Mini-Project 2: Yelp Business Rating Prediction using Tensorflow

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# Problem Statement

In this project, we aim to predict a business's stars rating using the reviews of that business and review count based on neural network implementation in Tensorflow. This project is twofold:

Task 1: Consider this problem as a regression problem. Compare the RMSE of the BEST **Tensorflow regression neural network model** you obtained with that of **regression model** you achieved in the last project.

Task 2: Consider this problem as a classification problem. Compare the accuracy of the BEST **Tensorflow classification neural network model** you obtained with that of **each classification model** you achieved in the last project.

# Methodology

## Regression Problem

Linear Regression

show predicted and actual for 10 business

show RMSE

Logistic Regression

show predicted and actual for 10 business

show RMSE

Simple Regression

show predicted and actual for 10 business

show RMSE

Regression with early stopping and modelcheckpoint with relu

show predicted and actual for 10 business

show RMSE

Regression with early stopping and modelcheckpoint with sigmoid

show predicted and actual for 10 business

show RMSE

Regression with early stopping and modelcheckpoint with tanh

show predicted and actual for 10 business

show RMSE

Hidden nodes selection in hidden layer

1. trial and error
2. Forward Approach : This approach begins by selecting a small number of hidden neurons. We usually begin with two hidden neurons. After that train and test the neural network. Then increased the number of hidden neurons. Repeat the above procedure until training and testing improved.
3. This approach is opposite of Forward approach. In this approach we start with large number of hidden neurons. Then train and test the NN. After that gradually decrease the number of hidden neurons and again train and test the NN. Repeat the above process until training and testing improved.

3 Rule of thumb method[3] Rule of thumb method is for determining the correct number of neurons to use in the hidden layers, such as the following: • The number of hidden neurons should be in the range between the size of the input layer and the size of the output layer Foram S. Panchal et al, International Journal of Computer Science and Mobile Computing, Vol.3 Issue.11, November- 2014, pg. 455-464 © 2014, IJCSMC All Rights Reserved 462 • The number of hidden neurons should be 2/3 of the input layer size, plus the size of the output layer • The number of hidden neurons should be less than twice the input layer size

Simple Method[3] It is a simple method to find out neural network hidden nodes. Assume a back propagation NN configuration is l-m-n. Here l is input nodes, m is hidden nodes and n is output nodes. If we have two input and two output in our problem then we can take same number of hidden nodes [3]. So our configuration becomes 2-2-2 where 2 is input nodes, 2 is hidden nodes, 2 is output nodes.

In two phase method the termination condition is same as the trial and error method but in a new approach. In this method data set is dividing into four groups. Among all four groups two groups of data are used in first phase to train the network and one group of remaining data set is used in second phase to test the network. Last group of data set is used to predict the output values of the train network. This experiment is repeated for different number of neurons to get minimum number of error terms for selecting the number of neurons in the hidden layer

Another approach to fix hidden neuron is the sequential orthogonal approach. This approach is about adding hidden neurons one by one. Initially, increase Nh sequentially until error is sufficiently small. When adding a neuron, the new information introduced by this neuron is caused by that part of its output vector which is orthogonal to the space spanned by the output vectors of previously added hidden neurons .An additional advantage of this method is that it can be used to build and train neural networks with mixed types of hidden neurons and thus to develop hybrid models

REFERENCES [1] S. N. Sivanandam, S. Sumathi, and S. N. Deepa, Introduction to Neural Networks Usin Matlab 6.0, Tata McGraw Hill, 1st edition, 2008. [2] “Review on Methods to Fix Number of Hidden Neurons in Neural Networks K. Ghana Sheila and S. N. Deepak, “Review on Methods to Fix Number of Hidden Neurons in Neural networks,” Mathematical Problems in Engineering, vol. 2013, Article ID 425740, 11 pages, 2013. doi:10.1155/2013/425740 [3] Saurabh Karsoliya, “Approximating Number of Hidden layer neurons in Multiple Hidden Layer BPNN Architecture,” International Journal of Engineering Trends and Technology- Volume 3 Issue 6- 2012 [4] http://en.wikipedia.org/wiki/Types\_of\_artificial\_neural\_networks [5] http://www.myreaders.info/02\_Fundamentals\_of\_Neural\_Network.pdf [6] Boger, Z., and Guterman, H., 1997, “Knowledge extraction from artificial neural network models ,” IEEE Systems, Man, and Cybernetics Conference, Orlando, FL, USA

## Classification Problem

# Experimental Results and Analysis

# Task Division

## Chandini Nagendra:

## Siddharth Chittora

Discussed together on how to improve the model and came up with the following solution

# Project Reflection

label encoding does not work for tensor flow, when using classification. do one hot coding

with 25 neurons in the 1st layer the r2 score was 60 and with 60 neurons in the 1st and 30 in the second the R2 was 72.

# Additional Features