COMP 421 – HOMEWORK 02

REPORT

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First, I read the training and test data from given data file, and placed the data in relevant matrices in which rows represent each image and columns represent pixel indices. (This part is the same with the Hw01)

Then I implemented the needed sigmoid and update functions (10.44-10.45 from textbook). I also set the learning parameters as stated in the homework description.

$$\Delta \mathbf{w}_i = \eta \sum_t (r_i^t - y_i^t) y_i^t (1 - y_i^t) \mathbf{x}^t$$

$$\Delta w_{i0} = \eta \sum_t (r_i^t - y_i^t) y_i^t (1 - y_i^t)$$

```
eta <- 0.01
epsilon <- 0.001
```

Next, I set the X (training data points) and R (truth labels for training data) matrices for training data, and initialized W & w0 with uniform random values (between -0.01 and 0.01).

I implemented a loop to learn W and w0. In the loop, I used the sigmoid function and update (gradient descent) functions for W & w0. I also captured the objective values for each iteration. The loop iterates until the following condition is satisfied (until no significant updates occur anymore).

```
epsilon > sqrt[ sum( (w0 - prev_w0) ^ 2 ) + sum( (W - prev_W) ^ 2 ) ]
```

After learning W and w0, I used a plot function to draw the objective function values captured through the iterations of the loop.

To form the confusion matrix for training data, I first created a matrix representing the truth values for each data point. Then created the confusion table using the predicted and truth values for training data.

I repeated the last step using the test data to form a confusion matrix for the test data, and then printed the two confusion matrices.