Implementation of Artificial Neural Networks

Lab Assignment 3

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***Abstract*—Artificial Neural Networks (ANN) are multi-layered, fully-connected neural nets. They consist of an input layer, multiple hidden layers, and an output layer. Every node in one layer is connected to every other node in the next layer. The network can be made deeper by increasing the number of hidden layers.**

In this work we tried to use analytical solution to fit a curve to the diagnosis.csv Dataset.

I. Introduction

Artificial neurons, also known as units, are found in artificial neural networks. The entire Artificial Neural Networks in a system are made up of these units, which are arranged in a number of layers. Artificial neural networks frequently have hidden layers in addition to input, output, and other layers. The input layer gets information that the neural network needs to interpret or learn from the outside environment. Then, after passing through one or more hidden layers, this data is transformed into useful information for the output layer. The output layer then delivers an output in the form of an ANN response.

II. Method

In this section, we will explain the individual steps involved in creating an Artificial neural Network:

A. Data Pre-processing

Data processing is one of the most essential step in any machine learning algorithm.

The data provided to us was in the form of a .csv file, which can be read in python or colab notebooks by the use of 'read_csv' functionality provided in the pandas module. This returns us a Dataframe of all the different of individual example present in the csv file.

B. Method/Procedure

1) Import necessary packages.
2) Load the given data file is **diagnosis.csv**
3) After the data is loaded we spilt the dataset into training testing and validation.
4) Create a class **ArtificialNeuralNetwork** which will contain all the necessary functions required.
5) We are using **sigmoid function** as the optimizer function and cost function is **Binary Cross Entropy Loss Function**.
6) We write functions for forward prop back prop , calculating confusion matrix and traning function.
7) Create object of this class Neural Network.
8) Train model for this object and the values provided.
9) Calculate accuracy with and without validation.
10) Calculate confusion matrix for range 0 to 1.
11) Calculate Specificity and sensitivity.
12) Calculate the accuracy and plot the accuracy curve.
13) Calculate the AUROC Score and plot the ROC curve

III. Results

The plots of the accuracy, Confusion Matrix, Specificity, Sensitivity, AUROC Score and ROC Curve are obtained from the code as per the question, and are displayed as follows:

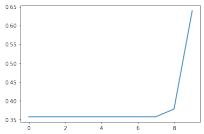

Fig. 1. Accuracy

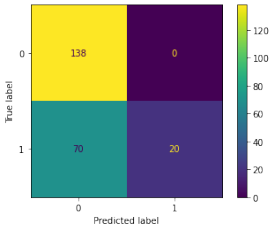

Fig. 2. Confusion Matrix

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Sensitivity :  1.0
Specificity :  0.2222222222222222
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Fig. 3. Sensitivity and Specificity

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AUROC Score:  0.6111111111111112
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Fig. 4. AUROC Score

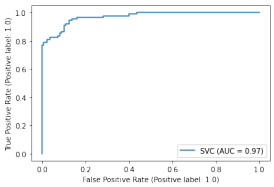

Fig. 5. ROC Curve

IV. Discussion

It was observed that to train the model, we used 128 hidden nodes. Sigmoid function was used as the optimizer. A batch size of 5 was created. The learning rate was set to 0.0001 and the number of epochs was 10.

We can see that the model works with an efficiency of 69.3 percent.

V. Conclusion

Artificial Neural Network has been implemented on the given Diagnosis Data-set and has been studied.

Appendix (Code)

The code is available at here