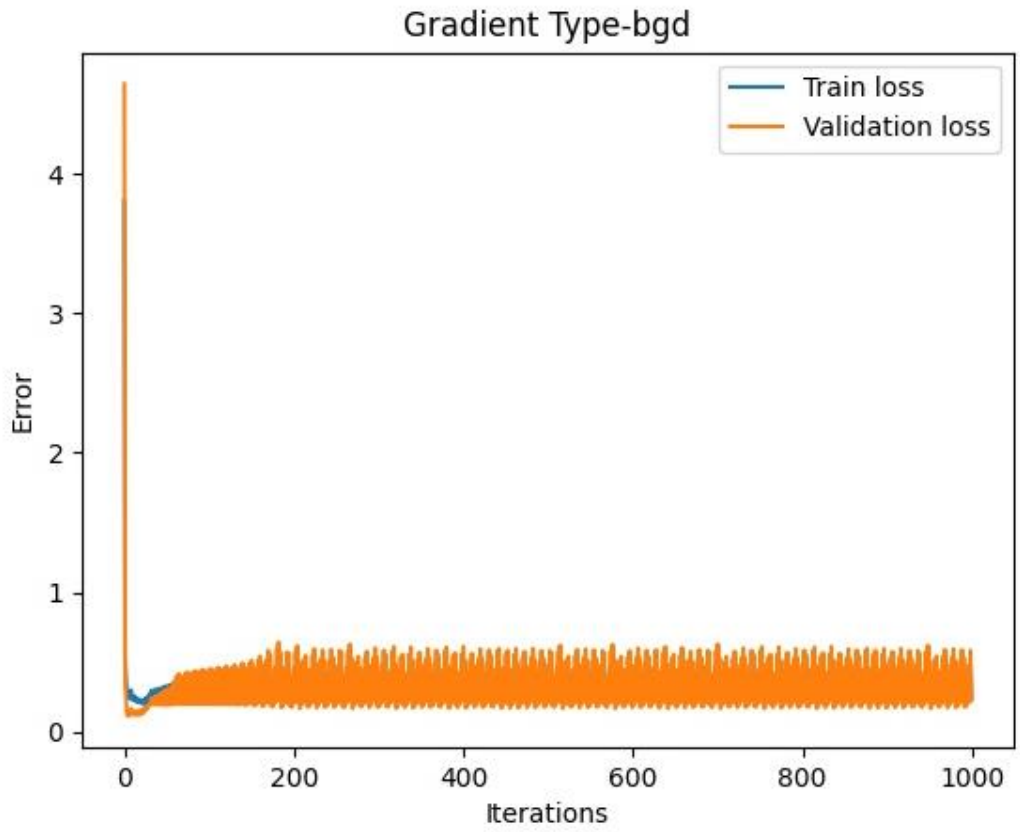
- Learning rate =0.0001
- Iterations=1000
- Training Loss= 0.5242444758577723
- Test Loss= 0.5330463619018994
- Accuracy on Test Set= 73.35766423357664
- Accuracy on Train Set= 75.96253902185224



Saksham Dhull 2018186

BGD

- Learning rate =10
- Iterations=1000
- Training Loss= 0.2412454687975458
- Test Loss= 0.28605837782571913
- Accuracy on Test Set= 93.06569343065694
- Accuracy on Train Set= 93.75650364203955

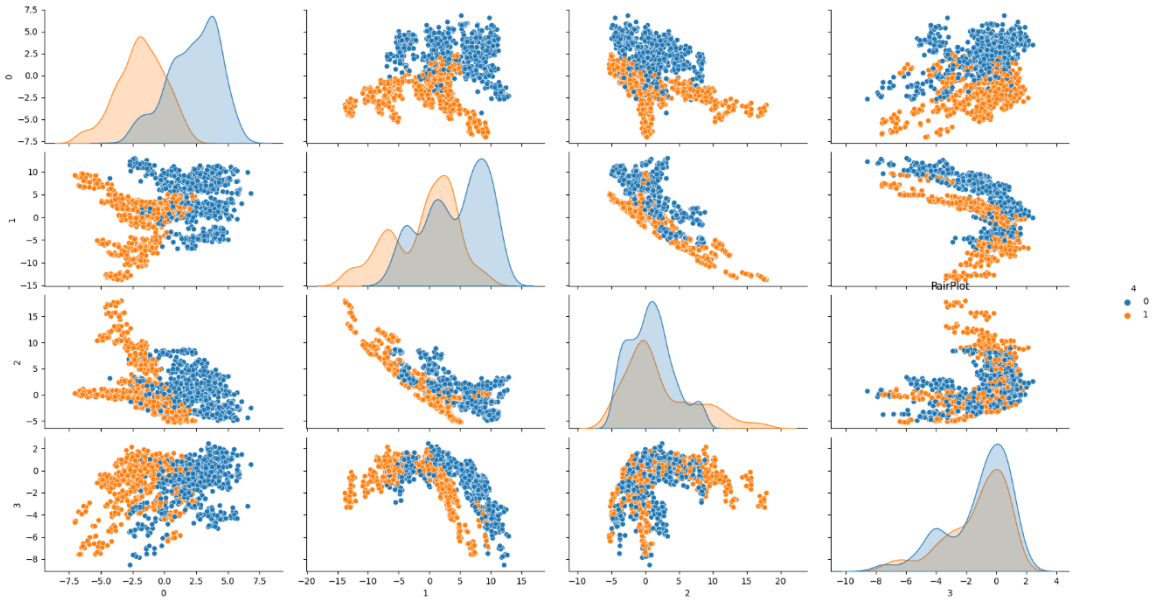


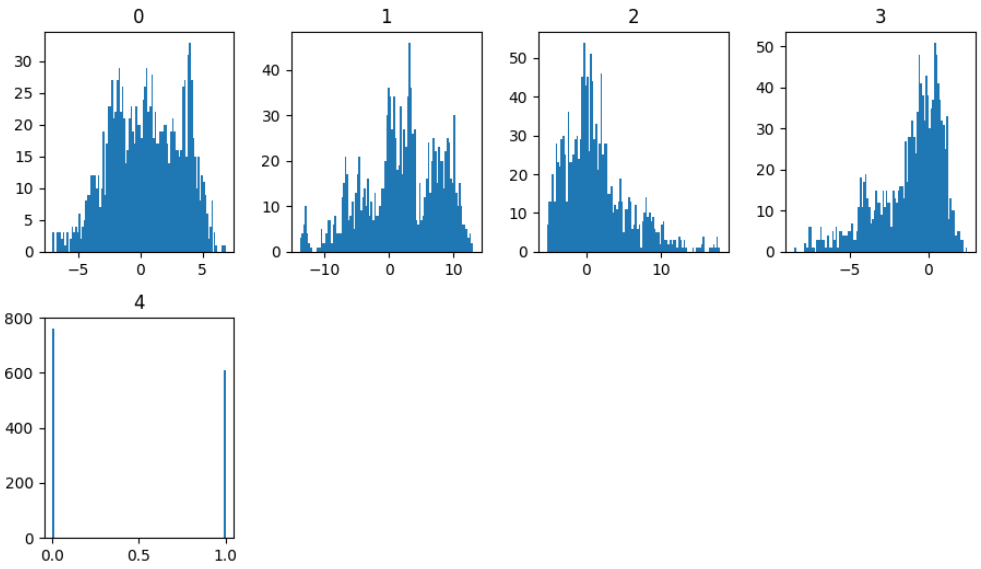
Saksham Dhull 2018186

- **Comparing Loss Plots→** The Sgd loss plot has spikes in the plot in between as for Sgd we have to randomly select a data sample and then update theta using that sample, we choose a random sample for every iteration.
- **Number of Epochs→** Sgd takes more number of epochs to converge as compared to Bgd.
- Sk-Learn Logistic Regression accuracy :-
    a. on Train data = 0.9937565036420395
    b. on Test data = 0.9817518248175182
- Sk-Learn SGD accuracy :-
    a. on Train data = 0.9864724245577523
    b. on Test data = 0.9817518248175182

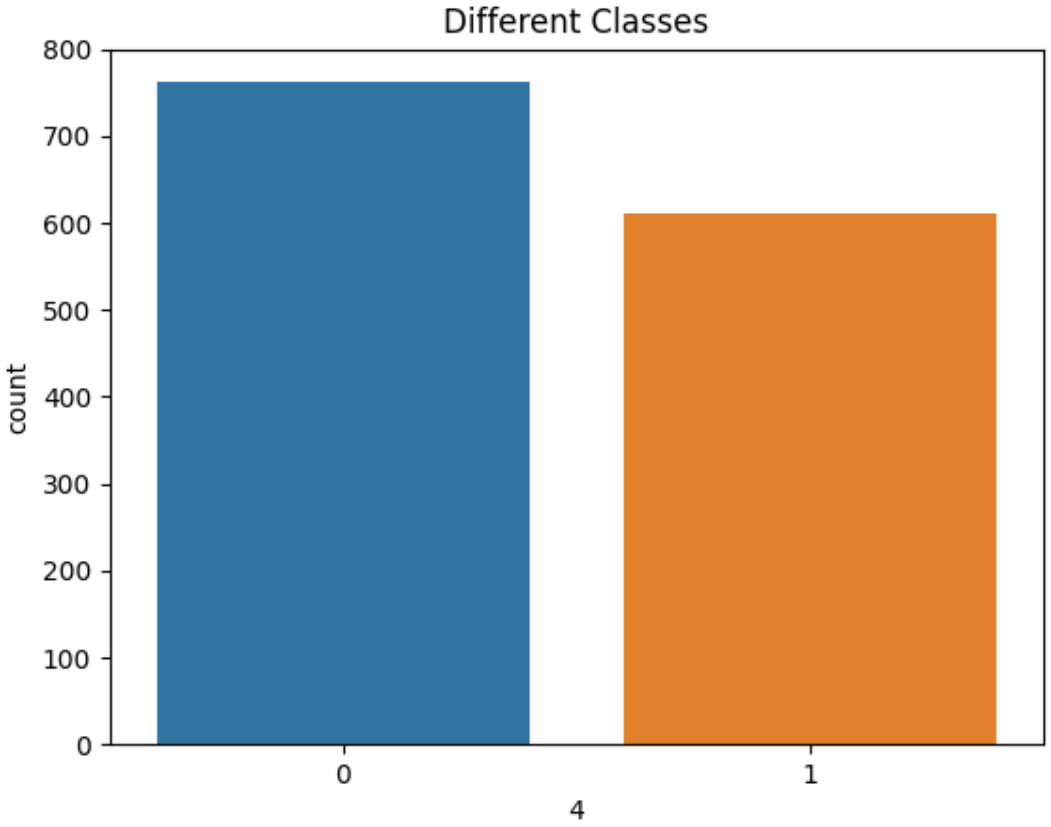
Saksham Dhull 2018186

EDA





Saksham Dhull 2018186



Saksham Dhull 2018186