

APPENDIX III

ELITE ARTIFICIAL NEURAL NETWORK

INTRODUCTION

The data obtained from experimentation is used to train the software for prediction of the required values, and study the correlation and trend of parameters. Even the samples, which were not experimented, helped to achieve concrete analyses. This appendix focuses on ANN software and the prediction of various from the same.

This software is a user-friendly interface for developing artificial neural network models. Given input-output data, the software develops (trains) an ANN model for pre-specified architecture. Once an ANN model is constructed, the software can also be used to make output predictions corresponding to new input data. The graphical analysis of the training and test set results obtained is another feature for of this software.

The software essentially performs three tasks, Development (training) of an ANN-based process model from given process input-output data, making predictions using ANN models built in the past and Graphical analysis of the prediction results

ANN Training

For building a model, training is essential and following instructions for building a new ANN model is required to be followed

Enter the first four field's fist like,

1. Number of neurons in the input layer of the ANN is equal to number of inputs present in the input-output data file. Therefore, enter the number of inputs as the number of neurons in the input layer. In our case we have used 5 input parameters and 5 neurons. The input parameters are GSM, composition of cotton, polyester, nylon and viscose in percentage.

2. Numbers of output neurons are same as the number of outputs in the input-output data file. In our case the output parameters are, FPR, BR and AIHF 60.
 3. Complexity level: One has to choose a particular level of complexity (Simple, Moderate, Complex) depending upon the size of the data. As the data is huge we had use complex complexity level.
 4. Termination criterion:
 - a. Total number of iterations to be performed to train the neural network.
 - b. Final error (RMSE) value of the training set to be achieved.
- Browse Training and Test files. Make sure that file names should appear under the "Browse" buttons instead of "--Select File--". One can take help of "Table" option to create training and test files or simple comma separated file created in MS-Excel can also be used.
 - Finally click on "Start Training" button and select "Random weights" option. Once training start, all the above options will get disabled, except termination criterion (this one can change at run time also).
 - If one wants to go for another ANN model with different inputs/outputs and training/test files, close and restart the "Elite-ANN" and follow the similar procedure.

Data Files Format

- This Software accepts training and test files separately.
- This software accepts the files only in the 'csv' (comma separated values) format.
- These types of files can be generated in, either using "Table" option in the software, or by "MS Excel".
- First put all the inputs variables in the successive columns and then follow by all the output variables from next column, as shown in the following (MS Excel File view).

Table Option

Follow the steps to build the data files.

- Click on the "Table" button shown in the following picture.
- A new dialog box will appear in front, as shown in the following picture. Fill the parameters required for the table construction and click ok to proceed.
- A table of the specified parameters will open; fill all the values correspondingly in the table and save it at appropriate location. This type of tables can be used for the training/test data file and Validation data file.

Loading Data Files

- Press "Browse" button in the training/test file option to load the Training/Test data file.
- Test data is optional, so one can build ANN model without test data also.
- Check that the name of the data file must appear below the corresponding "Browse" button after successfully loading the file for training or test.

Training

First supply the four parameters in the proper edit boxes then browse Training/Test data files, after that one can start the training of the neural network by clicking on the "Start Training" button.

- Press "Start Training" button, a new dialog box named "Load Weights" will open.
- Choose "Random Weights" option to start newly ANN training. Before this one has to give any (randomly) seed value in the box below it.
- Choose "Frozen Weights" option, if one wants to continue training from the already saved weight file. An "Open" file dialog box will open. Browse the previously saved weight file, so that ANN can start training onwards. Be sure that the parameters in the weight file and one stated above in the four edit boxes along with names and locations training and test files must match.
- Elite-ANN automatically saves the weights file. A weight file corresponding to minimum test set error is saved in to the folder from where Training data file is selected for the ANN training. The name of the weight file will be



"****_Optwts.csv" (**** is the name of the training file used for ANN training). One can also save the weight file manually at any desired moment of time simply by clicking on the "Freeze Weights" button (be sure that you have stopped the training before this).

Graphical Presentation

RMSE (Root means squared Error) corresponding to training and test set are graphically presented on the pane. This option makes easy to compare the different error with each other.

Building an optimum ANN-based model is heuristic process. And one has to run the ANN training on a given data set many time for different ANN structural configurations, seed value for random number generation, learning rate and momentum factor etc. Also change the value of learning rate and momentum factor at run time, which helps ANN to escape from getting stuck in to the sub-optimal solution.