**PART A**

***Output –***

➜ LogisticRegression git:(main) /usr/local/bin/python3 /Users/praveenakondepudi/Documents/Repos/LogisticRegression/Assignment2-PartA.py

epoch 1: w1 = -0.025, w2 = 0.053, w3 = -0.102, w4 = 0.243, w5 = -0.455

epoch 101: w1 = -4.446, w2 = 4.900, w3 = -1.578, w4 = 0.229, w5 = 0.046

epoch 201: w1 = -6.810, w2 = 5.725, w3 = -0.956, w4 = 0.050, w5 = 0.022

epoch 301: w1 = -8.306, w2 = 5.863, w3 = -0.585, w4 = 0.017, w5 = 0.009

epoch 401: w1 = -9.256, w2 = 5.875, w3 = -0.354, w4 = 0.011, w5 = 0.002

epoch 501: w1 = -9.858, w2 = 5.868, w3 = -0.208, w4 = 0.011, w5 = -0.003

epoch 601: w1 = -10.241, w2 = 5.861, w3 = -0.116, w4 = 0.012, w5 = -0.006

epoch 701: w1 = -10.483, w2 = 5.856, w3 = -0.058, w4 = 0.012, w5 = -0.008

epoch 801: w1 = -10.637, w2 = 5.852, w3 = -0.020, w4 = 0.012, w5 = -0.009

epoch 901: w1 = -10.735, w2 = 5.850, w3 = 0.003, w4 = 0.012, w5 = -0.010

result1 = tensor([-10.7962, -10.7962, -10.7962, -10.7962, -10.7962, -10.7962, -10.7962,

-10.7962, -10.7962], grad\_fn=<AddBackward0>)

result2 = tensor([-20.5784, -24.6315, -23.3554, -2.5761, -3.5261, -20.8006, 2.7488,

3.2694, -23.7876], grad\_fn=<AddBackward0>)

result3 = tensor([-20.5285, -24.5316, -23.2732, -2.5409, -3.4985, -20.7484, 2.8445,

3.3726, -23.6996], grad\_fn=<AddBackward0>)

result4 = tensor([-20.5869, -24.6967, -23.3967, -2.5063, -3.4746, -20.8108, 2.9994,

3.5461, -23.8363], grad\_fn=<AddBackward0>)

result5 = tensor([-20.6682, -25.0222, -23.6177, -2.5468, -3.4994, -20.8998, 2.7004,

3.1983, -24.0893], grad\_fn=<AddBackward0>)

**Chart, scatter chart

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**PART B**

**S*teps***

1. Loading and Normalizing MNIST dataset
2. Define a Convolutional Neural Network - Logistic Regression
3. Define a Loss function and optimizer
4. Train the CNN
5. Save the trained model
6. Now test the trained model with test data

***Output –***

**Total testset images: 1902 correctly identified images: 1819 Error: 4.363827549947423% Accuracy: 92%**

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➜ LogisticRegression git:(main) ✗ /usr/local/bin/python3 /Users/praveenakondepudi/Documents/Repos/LogisticRegression/MNIST\_LogisticRegression\_pytorch\_PARTB.py

epoch:1, iteration: 1 training average running loss: 0.295

epoch:1, iteration: 11 training average running loss: 1.173

epoch:1, iteration: 21 training average running loss: 0.446

epoch:1, iteration: 31 training average running loss: 0.346

epoch:1, iteration: 41 training average running loss: 0.271

epoch:1, iteration: 51 training average running loss: 0.262

epoch:1, iteration: 61 training average running loss: 0.253

epoch:1, iteration: 71 training average running loss: 0.213

epoch:1, iteration: 81 training average running loss: 0.224

epoch:1, iteration: 91 training average running loss: 0.198

epoch:1, iteration: 101 training average running loss: 0.207

epoch:1, iteration: 111 training average running loss: 0.206

epoch:2, iteration: 1 training average running loss: 0.028

epoch:2, iteration: 11 training average running loss: 0.195

epoch:2, iteration: 21 training average running loss: 0.193

epoch:2, iteration: 31 training average running loss: 0.171

epoch:2, iteration: 41 training average running loss: 0.180

epoch:2, iteration: 51 training average running loss: 0.173

epoch:2, iteration: 61 training average running loss: 0.161

epoch:2, iteration: 71 training average running loss: 0.175

epoch:2, iteration: 81 training average running loss: 0.180

epoch:2, iteration: 91 training average running loss: 0.166

epoch:2, iteration: 101 training average running loss: 0.164

epoch:2, iteration: 111 training average running loss: 0.169

epoch:3, iteration: 1 training average running loss: 0.019

epoch:3, iteration: 11 training average running loss: 0.188

epoch:3, iteration: 21 training average running loss: 0.144

epoch:3, iteration: 31 training average running loss: 0.147

epoch:3, iteration: 41 training average running loss: 0.143

epoch:3, iteration: 51 training average running loss: 0.158

epoch:3, iteration: 61 training average running loss: 0.155

epoch:3, iteration: 71 training average running loss: 0.150

epoch:3, iteration: 81 training average running loss: 0.155

epoch:3, iteration: 91 training average running loss: 0.168

epoch:3, iteration: 101 training average running loss: 0.148

epoch:3, iteration: 111 training average running loss: 0.147

epoch:4, iteration: 1 training average running loss: 0.016

epoch:4, iteration: 11 training average running loss: 0.151

epoch:4, iteration: 21 training average running loss: 0.159

epoch:4, iteration: 31 training average running loss: 0.150

epoch:4, iteration: 41 training average running loss: 0.156

epoch:4, iteration: 51 training average running loss: 0.135

epoch:4, iteration: 61 training average running loss: 0.135

epoch:4, iteration: 71 training average running loss: 0.146

epoch:4, iteration: 81 training average running loss: 0.128

epoch:4, iteration: 91 training average running loss: 0.161

epoch:4, iteration: 101 training average running loss: 0.136

epoch:4, iteration: 111 training average running loss: 0.153

epoch:5, iteration: 1 training average running loss: 0.016

epoch:5, iteration: 11 training average running loss: 0.162

epoch:5, iteration: 21 training average running loss: 0.154

epoch:5, iteration: 31 training average running loss: 0.134

epoch:5, iteration: 41 training average running loss: 0.144

epoch:5, iteration: 51 training average running loss: 0.125

epoch:5, iteration: 61 training average running loss: 0.122

epoch:5, iteration: 71 training average running loss: 0.145

epoch:5, iteration: 81 training average running loss: 0.135

epoch:5, iteration: 91 training average running loss: 0.128

epoch:5, iteration: 101 training average running loss: 0.137

epoch:5, iteration: 111 training average running loss: 0.137

epoch:6, iteration: 1 training average running loss: 0.015

epoch:6, iteration: 11 training average running loss: 0.124

epoch:6, iteration: 21 training average running loss: 0.129

epoch:6, iteration: 31 training average running loss: 0.136

epoch:6, iteration: 41 training average running loss: 0.131

epoch:6, iteration: 51 training average running loss: 0.123

epoch:6, iteration: 61 training average running loss: 0.127

epoch:6, iteration: 71 training average running loss: 0.134

epoch:6, iteration: 81 training average running loss: 0.166

epoch:6, iteration: 91 training average running loss: 0.138

epoch:6, iteration: 101 training average running loss: 0.145

epoch:6, iteration: 111 training average running loss: 0.118

epoch:7, iteration: 1 training average running loss: 0.008

epoch:7, iteration: 11 training average running loss: 0.132

epoch:7, iteration: 21 training average running loss: 0.119

epoch:7, iteration: 31 training average running loss: 0.119

epoch:7, iteration: 41 training average running loss: 0.125

epoch:7, iteration: 51 training average running loss: 0.129

epoch:7, iteration: 61 training average running loss: 0.130

epoch:7, iteration: 71 training average running loss: 0.127

epoch:7, iteration: 81 training average running loss: 0.139

epoch:7, iteration: 91 training average running loss: 0.127

epoch:7, iteration: 101 training average running loss: 0.133

epoch:7, iteration: 111 training average running loss: 0.138

epoch:8, iteration: 1 training average running loss: 0.017

epoch:8, iteration: 11 training average running loss: 0.125

epoch:8, iteration: 21 training average running loss: 0.133

epoch:8, iteration: 31 training average running loss: 0.131

epoch:8, iteration: 41 training average running loss: 0.126

epoch:8, iteration: 51 training average running loss: 0.140

epoch:8, iteration: 61 training average running loss: 0.140

epoch:8, iteration: 71 training average running loss: 0.132

epoch:8, iteration: 81 training average running loss: 0.097

epoch:8, iteration: 91 training average running loss: 0.119

epoch:8, iteration: 101 training average running loss: 0.139

epoch:8, iteration: 111 training average running loss: 0.118

epoch:9, iteration: 1 training average running loss: 0.009

epoch:9, iteration: 11 training average running loss: 0.135

epoch:9, iteration: 21 training average running loss: 0.116

epoch:9, iteration: 31 training average running loss: 0.129

epoch:9, iteration: 41 training average running loss: 0.123

epoch:9, iteration: 51 training average running loss: 0.128

epoch:9, iteration: 61 training average running loss: 0.132

epoch:9, iteration: 71 training average running loss: 0.107

epoch:9, iteration: 81 training average running loss: 0.123

epoch:9, iteration: 91 training average running loss: 0.130

epoch:9, iteration: 101 training average running loss: 0.133

epoch:9, iteration: 111 training average running loss: 0.112

epoch:10, iteration: 1 training average running loss: 0.008

epoch:10, iteration: 11 training average running loss: 0.128

epoch:10, iteration: 21 training average running loss: 0.117

epoch:10, iteration: 31 training average running loss: 0.121

epoch:10, iteration: 41 training average running loss: 0.126

epoch:10, iteration: 51 training average running loss: 0.117

epoch:10, iteration: 61 training average running loss: 0.128

epoch:10, iteration: 71 training average running loss: 0.140

epoch:10, iteration: 81 training average running loss: 0.126

epoch:10, iteration: 91 training average running loss: 0.106

epoch:10, iteration: 101 training average running loss: 0.102

epoch:10, iteration: 111 training average running loss: 0.138

Finished Training

Training Plotting Done!

iteration: 1 testdata average running loss: 0.017

iteration: 11 testdata average running loss: 0.174

**Total testset images: 1902 correctly identified images: 1819 Error: 4.363827549947423% Accuracy: 92%**

Plotting Done!

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