

Assessing Lecturers' Performance using Fuzzy Logic

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ABSTRACT

Assessing lecturers is a routine work conducted at various universities to ascertain the academic performance of the lecturers. In literature, various methods and variables are being employed to do the evaluation. The objective of this research was to employ fuzzy logic in assessment of lecturers as against the traditional statistical methods. Four input variables, namely lecturer delivery, punctuality, interaction with students and assignment were used which produces a single output- Result, with its linguistic terms as Excellent, Fair, Good or Poor. The result shows that Fuzzy logic can be a simpler way of evaluating lecturers.

Keywords

Lecturers Assessment, Fuzzy logic, Fuzzification, Defuzzification

1. INTRODUCTION

All over the world universities are considered the highest academic learning institutions. At the universities both undergraduate and post-graduate courses are taught. However for some universities only undergraduate or postgraduates courses are taught.

Lecturers at the universities are expected to teach certain number of courses and also demonstrate some level of proficiency in the courses they teach. To ensure quality of education, universities employ assessment criteria to assess each lecturer's performance over a period of time to ascertain the level of delivery and proficiency of the said lecturer.

According to [2], the main purpose of evaluation is to provide information and feedback to academic staff on their teaching performance which in turn should enable them do some self-reflection and eventually take some necessary action to enhance their teaching performance in their function.

Over the years, various assessment methods have been employed to assess lecturers' academic performance. Most notable among them are the statistical tools. Fuzzy logic can however be a better alternative.

2. RELATED WORK

Evaluation of lecturers' performance has been dealt with for some time now. Various criteria and varying parameters have been used by different authors.[3] Used 34 items among which were punctuality, teaching for the whole period, encourage students to answer question etc. The mean and standard deviation of the items were found.[2] Used 4 variables namely planning and preparation, delivery techniques, assessment, student-lecturer relation. All this were statistical.

Fuzzy logic is an extension of the classical set theory. It was proposed by Prof. Lofti Zadeh in the year 1965. It is mostly used to deal with imprecision and vagueness of human

subjective judgment and represent information from zero to one [9].

Fuzzy logic has received attention in several domains including its application in lecturers' assessments.[6] used fuzzy logic in teacher performance evaluation. Fifteen items were used in the evaluation criteria. In another research, [4] applied fuzzy logic in employee performance appraisal system. [5] conducted students' performance evaluation using fuzzy logic reasoning. Five attributes were used in the evaluation criteria.[9] Applied fuzzy logic to credit scoring in Ghana to determine the credit worthiness of applicants.

3. METHODOLOGY

Fuzzy logic uses input and output variables in the construction of inference rules. Therefore the first process was to identify input, output variables and their linguistic terms

There are not generally or universally agreed inputs and outputs for lecturers' assessment. Therefore the input and output variables used for this research were obtained from the Quality control section of the Christ Apostolic University College's (www.cauc.edu.gh) for the year, 2014. They are

Lecturer Delivery, -Ability of a lecturer to deliver a course

Interaction with Students: Lecturer's engagement with students to motivate them

Punctuality: The number of times a lecturer goes to the lecturer room

Assignment: Lecturer offers and marks assignment given to students

The input and output parameters were placed in the fuzzy threshold as shown in tables 1 and 2 respectively

Table 1 Input Variables And Their Thresholds

INPUT NAME	LINGUISTIC	RANGE
Lecture Delivery	Excellent	.70-1.00
	Fair	.55-.70
	Average	.40-.55
	Poor	0-.40
Interaction With Students	Excellent	.70-1.00
	Fair	.55-.70
	Average	.40-.55

	Poor	0-.40
Punctuality	Excellent	.70-1.00
	Fair	.55-.70
	Average	.40-.55
	Poor	0-.40
Assignment	Excellent	.70-1.00
	Fair	.55-.70
	Average	.40-.55
	Poor	0-.40

Table 2 Output Variable A

Result	RANGE
Excellent	80.1-100
Fair	60.1-80
Average	40.1-60
Poor	0-.40

Sample input and output were plotted graphically using Matlab 7.0 as shown in Figures 1 and 2

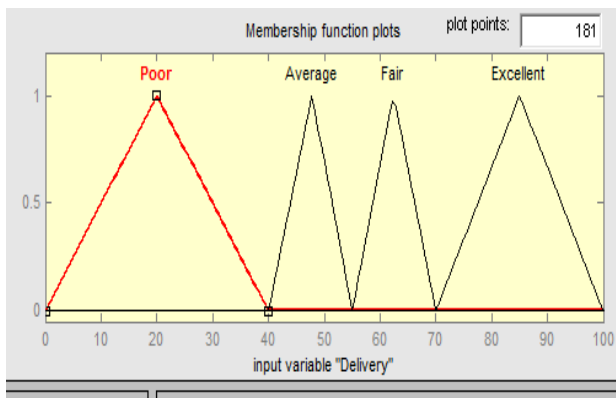


Fig. 1. Input variable Lecture Deliver

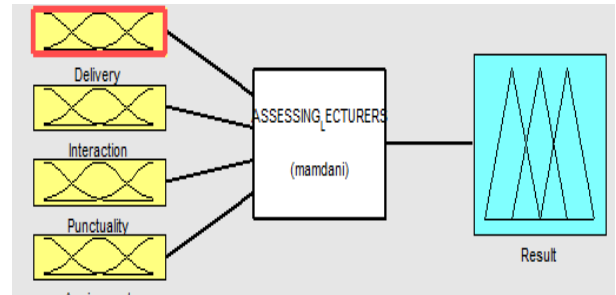


Fig 2. Input and output Variables

A fuzzy decision matrix was constructed using the input variables and an output to indicate the result. Fuzzy rules were obtained to form the rule-base for the fuzzy inference engine. Further, the min-operator was employed in the rule construction and the centroid method to defuzzify the result

Sample rules are

1. If Delivery(Excellent) and Interaction(Average) and Punctuality(Average) and Assignment (Average) then Result(Fair)
2. If Delivery(poor) and Interaction(Average) and Punctuality(Excellent) and Assignment (Average) then Result(Average)
3. If Delivery(poor) and Interaction(poor) and Punctuality(poor) and Assignment (poor) then Result(Poor)
4. If Delivery(Excellent) and Interaction(Excellent) and Punctuality (Excellent) and Assignment (p Excellent) then Result(Excellent)
5. If Delivery(poor) and Interaction(Excellent) and Punctuality(Average) and Assignment (Fair) then Result(Average)

4. IMPEMENTATION

Implementation of fuzzy logic systems normally goes through four stages to which this research was no exception. These are *Fuzzification, Data-store, inference and Defuzzification* stages respectively.

The process started by capturing the four input parameters into the fuzzy system. At the Fuzzification stage all the crisp values entered were converted to fuzzy values which was sent to the Data Store. The Data Store has a link with the inference engine which processes all the rules in the system. The final stage is to convert back the fuzzy values to crisp values which is termed as Defuzzification. The Centre-of-Gravity (CoG) Defuzzification method was used. This is because CoG Defuzzification method is simple and requires less computation effort compared to MOM, MAX, HD and CoS [8].

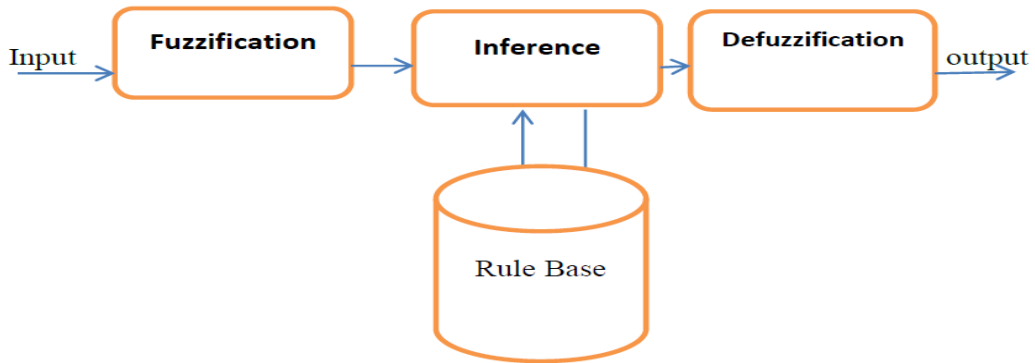


Fig 3. Fuzzy Inference System

Fig. 4 and 5 below shows examples of simulated results

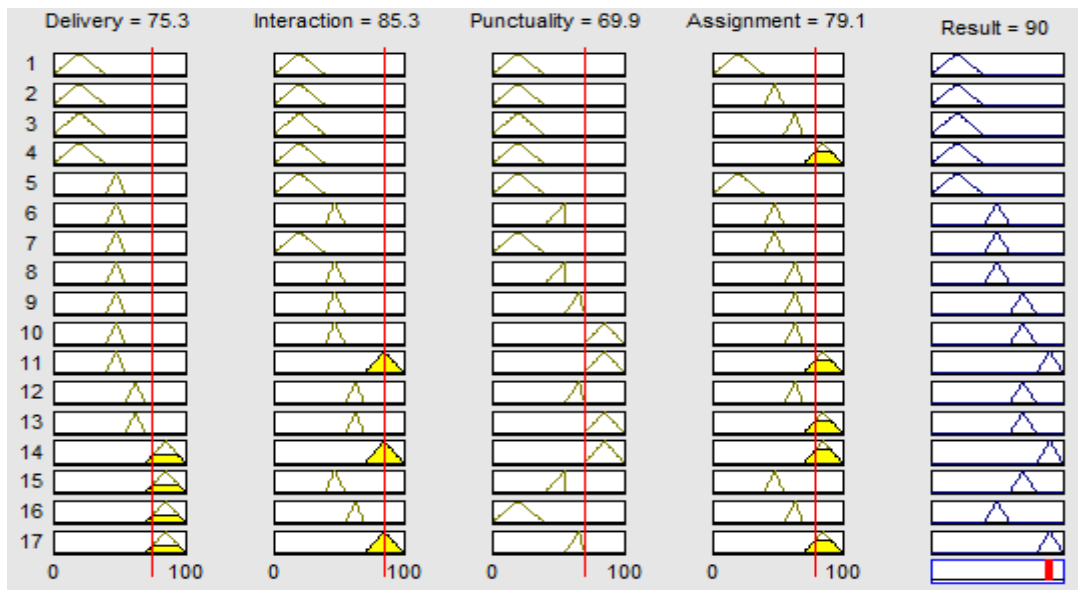


Fig. 4. Sample Simulated Result- Excellent

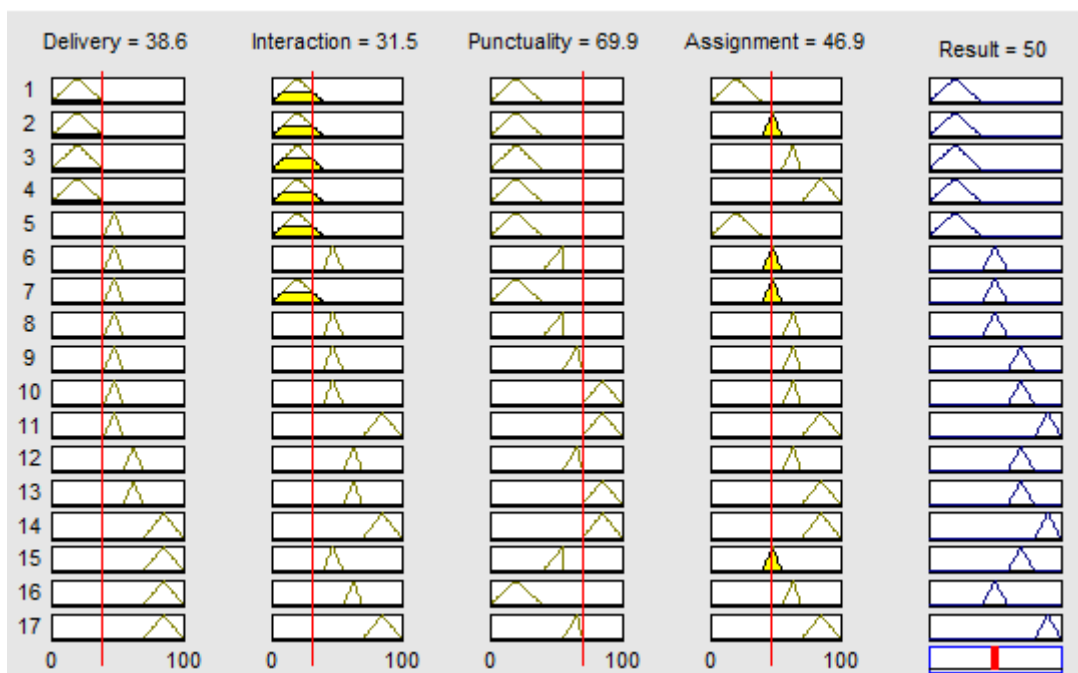


Fig. 5. Sample Simulated Result-Good

Table 3. Sample Simulated Results

NO	DELIVERY	INTERACTION	PUNCTUALITY	ASSIGNMENT	RESULT
1	28	17.7	25	31.5	20
2	68.9	39.2	25	36.2	50
3	49.2	53.1	55.3	63.8	52.2
4	81.1	73.1	72	76.2	90
5	19.9	25.4	17.4	28.5	20
6	68.4	62.2.	71.1	71.6	70
7	30	39.8	38	39.8	20
8	80.7	54	48.5	50.9	60
9	69.6	83	82.9	82.4	80
10	50	41	75.6	45.4	50

Table 3 shows sample simulated results.

We can then infer from the **output variable** of table 2, that, **Results** are

- 80.1 > = Results >= 100 Excellent
- 60.1 > = Results >= 80 Fair
- 40.1 > = Results >= 60 Average
- 0 > = Results >= 40 Poor

5. CONCLUSION

In this research, we applied Fuzzy logic in the assessment of academic performance of lecturers'. It was observed that, using the right input, output and their linguistic terms Fuzzy logic can offer a simple interpretable results

6. ACKNOWLEDGMENTS

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