

Using Fuzzy Logic Reasoning Approach in Fuzzy Decision Tree to Evaluate Students Performance

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Abstract

In this paper presents a fuzzy logic reasoning based approach with a decision tree for performance evaluation of students in private schools. The characteristic considered for evaluation cover academic of the students. Step by step fuzzy reasoning approach has been used to remove the problems of rule eruption. The comparisons between fuzzy and traditional average among the students are obtained and then we find out the decision tree model.

Keywords: Fuzzy reasoning approach, Decision tree, Fuzzy inference system.

INTRODUCTION.

Fuzzy inference techniques are used in performance evaluation of students and proposed an approach which is a combination of two membership functions [5]. A fuzzy expert system for evaluation of students' academic performance and also proposed many approaches using fuzzy logic techniques to provide practical method for evaluating students with existing

statistical methods[6]. Fuzzy expert system proposed for evaluating teachers overall performance based on fuzzy logic techniques. In this paper a new methodological approach using fuzzy logic reasoning has been proposed for performance evaluation of students.

1. FUZZY LOGIC REASONING APPROACH

Fuzzy logic and fuzzy set theory is fuzzy inference system [6]. Fuzzy inference systems are knowledge based or rule based systems that contain descriptive if then rules created from our experience [3]. The fuzzy inference system represents the core of fuzzy logic controllers and it's built of rule base and data-base which constitute the knowledge base and inference engine.

The fuzzy reasoning approach has found a wide application in designing of certain complex industrial and management systems which cannot be modeled precisely under various assumptions and approximations [2]. A basic figure of fuzzy system is shown in below.

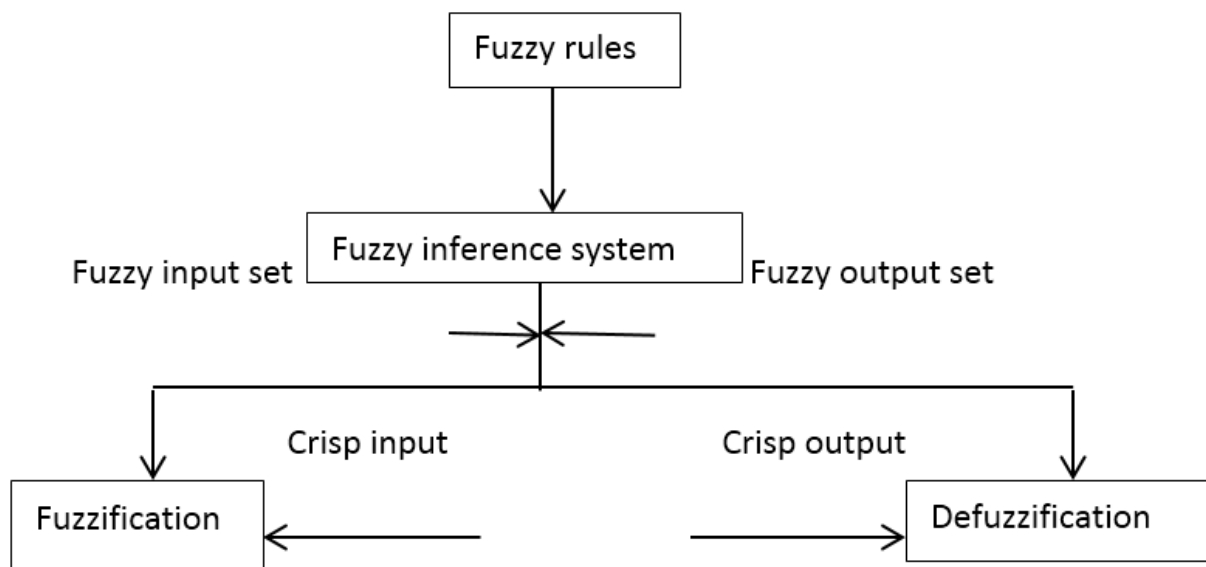


Figure 1.1: Basic figure of fuzzy system.

2. FUZZY LOGIC CONTROLLERS FOR DESIGNING:

In this study step by step fuzzy logic reasoning approach [7] has been used for designing for inference system for the controllers. The step by step approach for allows for combination of attributes in several steps resulting in remove

of rule explosion problem .Aview of step by step approach is shown in figure .It can be observed from the figure that in step 1,with extra – curriculum activities to give overall rating of the student. Step2, knowledge and punctuality were combined to performance analysis and step3, academics and communication skills were combined to give knowledge analysis.

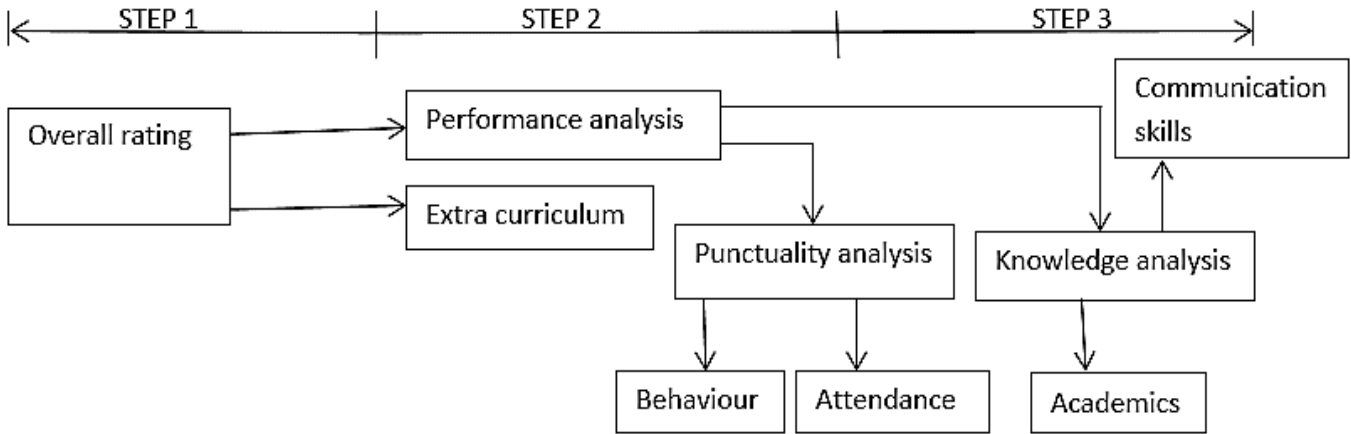


Figure 2.1: Step by step fuzzy logic reasoning:

Fuzzy Inference system has been used for building theproposed model [1].Fuzzy Inference system for knowledge controller is shown in figure

In this study we have used input and output attribute is fuzzified with linguistic variable are very bad, bad, medium,

good, best and given a universe of discover of [0 1].A view of input Membership functions for input attributes i.e. academic and communication skills are shown in figure and figure respectively.

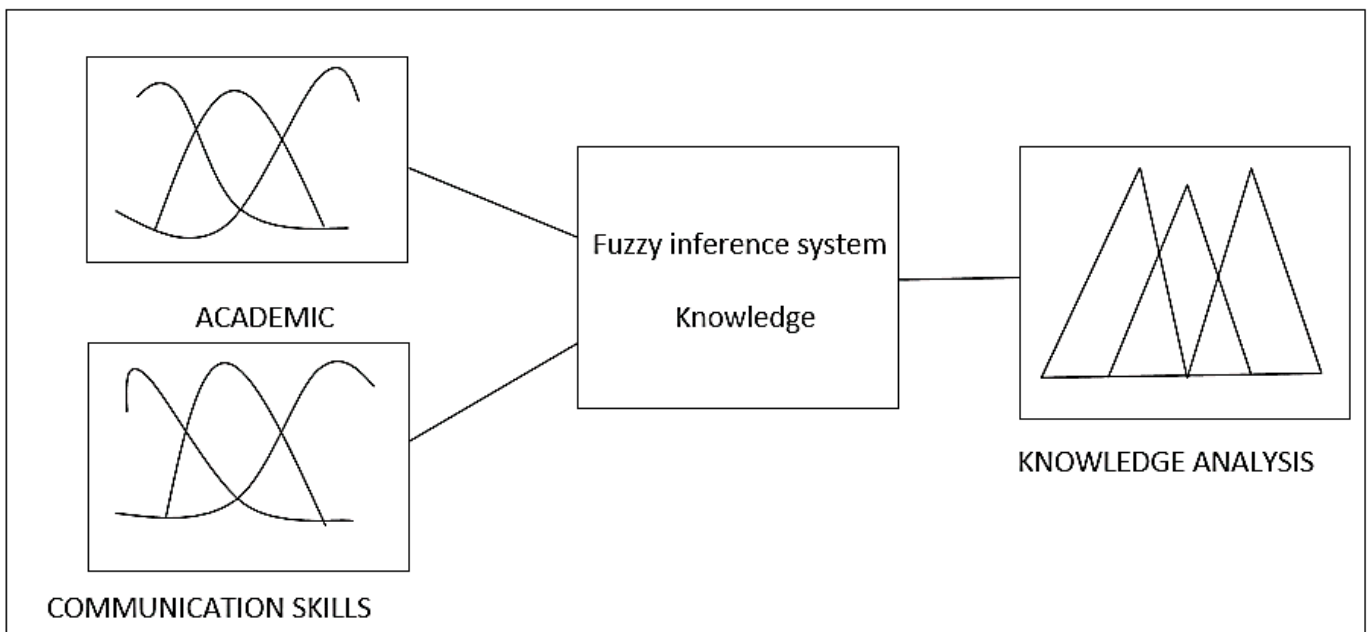


Figure 2.2: Fuzzy inference systems for knowledge controller.

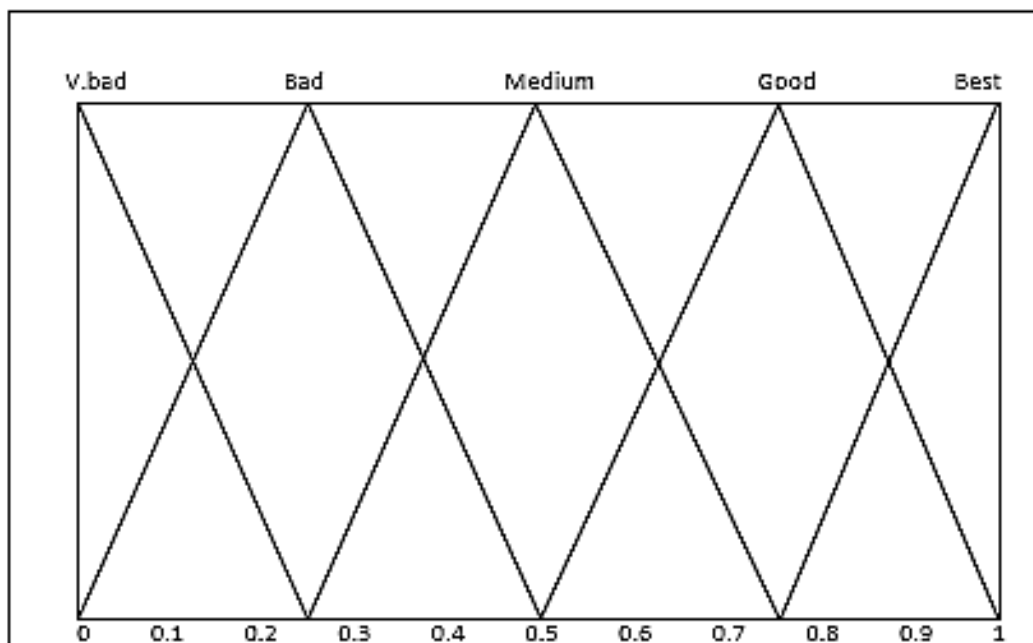


Figure 2.3: Membership function's for input "Academic".

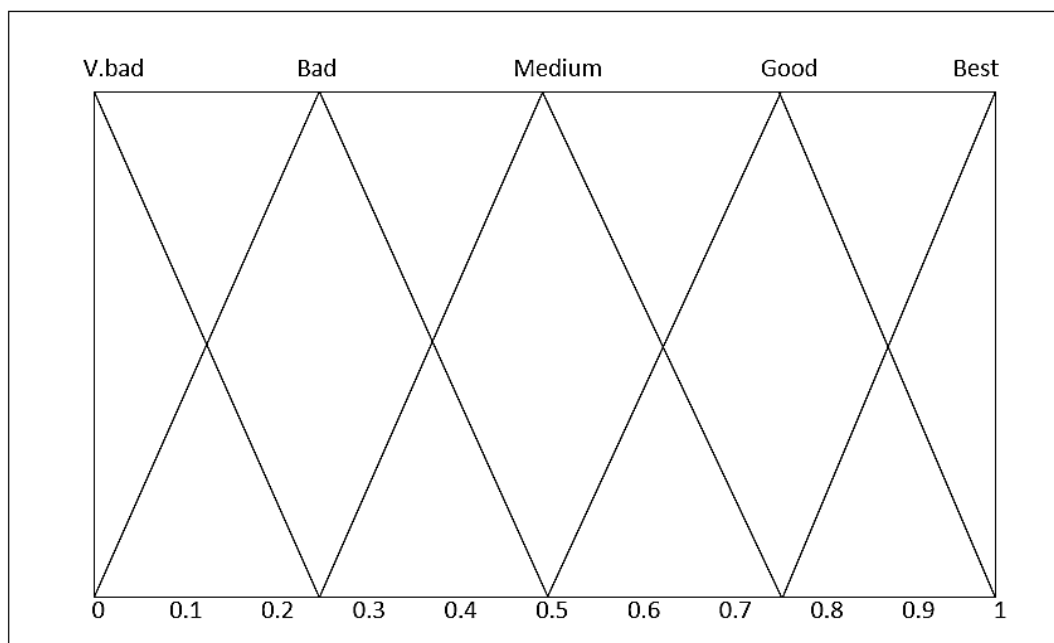


Figure 2.4: Membership function's for input "Communication skills".

We have used in this paper if then rules [4] for all the controllers. A view of if then fuzzy rules for knowledge and punctuality analysis are shown in table and respectively. The rules for other controllers were designed similarly. The fuzzy rules were built using knowledge and experience of expert and vary form one expert to another.

Table 2.1: If then rules for knowledge analysis.

Knowledge analysis	Acade mics					
		V.bad	Bad	Medium	Good	Best
Communication skills	V.bad	V.bad	Bad	Bad	Medium	Medium
	Bad	V.bad	Bad	Bad	Medium	Good
	Medium	V.bad	Bad	Medium	Good	Good
	Good	V.bad	Bad	Medium	Good	Best
	Best	V.bad	Bad	Good	Best	Best

Table 2.2: If then rules for Punctuality analysis.

Punctuality analysis	Behaviour					
		V.bad	Bad	Medium	Good	Best
Attendance	V.bad	V.bad	V.bad	Bad	Bad	Medium
	Bad	V.bad	Bad	Medium	Medium	Medium
	Medium	Bad	Bad	Medium	Good	Good
	Good	Bad	Medium	Good	Good	Best
	Best	Bad	Medium	Good	Best	Best

3. FUZZY DECISION TREE

A decision tree is Formalism for expressing mapping from attribute values to classes and consists of tests or attributes nodes linked to two or more sub trees and leafs or decision nodes labeled with a class which indicates the decision.

The main advantage of decision tree approach is it visualizes the solution; it is easy to follow any path through the tree. Relationships discovered by a decision tree can be expressed as a set of rules, which can then be used in developing an expert system; a decision tree model employs a recursive divide and conquers strategy to divide the data set into partitions so that all of the records in a partition have the same class label. In classical decision trees, nodes made a data follow down only one branch since data finally arrives at only a leaf node. In tree structured representations a set of data is represented by a node, and the entire data set is represented as a root node. When a split is made, several child nodes, which correspond to partitioned data subsets, are formed. If a node is not to be split any further, it is called a leaf; otherwise, it is an interval node. Decision trees classify data by sorting them down the tree from the root to leaf nodes.

The mathematic symbols considered for each attribute is mentioned in table3.1.The rating of each attribute was done out of 1.

Table 3.1: Symbols considered for each attribute.

S.No.	Attributes	Symbols
1	Academics	α
2	Communication	β
3	Behavior	μ
4	Attendance	γ
5	Extra-curriculum	δ

4. EXAMPLES:

In this paper define many experiments used and draw a decision tree and the experiments calculate using the fuzzy logic controller.

Experiment: A

Table 4.1: Students result compared

α	β	μ	γ	δ	Fuzzy rating	Average rating
0.3	0.9	0.9	0.9	0.9	0.69	0.78

The simulation result clearly shows the advantage of fuzzy controller over traditional average approach that is if a student scores less marks in academics in 0.3.Still her overall rating is higher using average method. That is 0.78 but using fuzzy approach the overall rating is reduced to 0.69.

Experiment: B

Table 4.2: Students result compared

α	β	μ	γ	δ	Fuzzy rating	Average rating
0.8	0.8	0.8	0.8	0.3	0.56	0.7

Experiment: C

Table 4.3: Students result compared

α	β	μ	γ	δ	Fuzzy rating	Average rating
0.35	0.4	0.35	0.4	0.3	0.36	0.36

Experiment: D

Table 4.4: Students result compared

α	B	μ	γ	δ	Fuzzy rating	Average rating
0.88	0.92	0.25	0.75	0.7	0.68	0.7

Experiment: E

Table 4.5: Students result compared

α	β	μ	γ	δ	Fuzzy rating	Average rating
0.6	0.55	0.65	0.6	0.6	0.61	0.6

Table 4.6: Dataset

S.No	α	β	μ	γ	δ	Fuzzy rating	Average rating
1	0.3	0.9	0.9	0.9	0.9	0.69	0.78
2	0.8	0.8	0.8	0.8	0.3	0.56	0.7
3	0.35	0.4	0.35	0.4	0.3	0.36	0.36
4	0.88	0.92	0.25	0.75	0.7	0.68	0.7
5	0.6	0.55	0.65	0.6	0.6	0.61	0.6

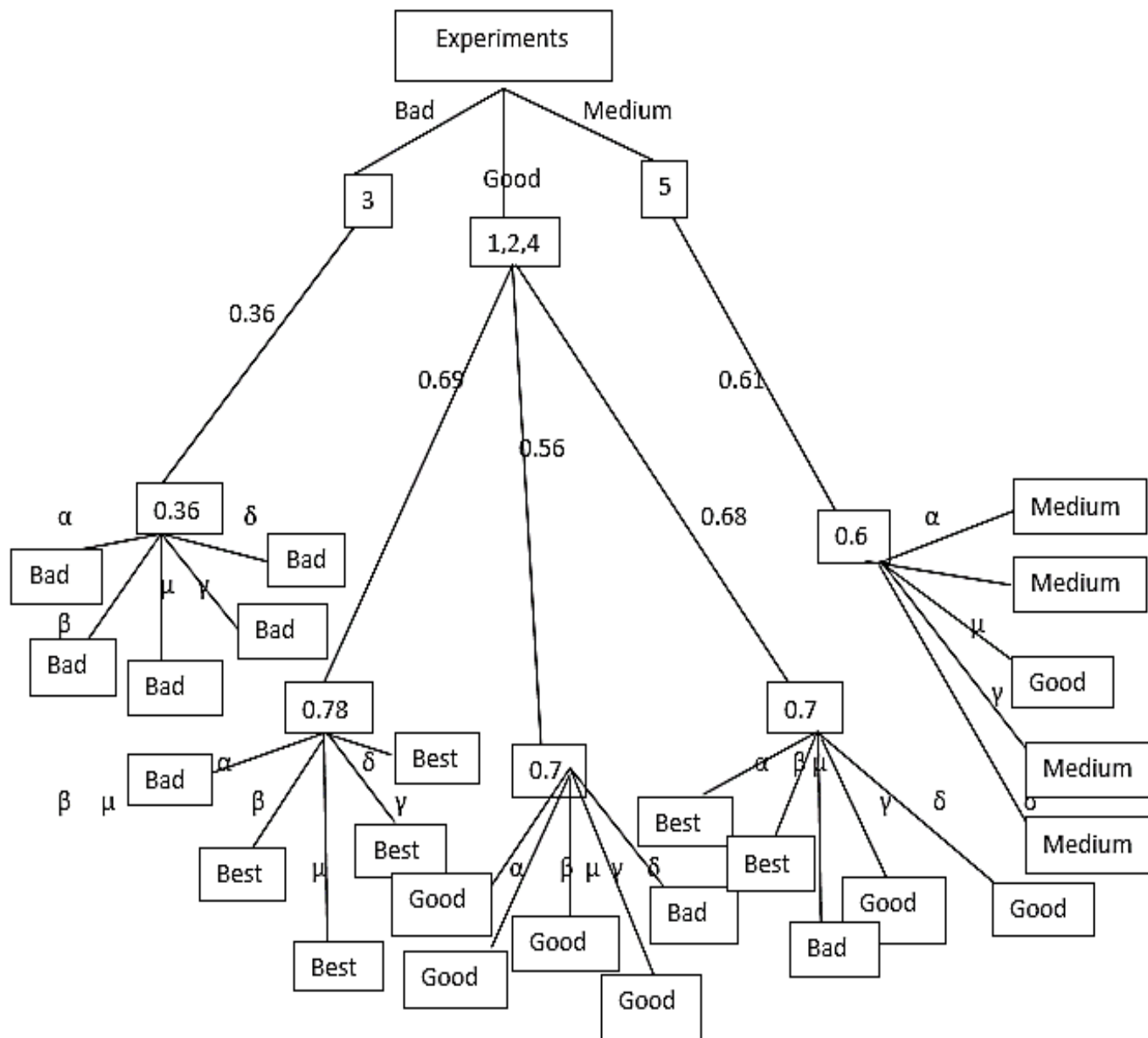


Figure: Decision tree

CONCLUSION

In this paper we conclude that the research objective obtained the overall performance of school students through different evaluation types like knowledge analysis and punctuality analysis. By using this evaluation types we analyze five different attributes like academics, communication, behavior, attendance, and extra curriculum. The attributes and their values used to evaluate the fuzzy rating and traditional average rating. Fuzzy logic control’s method is also used to analyze the fuzzy rating. The result analysis based on the overall class students’ performance. Finally we draw the decision tree model. It is very easy to rectify the defects of the students and their annual performance.

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