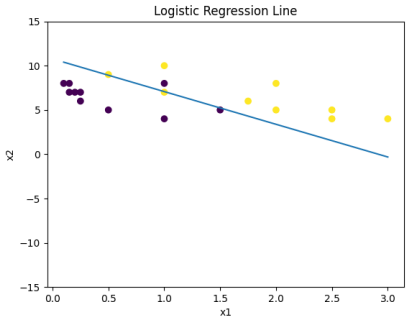
Labwork 3: Logistic Regression

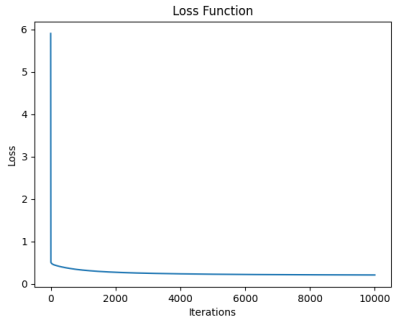
Phi Doan Minh Luong - 24400464

May 2025

1 Implementation

- First, we implement functions to calculate the loss of all data points, and 3 partial derivatives over w_0, w_1, and w_2
- Read the csv file and extract the value of x and y as lists of floats
- Perform gradient descent to optimize the weights w_0, w_1, and w_2. It iteratively updates w_0, w_1, and w_2 using the gradients (df0, df1, and df2) and the learning rate lr
- After training, the optimized weights w_0, w_1, and w_2 are used to plot the regression line based on the learned weights, and a plot shows the loss over iterations
- Here is the result when the gradient descent is run for 10,000 iterations with a learning rate of 0.1 when the initial value for w_0, w_1, and w_2 is 0, 1, and 2 respectively



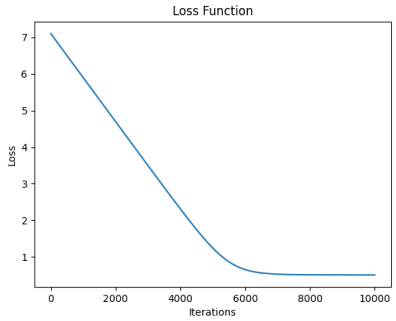


- After updating, the loss is around 0.21

2 The effect of different learning rates for convergence

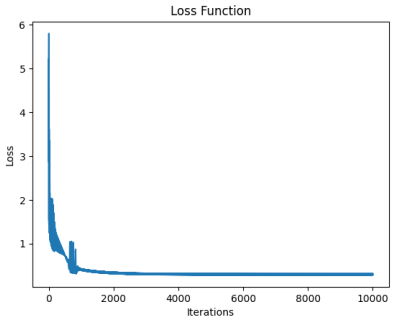
2.1 Learning rate is too small (0.0001)

- When the learning rate is too small, it requires many updates before reaching the minimum point



2.2 Learning rate is too large (0.9)

- When the learning rate is too large, it could cause drastic updates, which lead to divergent behaviors


Loss Function
Loss
Iterations
0
2000
4000
6000
8000
10000
1
2
3
4
5
6