Program Structures and Algorithms

Project Report

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PROBLEM STATEMENT:

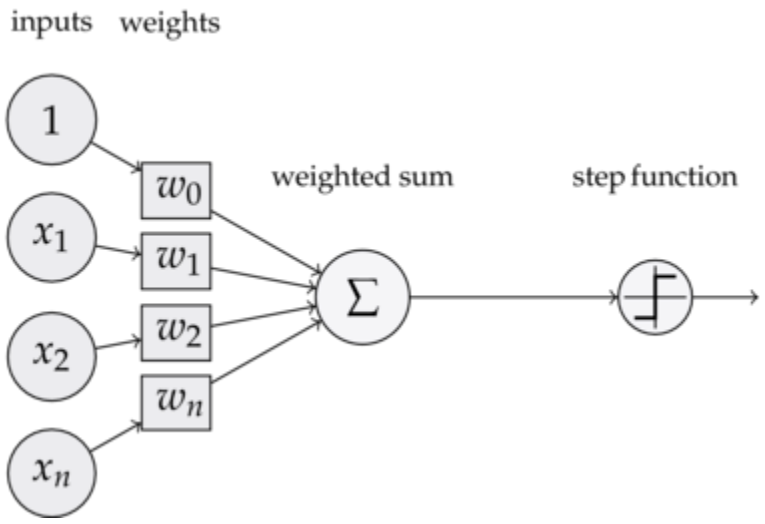
The objective is to build an artificial neural network from the ground up. To write the code for a simple perceptron which can model an unlimited number of neurons and layers. To implement the blending function for the hidden and output layers. Write a driver which, given a labeled dataset, will train the model, save the model and then run the model on the test data.

APPROACH:

We used the following classes to design the perceptron:

1) Neuron: To generate neurons.
2) Layer: To generate different layers.
3) Data Reader: To read the test and train data from .csv files.
4) Connection: To train various neurons and set the weights.
5) ArtificialNeuralNetwork: It is used to bind everything together.
6) MultiLayerPerceptron: It contains the main method to run the code and print the confusion matrix.

EXPLANATION:



- The idea is to take a large number of data say for example (handwritten digits), known as training data

- Then develop a system which can learn from those training data. In other words, the neural network uses the data to automatically infer rules for recognizing handwritten digits.
- Furthermore, by increasing the number of training examples, the network can learn more about handwriting, and so improve its accuracy.
- This algorithm tries to recognize the labels provided in the training dataset.
- The confusion matrix's diagonal contains the number of times the label was correctly recognized that is it gives the accuracy of the model.

SCREENCASTS (TO PROVE THE WORKING OF CODE):

```
==============Confusion Matrix - Start==============
  798   0   1   1   0   4   7   1   1   1
  0   1071   9   0   0   1   3   4   5   2
  0   1   671   4   2   1   3   6   0   1
  1   4   34   892   7   90   0   20   11   11
  0   0   5   0   571   4   4   2   5   1
  1   1   0   0   0   434   10   0   2   0
  8   3   15   0   24   27   889   1   19   3
  1   0   9   6   1   5   0   884   1   11
  8   4   12   2   9   42   2   3   422   7
  0   0   1   3   170   11   1   17   8   858
==============Confusion Matrix - End================
```

STEPS TO RUN THE CODE:

1) Download the project
2) Unzip the datasets (\src\com\algo\mlp\Datasets.zip)
3) Enter the paths to the train.csv and test.csv in MultilayerPerceptron.java class
4) Run the file.