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Machine Learning - Logistic Regression

Binary & Multi-class Classification

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 [Jupyter Notebook Link](#)

1 Task 1 Report

1.1 5 Examples from the MNIST Dataset

The MNIST database of handwritten digits. It has a training set of 60,000 examples, and a test set of 10,000 examples. It is a subset of a larger set available from NIST. The digits have been size-normalized and centered in a fixed-size image. It is a good database for people who want to try learning techniques and pattern recognition methods on real-world data while spending minimal efforts on preprocessing and formatting.



Figure 1: Dataset Examples

1.2 Binary Model

The binary classification is done using `Binary-Classification(data,[number to classify ex. 3])` function which contain the normal procedure of the training, fitting, and predictions.

The number passed to the function will be classified as true and all other number will be classified as false. [Details provided in the jupyter notebook]

train accuracy is = 0.993733

test accuracy is = 0.9933

1.3 Confusion Matrix

A confusion matrix is a table that is often used to describe the performance of a classification model (or "classifier") on a set of test data for which the true values are known.

Usually Created by command: `metrics.confusion-matrix(y-test, predictions)` or it may be plotted by using **Matplotlib** for more visually appealing plot.



Figure 2: Confusion Matrix for Binary Classification

For Interpreting Results We need:

- The number of correct predictions for each class.
- The number of incorrect predictions for each class, organized by the class that was predicted.

These numbers are then organized into a table, or a matrix as follows:

- Expected down the side: Each row of the matrix corresponds to a predicted class.
- Predicted across the top: Each column of the matrix corresponds to an actual class.
- The counts of correct and incorrect classification are then filled into the table.

As an example for the actual 0 class in the upper left in fig[2] it was predicted correctly ($8.8e+03$ times) and was wrongly predicted (27 times).

1.4 Multi-class Classification

Same Procedure as binary classification, but ow all digits are classified

train accuracy is = 0.935067

test accuracy is = 0.8699

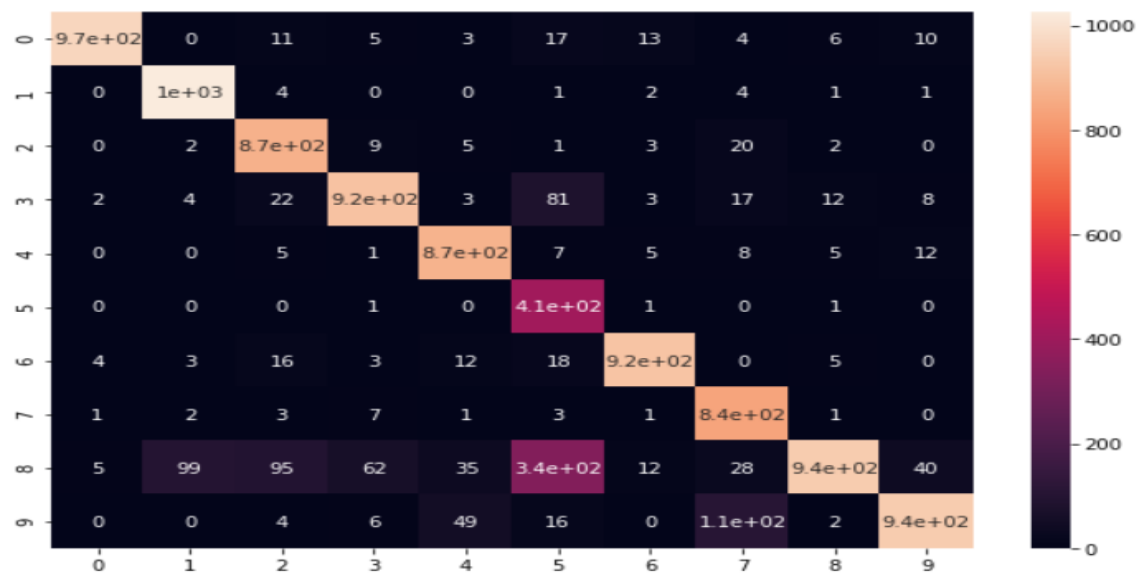


Figure 3: Confusion Matrix for Multi-class Classification