Chapter 10
The Automatic Detection of Diabetes Based on Swarm of Fish

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ABSTRACT

Diabetes is a major health problem and a disease that can be very dangerous in developing and developed countries, and its incidence is increasing dramatically. In this chapter, the authors propose a system of automatic detection of diabetes based on a bioinspired model called a swarm of fish (fish swarm or AFSA). AFSA (artificial fish swarm algorithm) represents one of the best methods of optimization among swarm intelligence algorithms. This algorithm is inspired by the collective, the movement of fish and their different social behaviors in order to achieve their objectives. There are several parameters to be adjusted in the AFSA model. The visual step is very significant, given that the fish artificial essentially moves according to this parameter. Large parameter values increase the capacity of the global search algorithm, while small values tend to improve local search capability. This algorithm has many advantages, including high speed convergence, flexibility, and high accuracy. In this chapter, the authors evaluate their model of AFSA for the purpose of automatic detection of diabetes.

INTRODUCTION AND PROBLEM

The diagnosis of diabetes disease via an abstract interpretation of the data is an important classification problem. Diabetes occurs when the body is unable to produce or respond properly to the insulin that is needed to regulate glucose. Diabetes is not only a factor contributing to the

Heart disease, but also increases the risk of developing kidney disease, blindness, nerve damage, and damage to blood vessels. Statistics show that more than 80% of people with diabetes die from some form of heart disease or blood vessels.

Currently, there is no cure for diabetes; However, it can be controlled by insulin injection, changing eating habits, and doing physical exercises.

Meta-heuristics and biomimetic methods are a class of methods that provide good quality solutions to difficult problems for which there are no more efficient conventional methods. They are generally stochastic, iterative methods that progress.

Towards an optimum by evaluating an objective function. Poisson Swarm Optimization is a branch of swarm intelligence (a population-based meta-heuristic), inspired by the behavior of real Fish.

The AFSA algorithm is well suited for discrete optimization problems such as quadratic assignment problems, bioinformatics and data mining.

Data from the dataset is abstract data for the machine. What do they tell us about this data? And what is the reliability of the information derived from them? Such is the problematic of this research work as well as to see how Meta heuristics contributes to the improvement of data mining tasks. More precisely, an NP-difficult optimization problem is solved which is the detection of diabetic disease and improve the supervised classification (an acceptable (high) accuracy rate) of the data mining, using the Bio-inspired and Meta heuristics.

A promising solution is to use an inspired Bio Method (AFSA) that assigns a category to a data set, classifies these data into two different classes, the first class contains data from the sick and the second contains data from the normal people.

Objective of Work

The aim of this work is to propose a Bioinspired technique for the resolution of a Data Mining task capable of giving good results compared to others obtained by other classical classification methods.

There are other works that use this algorithm but none of them is used for classification. That is the advantage of our work.

We used a Bioinspired method. Its principle is to learn how to organize elements in predefined categories according to their characteristics.

Knowing how to automatically assign a category to an item can be very useful and calculate validation measures by trying to improve those measures obtained by classical classification algorithms.

In this chapter we will evaluate our AFSA approach with the aim of Automatic detection of diabetes.

The AFSA Approach (Artificial Fish Swarm Algorithm)

AFSA is an optimization algorithm that simulates the behavior of swarms of fish, such as hunting for food and movement. For example, the position of most fish in a basin is typically the position at which most foodstuffs can be obtained. There are three main stages in AFSA, which are tracking, moving in swarm, and feeding. In the AFSA, these three steps are repeated in order to determine the optimal solution. Similar to other bioinspired algorithms, AFSA is used to determine the optimum or most satisfactory solution within a limited time. In the AFSA approach, the position of each fish is considered a solution, and each solution has a fitness value that is evaluated using the fitness function. The fitness function changes when different objectives are set.

Let us suppose that the state vector of the artichoke swarm is $X = (x_1, x_2,,, , x_n)$ where $(x_1, x_2,,, , x_n)$ is the state of the fish. The variable "Visual" is the visual distance, the artificial fish only activates in the inner radius of the circle to the length of the field of vision. The food concentration in the fish position is expressed as $y = f(x)$ where y is the value of the objective function. The distance between the fishes

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