A Heuristic Approach to the Disease Diagnose System Using Machine Learning Algorithms

(An *Expert Advisory System for EMU Bird's Diseases*)

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***Abstract*--The paper deals with the concepts of expert system and data mining belongs to the Artificial Intelligence fields. The main task of expert system is to ratiocination, while the machine learning algorithm is to find the better optimal solution. This paper mainly focuses on diagnoses of the disease which is effected to the Emu bird by mechanism of Particle Swarm Optimization (PSO) algorithm and Artificial Bee Colony(ABC) algorithm. The decisive rules of database is mined and that could be applied in expert system. Thus, by applying optimization techniques resulting to best global optimized solution.**

***Keywords*—*Optimization *Global optimal solution *Machine Learning algorithm *Expert system *Decisive rules**

I. INTRODUCTION

The expert system[1,2] is a knowledge system which takes computer as a tool and makes use of the expertise and knowledge consequence to comprehend and solve the problem[1]. It imitates the macroscopically inferential activity of expert, and uses computer to inference realm knowledge which is conformed to the model described]. Expert system [2] is made up of four parts: knowledge base, inference engine, knowledge acquisition and explaining interface with the knowledge base and inference engine as its kernel.

Increasing the reliability of the systems and lowering the time consumption of the farmers in going to veterinary doctors for the treatment, the proposed system provides a good interface for getting the relevant information suggested by the experts. With machine learning[1] , however we turn all that on its head and get computers to program themselves thus leads to user satisfaction.

A. Emu Expert Advisory System

In Implementation of Expert Advisory System, symptoms constitute an important class of diagnosing the disease. In this, each symptom maintains a map of the tables that enables it to compute the number of local probability diseases i.e., through ABC algorithm [3] and the outcome is given to next level that uses PSO algorithm[4,14] for better optimization that leads to global optima decision. Using algorithms, the decision is done by optimizing all the symptoms which are closely related to one particular disease. The cost of searching gradually reduces to get the final optimized solution. The paper focuses on optimization algorithms[5], which in turn improve the performance of search efficiency that results in high quality solutions and achieves faster convergence at shorter computation time than the other optimization strategies.

An application is done on Emu irds is developed for diagnosing the disease i.e., effected. Two level optimization is done for the better solution using the basic architecture of machine learning system is presented. Even less papers are dealing with this type of applications.

In bi-level or two level optimization the problem is considered with diagnosing disease . The machine learning architecture[6,13] consists of 3 systems . System1 is Rule based where the set of rules are collected from the experts to the relevant field and knowledge base purely build with rules and facts by taking variables. System 2 and System 3 consists of machine learning algorithms where the set of feasible points of upper level are not matched with KB then problem is set to ML algorithms. Machine learning algorithms optimizes the intake rules and go for better convergence to set of possibilities of affecting diseases and its probability factor even the rule is not there in the knowledge base[7]. The approximation is done at middle level and the outcome of System 2 is given to the System 3 for final optimized disease. The target of this type of application is that reduction of number of rules in the knowledge base, so that the system can efficiently works.

For solving such a problem we show that the set of feasible points of upper level can expressed completely as solution set of multiple decisions. Then we can determine

an approximation of this solution based on optimization of rules using different machine learning algorithms.

Here our aim is to not a good approximation of disease i.e., set of the minimal solutions, the efficient set , as it is aim generally in best optimized solution, but of the solution set itself. A good approximation of this minimal solution set and thus of the set of feasible solutions[8] of upper level problem is lead to next level for better solution. This is important for getting good accuracy and efficient solutions, avoiding to incorporate more no.of rules like rule based system(System 1). Thereby not only one minimal solution[8] but an approximation of whole efficient set of two level optimization is done for any sort of application.

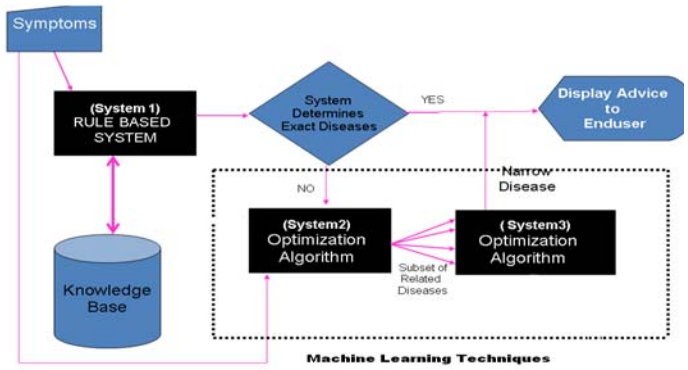

Fig:1 Block Diagram of Expert Advisory System

II. DATABASE GENERATION

This section describes the setup for production of rules in the knowledge base[9]. Generally the rules are of the Form[10]

Rule 1: S1=1,S2= 0,S3= 0,S4= 0, S5=0,S6= 1,S7= 0,S8= 1,S9= 0,S10= 0,S11= 0,S12= 0
Resultant disease Disseminated equine herpesvirus-1

Rule 2: S1= 1,S2=1 ,S3= 0 ,S4= 0, S5= 0,S6= 0 ,S7=1 ,S8= 0 ,S9= 0 ,S10= 0 ,S11=0 ,S12= 1
Resultant disease Histoplasmosis

Rule 3: S1= 0,S2= 1 ,S3= 0 ,S4= 0 , S5= 1,S6= 1 ,S7= 0 ,S8= 0 ,S9= 0 ,S10=1 ,S11=0 ,S12= 0
Resultant disease Western equine encephalitis virus.

III. MACHINE LEARNING ALGORITHMS

The proposed system consists of 3major algorithms/steps

Step 1: Rule Based Algorithm
Step 2: Artificial Bee Colony Algorithm
Step3: Particle Swarm Optimization Algorithm.

Artificial Bee Colony(ABC) and Particle Swarm Optimization(PSO) algorithms are most recently defined algorithms[12], motivated by intelligent behavior of honeybees and swarms.

A. Rule based System

Step 1: Rule based algorithm:
Pseudo code for the implementation
Step 1.1: Enter the Symptoms to obtain the major disease.
Let us take an Ex1 100001010000
From rule 3 s2=1, s5=1,s6=1 and s10=1
Step 1.2: If the exact match symptoms found in the Knowledge base then Rule based system produce the output i.e., disease name as Disseminated equine herpervirus-1
Ex2 100001000000,
Step 1.3: Exact match symptoms were not there in KB i.e., insufficient knowledge it fails go System 2.

B. Machine learning Algorithms

Step 2: Artificial Bee Colony Algorithm:

Step 2.1: System 2 generates probability no.of diseases which have match to the neighboring disease i.e., 60% optimization of symptoms are matched with input.
Ex2: Input String 100001000000
Generates the probable diseases those are retrieved as
From rule1 s1=1 and s6=1 From rule 2 s1=1,s2=1 and s7=1
Output of ABC is calculated by No.of matched bits / Total no.of bits

Step 2.2**:** Produce the 60% optimization output
Western Equine Encephalitis-60%
Hisplasmosis-60%
Disseminated equine herpervirus-1-91%
Step 2.3: Loop is continued until the requirements satisfied, if it fails go to System 3.
Step 3: Particle Swarm Optimization Algorithm:
Step 3.1: Input of System 3 gets from System 2 and generates upto 90% best optimization level.
Step 3.2: *Output of PSO* = Max - [(Max- Min) x iter]/ maxIter

where iter = current iteration number.

Step 3.3: Produce the global output as Narrowest disease upto 80-90% optimization is
Disseminated equine herpervirus-1 followed by Prevention measure[11].

IV. CONCLUSION

In the proposed system, the Particle Swarm Optimization(PSO) and Artificial Bee Colony(ABC) Algorithm gives a better decision, though we do not have robust production rules[15]. During preprocessing the common symptoms were efficiently recognized that converge to best optima solution. Thus, the implementation of the proposed system, gradually reduces the processing time of rules in comparison with the Rule Based System. The algorithm used in the system can be treated as quite effective, in most cases it finds a solution which represents a good approximation to the optimal one and fast enough for the number of iterations.By the thorough interaction with the users and beneficiaries the functionality of the System can be extended further to many more areas in and around the world. The algorithm can be further improved for more complex test problems and applications that subject to extended work.

Table I Sample Rule format

Name of dise	Sym1	Sym2	Sym3	Sym4	Sym5	Sym6	Sym7	Sym8	Sym9	Sym0	Sym11	Sym12	ID
Psitticine beak & feather	0	1	1	1	0	1	0	0	0	0	0	1	1

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