ENGR421 - Homework 2

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Discrimination by Regression

This homework was an implementation of the Discrimination by Regression algorithm. In discrimination, we predict the output by using the sigmoid function. The weights used are optimized by gradient descent, which have the following equations:

$$\Delta \mathbf{w} = \eta \cdot \sum_t (r^t - y^t) y^t (1 - y^t) \mathbf{x}^t$$
$$\Delta w_0 = \eta \cdot \sum_t (r^t - y^t) y^t (1 - y^t) \tag{0.1}$$

As we are updating the weights, we also calculate the objective function. Thanks to the objective function, we see our error decreasing exponentially. This means that our learning parameters given to us (η and ε) function well.
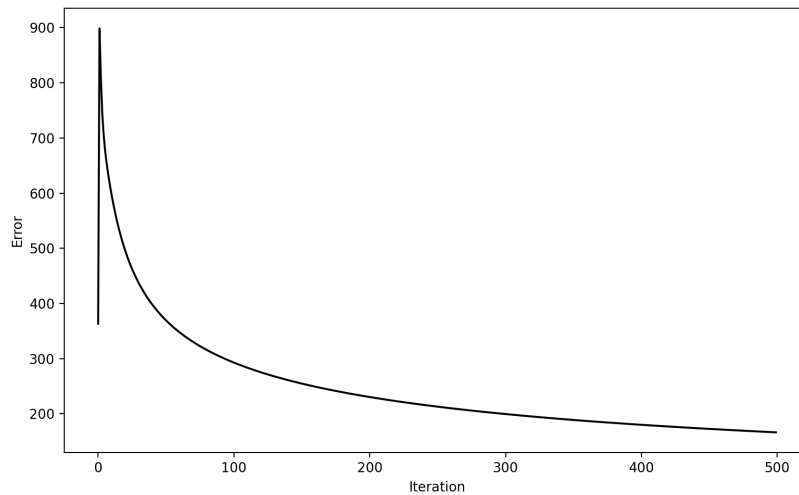
The confusion matrices for the training and test sets can be seen below:

```
Confusion matrix for the training set:   Confusion matrix for the test set:
y_train        1   2    3   4   5       y_test         1    2    3    4    5
y_predicted                             y_predicted
1             101   2   11   0   1       1             82    1    4    0    2
2              0   78    1   0   0       2              0   87    0    0    0
3              6    6  100   0   1       3             13    3   98    0    3
4              0    0    0  99   2       4              0    0    0  103    1
5              0    0    0   1  91       5              4    0    3    0   96
```

The confusion matrix agrees with the confusion matrix that is given in the homework description, which suggests that the performance of the algorithm is good.