

# Optimized Parameter of Wavelet Neural Network (WNN) using INGA

Nithya.S<sup>[1]</sup>

Assistant Professor,  
Department Of Computer Science,  
Sri Akilandeswari Women's College,  
Vandavasi

Subhashini.R<sup>[2]</sup>

MSC Computer Science,  
Department Of Computer Science,  
Sri Akilandeswari Womens College,  
Vandavasi

Sudha.D<sup>[3]</sup>

MSC Computer Science,  
Department Of Computer Science,  
Sri Akilandeswari Women's College,  
Vandavasi

**Abstract:** Genetic algorithm has been one of the most popular methods for many challenging optimization problems. It is a critical problem in which the evacuation time is an important issues. The continuous air traffic growth and limits of resources, there is a need for reducing the congestion of the airspace system. The main objective of this work is to automatically adapt the airspace configurations, according to the evolution of traffic Niche genetic algorithm(INGA) was used in reliability optimization of software system. And also the searching performance of the genetic algorithm was improved by the stochastic tournament model. The multi-module complex software system reliability allocation effectively. Genetic algorithm (GA) and FGA are compared though seven benchmark function. It can be applied to a wider range of problem including multi-level problem. The uniform schema crossover operator and the non-uniform mutation in the genetic algorithm.

**Keywords:** INGA,GA,WNN,FGA,etc

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## I. INTRODUCTION

### 1. NEURAL NETWORKS:

- A neural network can be defined as a model of reasoning based on the human brain. The brain consists of a densely interconnected set of nerve cells, or basic information-processing units, called neurons.[1][4]
- The human brain incorporates nearly 10 billion neurons and 60 trillion connections, *synapses*, between them. By using multiple neurons simultaneously, the brain can perform its functions much faster than the fastest computers in existence today.
- Each neuron has a very simple structure, but an army of such elements constitutes a tremendous processing power.
- A neuron consists of a cell body, **soma**, a number of fibers called **dendrites**, and a single long fiber called the **axon**.
- Our brain can be considered as a highly complex, non-linear and parallel information-processing system.

### 2. PRECEPTONS:

The operation of Rosenblatt's perceptron is based on the McCulloch and Pitts neuron model. The model consists of a linear combiner followed by a hard limiter.

The weighted sum of the inputs is applied to the hard limiter, which produces an output equal to +1 if its input is positive and -1 if it is negative.

In the case of an elementary perceptron, the n-dimensional space is divided by a hyperplane into two decision regions. The hyperplane is defined by the linearly separable function

$$\sum_{i=1}^n x_i w_i - \theta = 0$$

### 3. GENETIC ALGORITHM:

A genetic algorithm (or GA) is a search technique used in computing to find true or approximate solutions to optimization and search problems[2].

- I. Genetic algorithms are categorized as global search heuristics.
- II. Genetic algorithms are a particular class of evolutionary algorithms that use techniques inspired by evolutionary biology such as inheritance, mutation, selection, and crossover (also called recombination).
- III. Typically, there will be more than one output class or class value and therefore more than one output node.

### 4 . WAVELET NEURAL NETWORK:

A wavelet neural network (WNN) based on the genetic algorithm (GA) was used in conjunction with an experimental design to optimize the enzymatic reaction conditions for the preparation of esteramines-based esterquats.[3] A set of experiments was designed by central composite design to process modeling and statistically evaluate the findings. Five independent process variables,

including enzyme amount, reaction time, reaction temperature, substrates molar ratio and agitation speed were studied under the given conditions designed by Design Expert software. All these show that the WNN has great potential ability in prediction of reaction conversion in lipase-catalyzed synthesis of products.

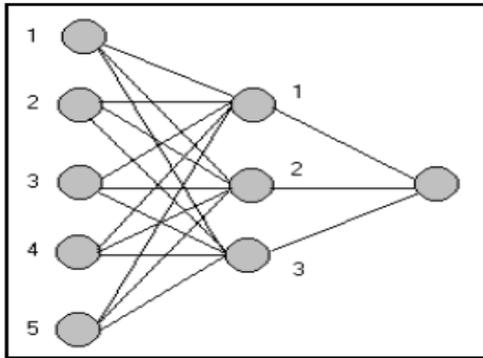


Fig 1.1 State diagram

**5 .OPTIMIZATION PARAMETER:**

A optimization is a process that find a best , or optimal , solution for the problem . the optimization have major three factor

1. An objective function
2. A set of unknow or variable
3. A set of constraint

**5.1 OPTIMIZATION METHODS:**

There are two optimization methods are having the model[1][4]. They are

1. Linear programming.
2. Non linear programming.

**Optimistic Model**



**Pessimistic Model**



Fig 2.1 optimistic model

**III. LITERATURE REVIEW**

**1. INGA-WNN prediction model**

**1.1 WNN modeling**

WNN is generally divided into relax-type and close-type by the different wavelet-basis functions. And our prediction adopts the close-type with a three-layer feed-forward neural network. In our model, we assume that the network topology appear [5][9], and there are  $m$  nodes in the input layer,  $h$  nodes in the hidden layer and  $n$  nodes in the output layer. The input samples are denoted by  $X_1 \sim X_m$ , the output samples are denoted by  $Y_1 \sim Y_n$ . The stretching and translating parameters are denoted by  $a_1 \sim a_n, b_1 \sim b_n$  respectively. The link-weights in the network between the input layer to hidden layer and the hidden layer to output layer are denoted by  $w^{i-h}, w^{h-o}$  respectively.

According to Kolmogorov theory, the number of hidden layer nodes  $h$  is determined by the number of input layer nodes  $m$ . The calculation equation is

$$h = 2m + 1$$

The sigmoid function is still used as the activation function shown as follows

$$g(x) = 1 / [1 + \exp(-x)]$$

where  $x$  in (1) and (3) denotes the data of the previous layer. By the wavelet basis function, the output results of WNN are

$$h = \sum_{r=1}^m w_{rs} - b_s$$

$$Y_t = \sum_{s=1}^a w_{st} \psi$$

$$s=1 \quad a_s$$

Usually, the gradient descent method is used to calculate the network connection weights, by which the parameters in WNN are more accurate than before. However, the extreme value point from this method is just the approximate value. Meanwhile, it is vulnerable to the local optimal network problem[4]. So we prepare to use the Improved Niche Genetic Algorithm (INGA) for optimizing the local network parameters.

In fact, it is expected that a teacher should start from the familiar concepts in classical mechanics and should land down with derivation of these equations giving the physical significance meaningfully. Same is the approach followed in many of the standard books. Many researchers,

educationalists have attempted to bridge this gap and tried to give derivations of SE starting from many fundamental principles. However, again many of such attempts are thorny for undergraduate students. [1-9].

### 1.2 Time dependent Schrödinger equation (TDSE)

The concept of time dependent Schrödinger equation (TDSE) illustrated in literature and even during class room teaching is mostly either complex or meant for advanced learners. This article is intended to enlighten the concept to the beginners in the field and further to improve knowledge about detailed steps for abstract mathematical formulation used which helps in understanding to derive TDSE using various tools and in more comprehensible manner. It is shown that TDSE may be derived using wave mechanics, time independent equation, classical & Hamilton-Jacobi's equations[8]. Similar attempts have been done earlier by some researchers. However, this article provides a comprehensive, lucid and well derived derivation, derived using various approaches, which would make this article unique.

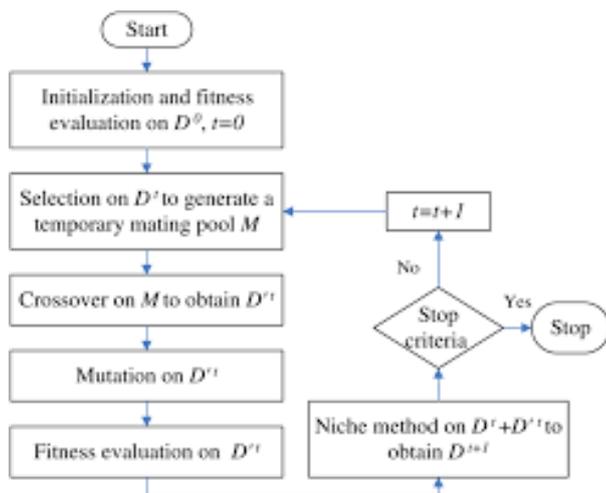


Fig1.3 time dependent flowchart

## 2. INGA algorithm

Based on the principle of natural selection also referred to as survival of the fittest, the Genetic algorithm (GA) originated in the 1960s, which is a global optimization algorithm[6]. GA is a probability optimization algorithm, and has great advantages in terms of parallelism and expansibility. So the algorithm is a good option for dealing with nonlinear problems. We can quickly obtain the global optimal solution for large-scale networks.

GA is mainly used to simulate the survival process of chromosomes. The process includes five steps: encoding, the determination of the fitness function, the genetic selection, crossover and mutation. Encoding makes the

problem in the form of code and presents it to the computer. This paper adopts the real-number encoding. After completing encoding, this algorithm realizes a series of operators such as selection, crossover and mutation. Through the comparison of fitness and Iterative optimization, we will find the code of the optimal solution[7].

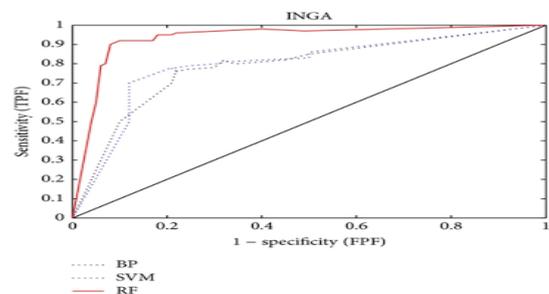


fig 2.1 inga graph states

### Fitness function

The increasing fitness value determines the evolutionary di-rection of GA. The error  $E$  of WNN is defined as the individual fitness function[8][9]:

$$E = \sum_{t=1}^2 (Y_t - \hat{Y}_t)^2$$

### IV.ADVANTAGE AND DISADVANTAGE:

#### ADVANTAGE:

- It improved niche technology
- It improves the convergence speed
- To solve the low convergence fault

#### DISADVANTAGE:

- It is difficult to preprocess the data.

### CONCLUSION:

This paper presents a framework that combiner similar days election, wavelet, decomposition and neural network to forecasting. The prediction model combine the improved niche technology with the flexible genetic algorithm. Hence the niche automation has the improved development capacity of genetic algorithm and the concurrence speed. Moreover, the improvement of diversification of population solves the problems of the immature and lower concurrence absolutely .The Experimentation verified the accuracy and success of the

INGA which also more absolutely in conclude the network security satiation .

### REFERENCES:

- [1] Varun Dutt Indian Institute of Technology, Mandi Young-Suk Ahn Carnegie Mellon University Cleotilde Gonzalez Carnegie Mellon University, "Cyber situation awareness:modelling-research showcase@cmu" <https://repository.cmu.edu/viewcontent>.
- [2] X.J. Ding, Y. Tian, Y. Yu, A real-time big data gathering algorithm based on indoor wireless sensor networks for risk analysis of industrial operations, IEEETrans. Ind. Inf. 12 (3) (2016) 1232–1242.
- [3] Samir W.Mahfound . Report no:95001 , "Niche methods for genetic algorithm" <https://www.sciencedirect.com/article/pdf>.
- [4] Nilesh P. BARDE1, Sandeep D. PATIL, "Fast algorithm for detecting community structure in networks" <https://www.ieee.org>.
- [5] "Exploiting time series analysis in twitter to measure a campaign process" <https://www.ieeeconfpublishing.com>
- [6] "A network security situation prediction model based on wavelet neural network" <https://www.sciencedirect.com/article/pdf>.
- [7] Mark Newman, "Dynamic programming algorithm optimization for spoken word recognition" <https://www.ieeexplore.ieee.org/document/11.pdf>.
- [8] Hamid reza fard masoumi, "Optimization of process parameter for lipase-catalyzed synthesis of esteramines-based esterquats using wavelet neural network". <https://www.sciencedirect.com/article/pdf>.
- [9] <https://www.cs.wmich.edu>.