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Fuzzy Mathematics Integrated Approaches

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ABSTRACT-

The flip bit is the most famous mutation technique. Now a newly generated population is used for further run of Approach (Algorithm). If the termination condition is satisfied, then the best solution in the current solution is returned as the most optimized solution. Genetic fuzzy rule based system is a fuzzy system augmented or hybridized with evolutionary computing to increase the learning capacity of the system, thus providing robust search capabilities in a complex environment. The main function is to adopt an evolutionary learning mechanism which can automatically generate / design knowledge base and thus help in search and optimization problems. The next section clearly explains how the genetic Approach (Algorithm) helps in learning process. The generic code structure and domain independent features of genetic Approach (Algorithm) make them desirable to incorporate apriori knowledge. This apron information is in the form of linguistic labels, membership function or fuzzy rules in the fuzzy rule based system. Thus genetic Approach (Algorithm) are used to acclimate or assimilate information from rule base or database These systems are used in many applications such as classification, Fuzzy Data Analytics, control processes and modeling.

Key Words: Algorithm, optimization, evolutionary, Fuzzy.

Introduction-

The work has been performed on KDD- 99 data set which is a standard dataset used to detect intrusions in the network. The KDD-1999 intrusion detection dataset uses a version of database which was prepared in 1998 DARPA Intrusion Detection Evaluation Program (MIT Lincoln Labs) to evaluate their research in intrusion detection. It consisted

of 9 weeks of raw TCP dump data as training dataset and 2 weeks of testing dataset. The KDD-99 dataset was used in Third International Knowledge Discovery and Fuzzy Data Analytics Tools Competition to prepare an intrusion detector which can identify good or bad connections. The dataset containing 41 attributes and labeled with either normal or specific attack type. Here 10% of the KDD- 1999 dataset has been used to evaluate the whole process. The 10% KDD dataset consists of 4, 94,021 records /connections in the training data. The training dataset consists of 24 training attack types which are under 4 major classes of attacks while the testing dataset consists of 14 additional attacks to differentiate some signatures and check whether these variants are captured or not to increase efficiency.

The features of KDD-99 dataset with fuzzy blend as defined by Stolfo et al. have been classified into following categories-

1. Basic Features- This category enclose all the attributes that can be retrieved from an individual TCP connection and comprise 9 attributes.
2. Time Based Traffic Features- It includes features which are calculated on the basis of time interval and is subdivided into two types:-

   a) Same Host Features-It examines only the connections in the past two seconds that have the same destination host as the current connection.

   b) Same Service Features-It examines only the connections in the past two seconds that have the same service as the current connection.
3. Host Based Traffic Features Here features were constructed using a window of 100 connections to the same host instead of a time window of 2 seconds.
4. Content Based Features-It consists of 13 features that are extracted from domain knowledge and are used to indicate suspicious behavior in the network or unstructured data portions in the packet.

The data describes the 41 attributes of the KDD- Cup 99 dataset and shows whether the feature is of symbolic type or continuous.

4.2 Fuzzy Rule Based System

Step1-Representation of data

Step2- Normalization of data

$$y = x - \min \max - \min$$

Where x represents the original attribute value, min represents the minimum boundary value i.e. 0, max represents the maximum boundary value i.e. 1 and y represents the normalized value i.e. 0 <= y <= 1

Step3-Calculating membership function

After normalizing the data, the membership function of every feature of each training pattern is determined by the following formula:-

$$\mu jx = \max 0, 1 - x - xj\upsilon$$

Where, x represents the normalized value of each feature,

$$xj = j - 1\ L - 1$$

where j = 1 ,2...L, and v = 1L - 1

where L represents the number of linguistic labels. Here L varies from 1-5 and help in calculating the membership function of each attribute.

Step4-Determining compatibility of each training pattern

The compatibility of each training pattern xp is calculated with the fuzzy if then rule Rj by using the following formula: $\mu j\ xp = \mu ji\,(xpi) ni = 1$

Where prefers to 1,2....., m training patterns and $\mu ji\ (xpi)$ is the membership function of the ith attribute of pth pattern.

Step5- Finding compatibility grade for each class

After obtaining the compatibility of each training pattern, relative sum of compatibility grades of the training patterns with rule Rj for each class is calculated.

This is given by:- $\beta Class\ h\ Rj = xp \in Class\ h\ \ \mu j(xp)\ N\ Class\ h$

Step6-Selecting fuzzy if-then rule for a particular class

The consequent class Cj for a given rule Rj is calculated as follows:

$$\beta Class\ h(Rj) = \max h = 1,..,c(\beta Class\ h(Rj))\ (10)$$

The maximum of $\beta Class\ h(Rj)$ is evaluated and the one with the maximum value is considered to be the class of that fuzzy if then rule Rj. If the maximum value comes out to be true for more than one class, then the consequent class Cj cannot be determined uniquely and is taken as φ and the corresponding rule is rejected.

Step7-Assessing the certainty degree CDj

$$CDj = \beta Class\ h\ j\,(Rj) - \beta\ \ \beta Class\ h\ r\ c\,(Rj)\ h = 1\ (11)$$

Where $\beta = h \neq hr\ \ \beta Class\ h(Rj) - 1 (12)$ The value of CDj = 1 represents very high confidence which denotes that the rule belongs to that specific class.

Step8- Generation of fuzzy if then rules

Thus the fuzzy if then rules are generated in the following manner:- Rule Rj-If x1 is Aj1 and x2 is Aj2 and....., xn is Ajn, then the class is Cj with CDj, J=12 N where Rj is the label of the jth fuzzy if then rule, Aj1, Aj2, Ajn denotes the antecedent fuzzy sets Evaluation Parameters of IDS with Fuzzy

The IDS is basically evaluated through the confusion matrix or contingency segment which was given by Provost and Kohavi. The matrix contains information about the actual and predicted classifications done by the system. It consists of the following records:-

True Negative (TN)- It refers to the number of correct events which predicted them as authentic connections.

False Positive (FN)- It implies the number of erroneous predictions which analyzed genuine events as fake events.

False Negative (FN)- The number of incorrect predictions which evaluated false connections as correct connections.

True Positive (TP)- It refers to the number of correct predictions which anticipate that the instance is fake or anomalous.

Different methods such as RIPPER, EFRID and other genetic fuzzy systems have been used to compare with the current approach and perceive which approach has overall better detection rate and lower false alarm rate. The Michigan Approach (Algorithm) and IRL approach perform moderately in detecting class with 88.13% and 93.2% but very low false alarm rate of 0.11% and 0.18% which depicts a very less possibility of misclassification. The Pittsburgh approach has a very high recall which shows its efficiency in detecting the attacks but the false positive rate is comparatively higher rounding about to 2%. The EFRID approach has a good detection rate but exorbitant false alarm rate of 7%. Similarly the RIPPER approach has high false positive rate of 2.02% The proposed approach gives more adept result with high recall value rounding to about 99% which is nearly equal to Pittsburgh approach and false alarm to about 1.27% which is comparatively very less than Pittsburgh approach. Hence the genetic fuzzy systems perform more skillfully than other existing approaches and are more reliable. The proposed methodology gives high performance than all other genetic fuzzy systems with suitable detection rate and meager false alarm rate, therefore stabilizing all the parameters.

OBJECTIVE OF THE STUDY

There are various sorts of Fuzzy Data Analytics desire. For example, a model in light of preparing and other measurement factors foreseen wage. Related conjecture probability (how likely this desire is legitimate?). Generally called the beyond any doubt desire probability (the sum I have conviction this could be a conjecture?) Perceptive Fuzzy Data Analytics to make some kind of guidelines, which is the condition suggests that a given result.

ASSUMPTIONS-

Consequence of a widened procedure of investigate and manufactured stock advancement. This headway begins when business information was basic secured on PC, predictable with change in information perfect to use, and additional as of late, make development that let customer to find the way from side to side their information dynamically. Soft, Data Analytics take this transformative technique more far off than demonstrate data access and bearing finding to potential and rational all together release.

RESEARCH METHODOLOGY-

Research Methodology presents the assorted perspectives of the clustering with the fuzzy based integration for multiple domains.

Group is a sorted out summary of things which have some customary properties. The bundle is the dissent of the association between the key points of sets and to do accordingly.

A crucial part of a group procedure is the partition between things. If the parts of the thing event vectors are in a comparative estimation until then clear Euclidean partition unit of measure isn't adequate to assemble relative thing cases. To be sure, even ensuing to following this, the result can occasionally be perplexing. If two estimations have not been taken in the similar estimation unit then it is a relative scale. The partition between two social events for normal components of the two groups is a fundamental perspective. The group methodology presents how the detachment should be figured.

Results & Findings-

Standard gathering techniques can be for the most part circled into Partition based and Hierarchy based. Subsequently. Hierarchical gathering is subdivided into agglomerative and troublesome Layered based data consolidates the Lance-Williams Formula of thought gathering. Yet dynamic Approach (Algorithm) very much arranged structures a gathering while the group allocating (Algorithm) uses organize learning. In doing thusly, they can endeavor to find the cluster through reiterated movement taking contemplations between different blends, or try to choose bunch as a thickly populated territory of the data. Approach (Algorithm) of the request, one is the portion movement methods. They are moreover isolated into probability cluster, K-medoids methodologies, and K-connotes procedure. This system bases on ways and point in their gathering and has a tendency to manufacture a bundle raised shape. Separating Approach Algorithm) is the second kind of examination of the thickness based package. They are attempting to find high-thickness fragments that interface the data, this is a versatile shape. These techniques are cruel to the estimation of gatherings of sporadic shapes. They are

generally associated with less-dimensional thing properties, for instance, space based data. Space based articles can contain extensive questions in addition.

Various methodologies work by suggestion things including building a blueprint of subsets of data properties. They are space division and, by then aggregate legitimate piece. They much of the time use a layered together in one period of the technique. A system based strategy is rapid and exclusion managing. A cross section based methodology can in like manner be profitable to go about as a transitional stage in various frameworks. Straight out data are immovably related trades in the database. The possibility of an equivalent sort isnt adequate in solitude gather this sort of data. The likelihood of the preeminent data joint exertion gives a ton of help. This situation is more honest to goodness, the money related advancement of the amount of exercises. With a particular true objective to add to this effort will be to pack the data previously the gathering of things, or straight out property estimations.

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