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# PROPOSED METHODOLOGY

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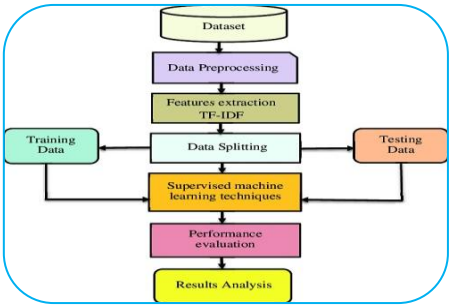
**ABSTRACT:**

*This chapter explore the proposed methodology of stock price prediction. The proposed algorithm derives form cascaded neural network. The process of cascading elaborates the neural network models for mapping of attributes for the voting of predefine class. The proposed algorithm encompass plant grow optimization (PGO) algorithm for the optimization of attributes. The PGO algorithm reduces the impact of attributes variance for the classification and prediction of stock price.*




**KEYWORDS:** *plant grow optimization (PGO) , methodology.*

## INTRODUCTION

The process of cascading of model employed two different neural network models self-organized map (SOM) network and radial basie neural network (RBF). The SOM neural network model work as clustering algorithm of stock market data. The RBF neural network is fast and single layer neural network model boost the classification of stock data. the continuity of chapter describes the approach of cascading algorithm, attribute optimization algorithm plant grow optimization, proposed algorithm, DNAAR algorithm and support vector machine.

## CASCADED NEURAL NETWORK :-

When large amounts of training data are available, several studies have shown that the addition of more layers improves the accuracy in neural networks classification tasks, usually followed by an additional increase in the number of parameters in comparison to shallower network. However, in stock dataclassification, the number of available data with labelled data may be limited by the high number of noises samples. More importantly, from the entire number of available voxels, only a very small number of those are, which drastically reduces the number of positive training samples.These limitations clearly affect the designed architecture, as neural network tends to suffer from overfitting when they are not trained with enough data. In this aspect, our particular approach has been designed to deal with these two issues. By adequately sampling the training data and splitting the training procedure into two different neural networks, we design a pipeline with fewer parameters while not compromising the precision and the accuracy of stock data classification. the process of cascaded model uses two different neural network models such as RBF and SOM.

## PLANT GROW OPTIMIZATION :-

The mapping and selection of stock data raised new feature level of price sample data. The sampling of all these data mapped with corresponding attributes [22]. For the optimization of attributes used plant grow optimization (PGO) algorithms. The principle of plant grow optimization algorithm is

fight of competition for the successor of life. The process of plant grows optimization algorithm describe in three sections given below [23, 24].

1 initialization

This phase defines the initial value of parameter for the growing the plant[22]

$$Set\ \ NG = 0\{NG\ is\ the\ generations\ counter\}$$
$$Set\ \ NC = 0\{NC\ is\ the\ convergence\ counter\}$$
$$Set\ \ NM = 0\{NM\ is\ the\ Mature\ points\ counter\}$$

*Set the upper limit of the branch points N and initialize other parameters.*
*Select N0 branch points at random and perform leaf growth.*

**Assign morphogen**

Calculate the eligibility of the leaf point.
Assign the concentration of the morphogen of each branch point.

**Branching**

Select two critical values between 0 and 1 randomly and dispose.
Produce new points by branching in four modes.

**Selection mechanism**

Perform leaf growth in all the points.

Pick out the mature branch points, the number of which is $k$ $(0 \leq k \leq N)$, by the maturity mechanism.

Set NM = NM + k

Produce a new point in the center of the crowded area and select the best point to substitute the crowded points.

Eliminate the lower competition ability branch points and select N branch points for next generation.

**2. Competition**

Compare the current points with the mature points and get the best fitness value

$f_{max}$

Set: $NG = NG + 1$

$If\ (f_{max} < f_{\max\ old}\ )Set: f_{max} = f_{\max\ old}$

If $(|f_{max} - f_{\max\ old}| < \varepsilon)Set: NC = NC + 1$

else

Set: NC = 0

else

Set: NC = NC+1

4. *termination*

$If\ (NG < NG_{max}\ \&\&NC < NC_{max}\ \&\&NM < NM_{max}\ )$

$Goto\ step\ 2$

*else*

$Exit$

**4.2 proposed algorithm**

The proposed algorithm focuses on the accuracy of stock price prediction . The algorithms follow the concept of cascading process of neural network. The cascading process of neural network enhanced the capacity of classification of data in concern of biomedical signal. the proposed algorithms used two neural network models, self-organized (SOM) map neural network and radial biases neural network (RBF). The process of model work on the basis of unsupervised and supervised. The process of working algorithm describes here.

Xi= sample of optimal feature data
N =size of sample data
V= vector of feature data process.
O = mapped data of cluster
G=Group of patterns,
SM=successor matrix
Wn= winner matrix
Bf =final pattern of classification.
D = dimension of data
R = relation of feature data
S= sample of set
$B^{\emptyset}$= adjust matrix
Ac = learning factor
The process of training sample as $(X_i \in R^D, y_i \in R)$,i=1……..m
$sample\ of\ input(p)$ if $*= V$

$$[s^1, \ldots . . s^k] \leftarrow [rand(1,k) \times (p-w)] + 1$$

$V \leftarrow n$ vector of neuron
For $i \leftarrow 1\ \ to\ N\ do$

$$O^{\cdot} \in C^D \leftarrow S *= V$$
$$N_*^i \in R^D \leftarrow biase\ of\ O$$
$$G \in R^D \leftarrow pattern\ N$$

End for
Input sample of BF $g_*^1, \ldots \ldots . . g_*^m$

$$F_{RBF} \in R^{D \times m} \leftarrow \emptyset([g_*^1, \ldots \ldots . . g_*^m])\ Adjust\ W$$
$$W \in R^D \leftarrow BF^{-1}$$
$$F \in R^{d.,} \leftarrow W^T\ \emptyset(G)$$

For $C \leftarrow 1\ to\ A_c\ dotraining\ of\ class\ Cb$
Adjust the weight factor of cascading process
$CC \in R^{d^{\sim}} \leftarrow$ relative feature process of SOM
Call kernel function

$$k(x_i, x_j) = \exp\left(\frac{-\|x_i - x_j\|^2}{\gamma}\right), \gamma \in R_+$$

End for
Adjustment matrix $B^{\emptyset}$ of space $F$ mapping of same class

$$B_{ij}^{\emptyset} = \{ \begin{matrix} e^{\left(-\|x_i - x_j\|^2\right).} \\ e^{\left(-\|x_i - x_j\|^2\right).} \end{matrix} .$$

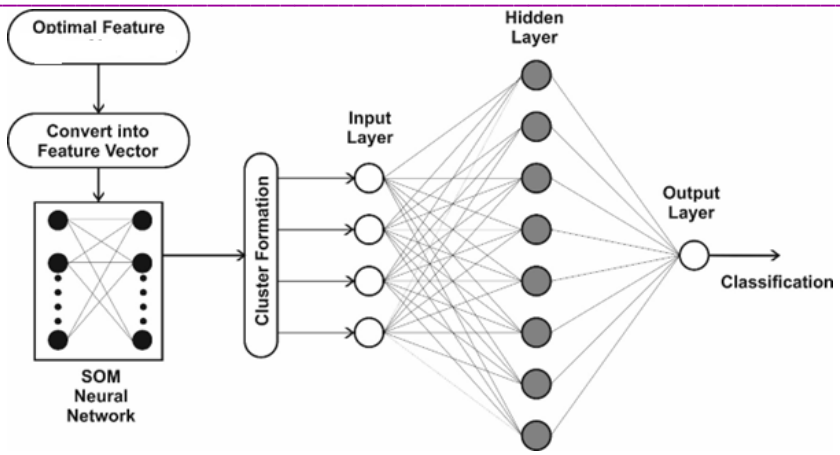



**Figure 4.4 proposed model of stock price prediction**

## SUPPORT VECTOR MACHINE :-

Support vector machine is technique used in predication and classification process. The process of hyperspace separate data points in two different plans of data. The performance of SVM is good with small sample and non-linear problems [11, 18].

The process of support vector is defined here

The training set {(x1, y1), (x2, y2,)….. (xn,yn)}, the input mapping to large space by the non-linear function Φ(x) and distribution of data

F(x) =w. Φ(x) +b…….. (1)

Where w is weight and B is constant

The support vector regression reduces the risk of stock price with var1 and var2 for the process of optimization and best fitting of hyperplane

$$min\frac{1}{2}||w||^2 + C\sum_{i=1}^{n}(var1 + var2) \dots\dots\dots\dots\dots\dots\dots\dots (2)$$

$$\begin{cases} yi - w.xi - b \le c + var1 \\ w.xi + b - yi \le c + var2 \\ var1 \ge 0 \\ var2 \ge 0 \end{cases} \quad \dots\dots\dots\dots\dots\dots (3)$$

$i = 1,2,..n$

Where i=1,2,…..,n, n is sample C is penalty variable and var1 is loss function yi=f(xi)

The solution of maximum coverage of variance range by kernel function

$$k(xi, xj) = \exp\left(-\frac{||x - xi||^2}{2\delta^2}\right) \dots\dots\dots\dots\dots\dots (4)$$

Where $\delta$ is margin of radial kernel function.

The SVM classifier categories the variance impact and maximize the possibility of price predication of given stock market data.

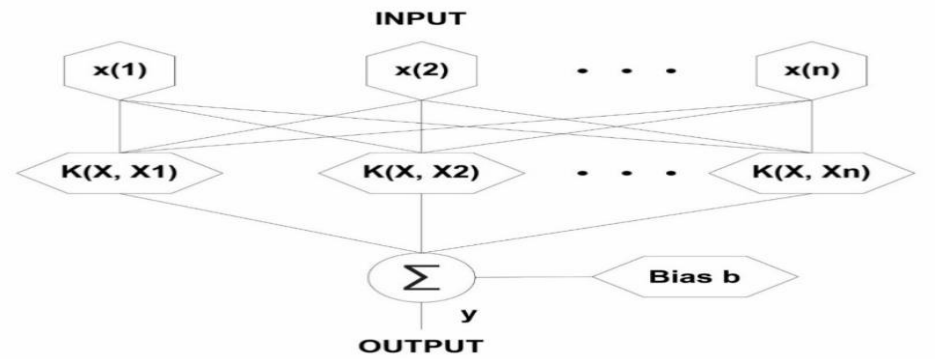



**Figure 4.5: Processing block of support vector machine for classification of stock price pridication.**

## BP (BACK PROPAGATION NEURAL NETWORK)

Back-Propagation (BP) neural network is a kind of multilayer feed-forward network first proposed by Rumelhart and McCelland in 1986, which with information forward propagation and error back propagation. $Hidden-layer$ is a unique structure of NN through which sends the information from the $input-layer$ to $output-layer$. The neuron state of $all-layer$ is in a parallel relationship and does not interfere with one another, each neuron can only affect the neuron state of the sub-layer. If the $real$ output and the $expected$ output have gaps, the error will be propagated back to input-layer [12, 14].

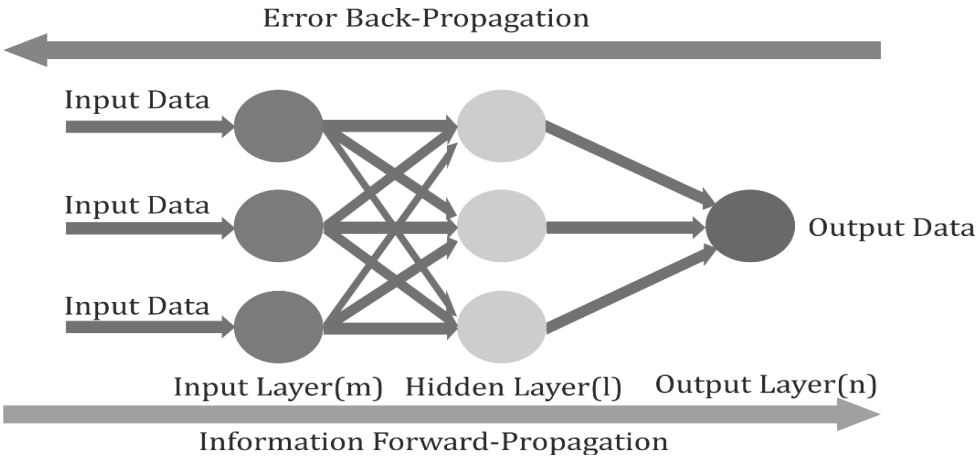



**Figure 4.6: BP network model with three-layer.**

In the back-propagation process, weights and thresholds need to be optimization, which gradient descent algorithm is frequently applied to maintain the NN layer's parameter by layer in the time period of the research. The NN's accuracy will be increased by continuously correcting the back-propagation's parameter, the weights and thresholds. Based on the error reverse propagation algorithm, BP NN has stronger mapping ability than other methods and it can process nonlinear and complex system problems preferably. Numerous researchers applied the linear relationship between factors to make the prediction, but this assumption has big limitations [18]. On such condition, the BP NN benefits are underlined. In arrangement to outcomes of weight startup and small training sample's limitations of BP NN, the merged Adaboost algorithm with BP network so that it can accurately predict the energy consumption by using various factors in the power industry. Nowadays an increasing number of studies have applied BP neural networks to do the forecasting, including rainfall forecasting,

carbon emission forecasting and etc. In energy forecasting, many optimizations combined BP NN is widely used. The topology of BP-NN is represented below:

The BP NN, one variety of multilayer feed-forward NN, have wide applications. This network is based on a gradient descent method that minimizes the squared errors sum between the output values and the actual values. The BPNN includes three types of neural layers, including an input layer, a hidden layer and an output layer.

$$w_{ij} = w_{ij}(t-1) - \Delta w_{ij}(t) \quad (1)$$

$$\Delta w_{ij}(t) = \frac{\eta \delta E}{\delta w_{ij}(t-1)} + \alpha . \Delta w_{ij}(t-1) \quad (2)$$

Where,
$w_{ij}$ - Weights between nodes $i$ and j.
$\eta$ - learning speed,
$\alpha$ - Impulse parameter,
$t$ - Current number of iterative steps
$E$ - Error super curve face

During the process of BPNN learning, the thresholds and weights of the joints between two layers are updated through subsequently back-propagating the errors via the network and minimizing the MSE of the $output - layer$.

$$MSE = \frac{1}{2}\sum_{k=1}^{m}(Y_k - O_k)^2 \quad (3)$$

Where,
$O_k$ - results of output layer neurons
$Y_k$ - desired output

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