A Look at Artificial Neural Networks

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Abstract

In this study we implement a general artificial neural network framework. Our framework allows us to construct neural networks with arbitrary input, hidden, and output units as well as an arbitrary number of hidden layers. The user is also able to specify the learn rate, number of epochs to train the neural network, and whether to do cross validated training with n folds. This framework allows us to explore the performance and accuracy trade offs of varying the above parameters on different data sets. We utilize two data sets to motivate this parameter space exploration. We also compare the performance and accuracy of training a single neural network to that of training an ensemble of neural networks. We show <list some results/generalizations>.

1   Introduction

TODO: Add the intro

2   Design and Implementation

The artificial neural network was implemented in Python. It consists of a single class which takes as arguments (i) the number of input units (ii) a list containing the number hidden units to create at each hidden layer (where the length of the list defines the number of hidden layers to create (iii) the number of output units (iv) the learn rate and (v) the number of epochs to train the neural network for. The neural network unit activations, errors, and weights are represented simply as matrices. This allows all computations to be down in a fast and efficient manner and makes the neural network implementation very comphrensible. The neural network class exports functions to (i) feed a single instance through the network (ii) run backpropagation (iii) train on a set of data (iv) test a set of data and (v) a set of functions to print weights, errors, and activations for debugging from the command line.

3   Methodology

TODO: Add the methodology

4   Results

Plots we have data for:

1. average accuracy for 1 hidden layer hidden units vary from 1-10 using 10 fold cross validation, epoch = 10

2. average accuracy for 2 hidden layer hidden units vary from 1-10 using 10 fold cross validation, epoch = 100

(1 and 2 will be combined into a single table, wbcd data)

3. average accuracy for 1 hidden layer hidden units vary from 1-120, epoch = 1000

4. average accraucy for 2 hidden layer hidden units vary from 1-120, epoch = 1000

(3 and 4 will combine into a single table, face data)

TODO: Add the results

5. Ensemble of neural networks using the best combination of parameters from 1 and 2 (plot varying the number of neural nets)

6. Ensemble of neural networks using the best combination of parameters from 3 and 4 (plot varying the number of neural nets)

5   Summary and Conclusions

TODO: Add the summary

References