

Novel Metaheuristic Algorithm for Decision Making

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ABSTRACT: Business intelligence is the latest technical priority among the people. Business Intelligence is the procedure to obtain from raw information to legible information. A BI solution assists to transform raw information into actionable information. It will help to make business decision making in the correct manner. And also it can assist the firms to build up new opportunities in the business world. By discovering these opportunities, and executing a new effective methodology, can provide a competitive market advantage and long-term stability. It will also help to analyze and visualize large amounts of data and help us create better business decisions using a Business Intelligence tool. The important function of BI model is to give better decision makers with tools and techniques that allow them to create efficient and suitable decisions. Nature inspired algorithms have their process observed in nature as their origin. The best feature of the Artificial Ant Colony Algorithm, which is a nature inspired swarm algorithm based on the behaviour of natural ant colonies. It is a parallel search over the problem data and previously obtained results from it.

Key words : Business intelligence, Nature inspired algorithms, Artificial ant colony algorithm, decision making.

I. INTRODUCTION

Business Intelligence is a latest technology to manage, analyze and export the raw information into a useful and significant way which can assist any organization to formulate correct business decisions. Business Intelligence present the raw data in a useful and meaningful way which can help any organization to make correct business decisions. Business intelligence aims to maintain the better business decision-making. BI relies on data collected from other systems, so the quality of the data is very important to BI. [1-10]

Analyzing data involve the recognition of significant patterns. Human analysts can see patterns in small data sets. Specialized data mining tools are able to find patterns in large amounts of data. These tools are also able to analyze significant relationships that exist only when several dimensions are viewed at the same time. The aim of data mining is to make sense of large amounts of mostly unsupervised data, in any domain (e.g. Finance, Marketing, Sales). For any data to make sense, it should be understandable, valid, novel, and useful. Also, Data Mining is for analyzing large amount of data

because small data sets can be easily analyzed using many standard techniques, or even manually.

Data mining strategies were classified into 3 categories, namely descriptive modeling, predictive modeling and market basket analysis. Predictive modeling approach makes use of input attributes to determine and predict output attributes. It is further classified into 3 sub categories like classification, estimation and prediction. Descriptive modeling approach identifies the best set of attributes and evaluates the performance of the model with the help of input attributes.

The goal of this work is to design and develop the new algorithm, to find the optimal customer from the huge set of customer in the current industry. To overcome the challenge behind in the Business intelligence is that to achieve the fact based and single version of the truth in decision making. The optimal customer must be valued and trustworthy, since to avoid the risk in the market. In this paper, to accomplish the optimal customer is in five stages: Database preparation and Normalize the data in the first stage, Apply the existing metaheuristics algorithms individually is the second stage, Apply the proposed new algorithms in the third stage, Compare and analysis with the existing metaheuristics algorithms with new algorithm is in the fourth stage and Intelligence concept is implemented [11-13].

II. LITERATURE REVIEW

Since the 1980s, the large number of meta-heuristic algorithms that combine system and randomness replicating natural fact have been created to beat the computational problems of existing numerical algorithms. And also solve the difficult and complex problems. These algorithms include particle swarm algorithm, bee colony search, ant colony search algorithm, firefly algorithm, genetic algorithm and other evolutionary computation methods. From above mentioned problem solving techniques, genetic algorithm is widely used technique for optimization problems and it gives global solution of the problem.

Andrias Baur et al. developed an ant colony algorithm in the problem of scheduling job operations [14]. A heuristic method of ACO was proposed by John E. Bell et al. to an established set of vehicle routing problem. [15] An internet based peer-to-peer grid infrastructure was developed by Francesco Palmieri based on ant colony framework. [16]. A train scheduling problem was

determined by K. Sankar using ant colony system meta-heuristic. [17].

An urban traffic control system was developed by R. Foroughi et al. using modified ant colony optimization approach. The modified approach is based on the design of intelligent data routers and intelligent data mining [18]. Marco Dorigo et al. depicted an overview and the advancements occurring in ACO and enumerated the applications of ACO as well [19]. A hybrid ant colony optimization approach for solving multi-objective design optimization of air cored solenoid was developed by Wael F. Abd El Wahed et al. The proposed approach differs from the traditional one in its design of a multipheromone ant colony optimization as well as inclusion of steady state genetic algorithm and local search approach [20].

Business Intelligence (BI) is a set of abilities, tools, techniques and solutions that help managers to understand business situation. Several related terms include competitive intelligence (CI), market intelligence, customer intelligence, competitor intelligence, strategic intelligence, and technical intelligence. Cottrill presented the North American literature, the term CI is frequently used and the external environment and external information sources are emphasized [21]. Watson et al. achieved some measurable financial benefit in business data analysis [22].

Gilad & Gilad presented the organizations have collected information about their competitors since the dawn of capitalism [23]. The real revolution is in the efforts to institutionalize intelligence activities. Azoff & Charlesworth presented the business information in a timely and easily consumed way and provides the ability to reason and understand the meaning behind business information through [24]. Malhotra points out BI benefits that facilitate the connections in the new-form organization, bringing real-time information to centralized repositories and support analytics that can be exploited at every horizontal and vertical level within and outside the firm [25].

III. METAHEURISTIC OPTIMIZATION

Metaheuristic algorithms are normally recognized as one of the important practical methodologies for combinatorial optimization problems. Heuristic methods for solving a important general class of computational problems by combining user-given heuristics in the hope of obtaining a more efficient procedure.

Metaheuristics are strategies that “guide” the search process.

- The aim is to competently explore the search space in order to discover (near-)optimal solutions.
- Techniques which comprise metaheuristic algorithms range from simple local search process to complex learning processes.
- Metaheuristic algorithms are approximate and usually non-deterministic. ACO is meta-heuristic. Soft computing technique for solving hard discrete optimization problems

A. Genetic Algorithm (GA)

The Genetic Algorithm is a meta heuristic search algorithm is to find optimized solutions in search problems using the nature inspired by evolutionary biology: mutation, selection, reproduction [inheritance] and recombination. In this search problem, the genetic algorithm search technique used to find out the approximate solutions. Every iteration of this procedure is called a *generation*. A GA is naturally iterated for any place from 50 to 500 or more generations. The complete set of generations is known as *run*. At the final end of a run, one or more considerably fit chromosomes in the population. GA researchers frequently report statistics averaged over many different runs of the GA on the same problem [26-27].

B. Artificial Ant Colony algorithm

Artificial Ant Colony algorithm is the Probabilistic technique [28-30]. The ant colony algorithm is the searching for optimal path in the graph based on the behaviour of ants seeking a path between their colony and source of food. The Ant Colony algorithm is the Meta-heuristic optimization algorithm. Ants navigate from nest to food source. The Ants are blind. It discovered the Shortest path is via pheromone trails. Each ant moves at random. The Pheromone is deposited on path and more pheromone on the path increases probability of path being followed.

Initialization

Loop

Loop

Each ant applies a state transition rule to incrementally build a solution and applies a local updating rule to the pheromone

Until each of all ants has built a complete solution

A global pheromone updating rule is applied

Until End_Condition

IV. IMPLEMENTATION OF PROPOSED ALGORITHM

To overcome the real life problems with the complex or irrelevant functionality of existing algorithm and to avoid manual decision making in the industry, to implement the new algorithm with the impression of Ant behaviour.

Fig:1 represents the overall application is proposed to find the optimal population. Genetic Algorithm (GA) and Artificial Ant Colony algorithms are implemented and find the result data base set and evaluate the performance with Receiver Operating Characteristic (ROC) curve. The new proposed ACO algorithm is implemented. The flow chart representation for proposed algorithm, Artificial Ant Colony Optimization (ACO) is in Fig 2.

V. RESULTS

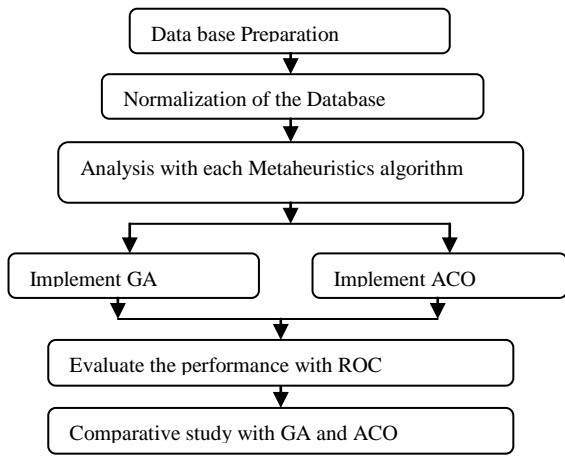


Fig 1 : Flow Chart of Overall Proposed Application

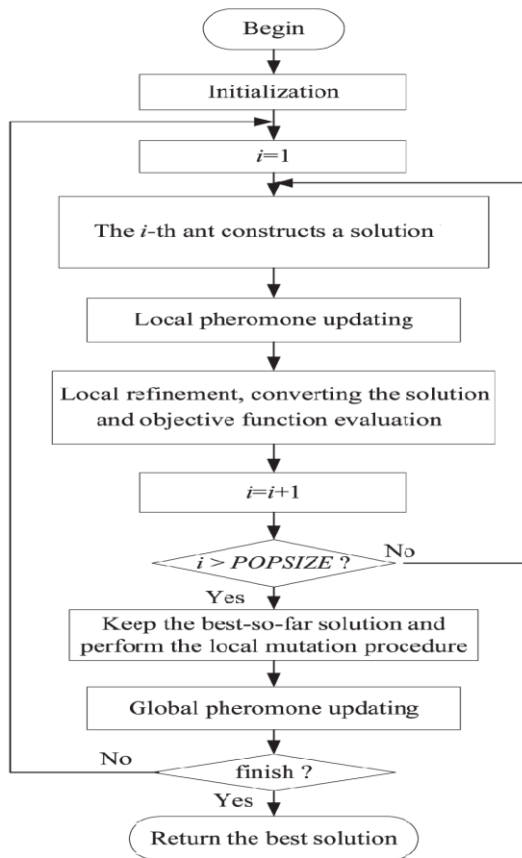


Fig 2: Flow chart Artificial Ant Colony Optimization

The application is produced with the implementation of algorithms and results will be shown as database and ROC analysis and among algorithms comparative study takes place and Intelligence concept is implemented that is forecasting the customer performance.

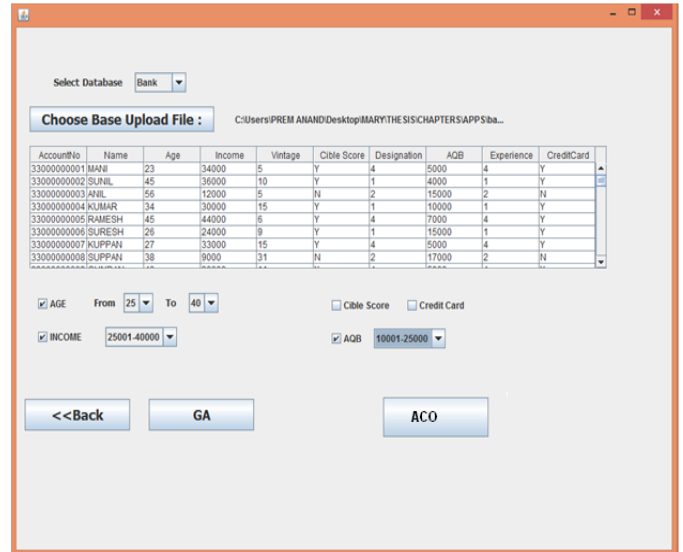


Fig 3: Metaheuristic algorithms (GA and the Proposed Algorithm (ACO)

Fig 3 represents the implementation results of metaheuristic algorithms such as GA and the proposed ACO algorithm. The Table 1 shows the comparison chart of ACO and GA. The proposed ACO algorithm gives the better performance.

Table I : Comparison of ACO with GA

Analysis variables/Techniques	GA	ACO
True Positive	210	340
True Negative	156	142
False Positive	181	76
False Negative	164	123
True Positive	0.45	0.73
False Positive	0.18	0.15
Positive Prediced Value	0.48	0.83
Az Value	0.47	0.81

VI. CONCLUSION

In this paper, Optimization techniques with different algorithms such as GA & ACO are implemented to achieve the optimal results from the huge set of customers. To avoid the limitations in the existing algorithms, the proposed algorithms are implemented that is Artificial Ant Colony Optimization (ACO) and the performance is evaluated by ROC curve with the AZ value. By conveying the discipline to planned financial modeling, make possible approaches of metaheuristic algorithm and forecasting strategies are implemented. The Experimental results show the understandable view of the manual decision making and various metaheuristic algorithms and the proposal of ACO algorithm. For forecasting the performance of the customer will be analyzed by the Back Propagation algorithm with the weightage strategy of the every attributes. The AZ value of GA approach produces 0.47, and the proposed ACO approach produces 0.81. It was scrutinized that the proposed ACO algorithm bring about well.

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