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Equity Portfolio Optimization Algorithm for Neural Networks

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Abstract *- Stock trading point's detection is a very interesting subject arising in numerous financial and economic planning problems. Here a Hybrid Intelligent system (HIS) method with dynamics time warping system for stock trading point's detection is presented. The Hybrid intelligent system is able to generate numerous stocks trading points from the historic data base, and then the dynamic time warping system will be applied to retrieve similar stock price patterns from historic data for training the system. These trading points represent short-term trading signals for selling or buying stocks from the market. A Back-Propagation neural network and Genetic Algorithm is further applied to learn the connection weights from these historic trading points and afterwards it is applied to forecast the future trading points from the set of test data. Experimental results demonstrate that the Hybrid Intelligent system with genetic algorithm can make a significant amount of profit when compared with other approaches using stock data.*

Keywords - Hybrid Intelligent system; Genetic Algorithm; Neural Network; Fuzzy Inference System

I. INTRODUCTION

Trading Points are difficult to predict to a particular Stock because they don't have much information about the trading points of a particular Stock. The Hybrid Intelligent System is used to decompose the particular Trading points and the result would be passed on to the back propagation neural network to train the entire Model. A hybrid intelligent system is developed with the genetic algorithm to be integrated with the neural network to improve the threshold value to further increase the profitability of the model. The refinement of data using genetic algorithm and the BPN models are used to predict the Trading Points. A genetic algorithm (GA) is a search technique used in computing to find exact or approximate solutions to optimization and search problems. Genetic algorithms are categorized as global search heuristics. Genetic algorithms are a particular class of evolutionary algorithms (EA) that use techniques inspired by evolutionary biology such as inheritance, mutation, selection, and crossover.

II. DEVELOPMENT OF HYBRID INTELLIGENT SYSTEM

The HIS is started up with the retrieval of the data from the specified server. The data taken out is used to develop the pattern and the template. The pattern and template are the training data and they are passed on to the HIS .The HIS comprises of the Neural Network and the Genetic Algorithm. In the Neural Network the training data is checked along with the testing data .They are assigned weights

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and if the weights do not satisfy the neural condition they are again trained unless they attain the required weight to pass on to the next phase. The next Phase would be the genetic algorithm where the stock trading points are predicted. The Crossover pattern is used here to predict the future trading points. Entire HIS operation in predicting the stock trading points is represented in Fig.1.

A. Back Propagation Neural Network

Neural networks are applicable in virtually every situation in which a relationship between the predictor variables (independents, inputs) and predicted variables (dependents, outputs) exists, even when that relationship is very complex and not easy to articulate in the usual terms of "correlations" or "differences between groups. Fluctuations of stock prices and stock indices are another example of a complex, multidimensional, but in some circumstances at least partially-deterministic phenomenon. Neural networks are being used by many technical analysts to make predictions about stock prices based upon a large number of factors such as past performance of other stocks and various economic indicators. The ability of the non linear relationships in input data makes them ideal for modeling the non linear dynamic systems such as the stock market. The Neural Networks are examined in three areas they are

1. Network Environment and training data
2. Network Organization
3. Network Performance.

The Neural Network must be trained on some Input Data. The two major problems in it are

1. Defining set of input used.

2. Deciding an algorithm to train the data.

Neural networks process numeric data in a fairly limited range. This presents a problem if data is in an unusual range, if there is missing data, or if data is non-numeric. Fortunately, there are methods to deal with each of these problems. Numeric data is scaled into an appropriate range for the network, and missing values can be substituted for using the mean value (or other statistic) of that variable across the other available training cases. After generating the sub segments through the PLR the trading points are needed to transformed into 0 and1 before they are fed to the BPN. The sub segments are divided and the time series data are defined as

If Ci=C+d; trend=upward;

If Ci=C-d; trend=downward;

If Ci=d<c; trend =steady;

Where

Ci is the stock Price at the ith trading point .

C is the stock price at the current trading point.

D is the threshold for checking the stock Price.

The trend is transferred as an output value of BPN. If the trend changes from up to down, the trading signal is changed from 0 to 1; if the trend changes from down to up, the trading signal is changed from 1 to 0; otherwise, the signal does not change. The trading Signals are not quite related to the Price Variation. The Trading signal should be able to react to the price variation and provide more detailed information. The trading points are redefined according to the tendency of the stock.

B. Back Propagation Algorithm

If the trend is up ward

$$Ti=Ci - \min\{Ci,Ci+1,Ci+c\} - \max\{Ci,Ci+1,Ci+c\} - \min\{Ci,Ci+1,Ci+c\} * 0.5$$

If the trend is downward

$$Ti=Ci - \min\{Ci,Ci+1,Ci+c\} - \max\{Ci,Ci+1,Ci+c\} - \min\{Ci,Ci+1,Ci+c\} * 0.5+0.5.$$

Ci means the Stock price of the ith Transaction Day.

The Back Propagation Leaning algorithm has two procedures. They are

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1) Feed forward step

2) Back propagation weight training step.

In back propagation, the gradient vector of the error surface is calculated. This vector points along the line of steepest descent from the current point, so we know that if we move along it a "short" distance, we will decrease the error. A sequence of such moves (slowing as we near the bottom) will eventually find a minimum of some sort. The difficult part is to decide how large the steps should be. A classic example of this in neural network training is where the algorithm progresses very slowly along a steep, narrow, valley, bouncing from one side across to the other. In contrast, very small steps may go in the correct direction, but they also require a large number of iterations. In practice, the step size is proportional to the slope and to a special constant: the learning rate. The correct setting for the learning rate is application-dependent, and is typically chosen by experiment; it may also be time-varying, getting smaller as the algorithm progresses.

C. Genetic Algorithm

A genetic algorithm has three major components. The first component is related with the creation of an initial population of m *randomly* selected individuals. The initial population shapes the first generation. The second component inputs m individuals and gives as output an evaluation for each of them based on an objective function known as fitness function. This evaluation describes how close to our demands each one of these m individuals is. Finally the third component is responsible for the formulation of the next generation. A new generation is formed based on the fittest individuals of the previous one. This procedure of evaluation of generation N and production of generation N+1(based on N) is iterated until a performance criterion is met.
A typical genetic algorithm requires:

1. A genetic representation of the solution domain,

2. A fitness function to evaluate the solution domain.

III. RESULT

The data retrieval would be from any server and then the generated pattern and the template are created with the data retrieved. The moving averages help out in a large scale for the using of the linear rise and fall in the retrieved points. The training process is only needed when a neural network is used. The genetic is used to search the best threshold value of the entire process. Using the HIS future trading points are predicted in an significant period of time.

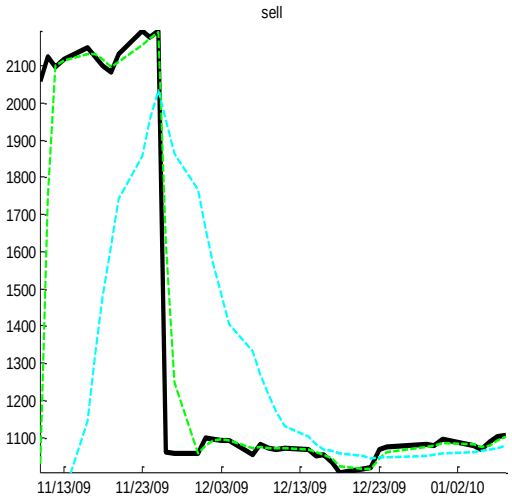

Figure 1. Compare moving average with current data.

The moving average would be useful in checking the input data because a graph would be plotted along with the data about the rise and the fall and it was shown in Fig. 1. Comparison between the genetic algorithm and the multi start search shows that the genetic algorithm can show improvements further. The risk of false prediction is completely eliminated by the algorithm and the conditions which are used in the Hybrid Intelligent System. The generated portfolio would say the entire details of the company along with the prediction in the stock trading points. The system is time efficient and with the usage of the neural and the genetic algorithm

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would help in more accurate prediction. The important fact of this system is it can work out in both the online and the offline mode. Offline mode is the process of manually selecting the trading points and predict based on them.

IV. CONCLUSION

The usage of the Back Propagation neural network and the algorithm in the HIS would help in analyzing the data through various conditions and also would generate a moving average before the algorithm. The main work of the algorithm is to select the trading points and pass on to the next algorithm. The Genetic Algorithm is the one where the process of prediction occur which would be more accurate and the time efficiency is also higher. The proposed system with the genetic algorithm and the crossover pattern would help the stock traders in predicting the points for the current data and the old data. By which the system operation can be certainly understandable by the prediction of the trading point for the earliest of the day and the predicting capability of the system can also be checked at any time and for any kind of the stock data. Hence the investors in the stock market can be given a certain indication of the future points whether to buy or sell it. Hence with this system the prediction can be more helpful for the traders to make an affinitive decision on a company stock on the current day whether to buy the stock or sell the stock of the particular company which is with in their hands.

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