Effectiveness Analysis Model for Online Teaching Based on Fuzzy logic.

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Abstract:

Education Plays very important role in experiencing phenomenal changes due to advancement of information technology. E-learning is latest channel having much potential in teaching and learning. This paper presents a methodology to check performance in online teaching. For this purpose, the whole data is divided into carious ranges and easily done by fuzzy logic system. A mathematical model that analyses input values in terms of logical values and variables in mathematics take numerical values is called fuzzy system. In fuzzy logic nonnumeric linguistic variables are often used in expression of rules and facts. In this paper we included fuzzy system, fuzzy logic, characteristic and membership function, and implementation of performance analysis includes.

Key Point:

Fuzzy logic, characteristic and membership function, Linguistic Variables, Rules and Facts, Methodology, Performance.

1. Introduction:

Teacher, Student, and Institutions have a very strong relationship. Teachers expect the things more and more in their support from the student and institution for effectiveness of teaching and vice versa. Reputed institutions focus on the performance of teacher during the teaching and try to do it much better for effective learning to students and could stand in very good rank position as compared to the other institutions. In online teaching there are many factors, on which the effectiveness of the teaching mostly depends: first is, ‘Communication skills’, ‘subject knowledge’, ‘Explanation or delivering of lecture’, ‘Network connectivity’. We consider here all the factors are necessary here. Based on these factors, the effectiveness of a teaching in online teaching can be evaluated and consider the teaching in the category of ‘poor’ and ‘very poor’, for the performance improvement process.

2. Importance of Fuzzy Logic

Fuzzy logic is playing a key role in the impression and design of various systems. In fuzzy logic the concept of linguistic variable and the other is that of a fuzzy if-then rule in which the antecedent and consequent are propositions containing linguistic variables.

3. Fuzzy System:

Fuzzy system is an alternative to traditional notions of set membership and logic that has its origins in ancient Greek philosophy, and applications at the frontline of Artificial Intelligence. It is relatively new field.

4. Characteristics of Fuzzy Logic System:

5. Linguistic Variables

In fuzzy logic applications, the non -numeric variables are used to expedite the expression of rules and facts are called linguistic variables.

Here we have following inputs ‘Communication skills’, ‘subject knowledge’, ‘Explanation or delivering of lecture’, ‘Network connectivity’ and one output ‘effectiveness. We are using the following linguistic variables in our approach:

* Communication skills: very less, less, good, very good
* Subject knowledge: very less, less, good, very good
* Explanation or delivering of lecture: very less, less, good, very good
* Network connectivity: very less, less, good, very good
* Effectiveness: very poor, poor, fine, excellent

6. Rules and Membership Functions

All factors are very important in fuzzy logic-based systems. Using membership function, we can divide the input and output parameters in to different ranges[2]. After that we define some rules based on that system.

6.1 Membership Function:

In classical sets we define clue function in which only two values 0 or 1 is taken for true or false of sentence or statement but in fuzzy logic membership function is used which is generalization of the clue function in classical sets which represents the degree of truth as an extension of valuation. In this paper we use Triangular membership function.

To described membership function, we take tuple { *a,b,c,d* } variable denoting the location of the corresponding corners, is given by

*f*(*x, a, b, c, d* ) = $\left\{\begin{array}{c}0     for x<a\\\frac{x-a}{b-a} for a\leq x<b\\\frac{x-c}{c-b} for b\leq x<c\\\frac{d-x}{d-c} for c\leq x\leq d\\0 for         x>d\end{array}\right.$

6.2 Different Variable Values:

1.

|  |  |
| --- | --- |
| Communication | Range |
| Very less | 0-15 |
| Less | 15-25 |
| Good | 25-30 |
| Very good | 30-50 |

2.

|  |  |
| --- | --- |
| Subject knowledge | Range |
| Very less | 0-25 |
| Less | 25-40 |
| Good | 40-75 |
| Very good | 75-100 |

3.

|  |  |
| --- | --- |
| Explanation or delivering of lecture | Range |
| Very less | 0-15 |
| Less | 20-35 |
| Good | 40-75 |
| Very good | 75-100 |

4.

|  |  |
| --- | --- |
| Network connectivity | Range |
| Very less | 0-14 |
| Less | 14-25 |
| Good | 25-50 |
| Very good | 50-100 |

5.

|  |  |
| --- | --- |
| Effectiveness | Range |
| Very poor | 0-29 |
| Poor | 30-49 |
| Good | 50-73 |
| Very good | 74-100 |

6.3 Precedent:

 Here as all factors are necessary to analyze the accurate effectiveness in online teaching. We assume that effectiveness depends upon all the factors, so, for the fine/excellent effectiveness it is required that all factors must have goo/very good values.

The various precedent with these input variables and output variable:

1. If communication is very less and subject knowledge is very less then effectiveness is very poor.

2. If communication is very less and subject knowledge is less then effectiveness is very poor.

3. If communication is very less and subject knowledge is good then effectiveness is poor.

4. If communication is very less and subject knowledge is very good then effectiveness is poor.

5. If communication is less and subject knowledge is very less then effectiveness is very poor.

6. If communication is less and subject knowledge is less then effectiveness is very poor.

7. If communication is less and subject knowledge is good then effectiveness is poor.

8. If communication is less and subject knowledge is very good then effectiveness is poor.

9. If communication is good and subject knowledge is very less then effectiveness is very poor.

10. If communication is good and subject knowledge is very less then effectiveness is very poor.

11. If communication is good and subject knowledge is less then effectiveness is poor.

12. If communication is good and subject knowledge is good then effectiveness is good.

13. If communication is good and subject knowledge is very good then effectiveness is very good.

14. If communication is very good and subject knowledge is very less then effectiveness is very poor.

15. If communication is very good and subject knowledge is less then effectiveness is poor.

16. If communication is very good and subject knowledge is good then effectiveness is good.

17. If communication is very good and subject knowledge is very good then effectiveness is very good.

18. If subject knowledge is very less and explanation is very less then effectiveness is very poor.

19. If subject knowledge is very less and explanation is less then effectiveness is very poor.

20. If subject knowledge is very less and explanation is good then effectiveness is very poor.

21. If subject knowledge is very less and explanation is very good then effectiveness is poor.

22. If subject knowledge is less and explanation is very less then effectiveness is very poor.

23. If subject knowledge is less and explanation is less then effectiveness is very poor.

24. If subject knowledge is less and explanation is good then effectiveness is poor.

25. If subject knowledge is less and explanation is very good then effectiveness is poor.

26. If subject knowledge is good and explanation is very less then effectiveness is very poor.

27. If subject knowledge is good and explanation is less then effectiveness is poor.

28. If subject knowledge is good and explanation is good then effectiveness is fine.

29. If subject knowledge is good and explanation is very good then effectiveness is fine.

30. If subject knowledge is very good and explanation is very less then effectiveness is very poor.

31. If subject knowledge is very good and explanation is less then effectiveness is poor.

32. If subject knowledge is very good and explanation is good then effectiveness is fine.

33. If subject knowledge is very good and explanation is very good then effectiveness is excellent.

33. If subject knowledge and explanation is very less and network connectivity is very less then effectiveness is very poor.

34. If subject knowledge and explanation is very less and network connectivity is less then effectiveness is very poor.

35. If subject knowledge and explanation is very less and network connectivity is good then effectiveness is very poor.

36. If subject knowledge and explanation is very less and network connectivity is very good then effectiveness is very poor.

37. If subject knowledge and explanation is less and network connectivity is very less then effectiveness is very poor.

38. If subject knowledge and explanation is less and network connectivity is less then effectiveness is very poor.

39. If subject knowledge and explanation is less and network connectivity is good then effectiveness is poor.

40. If subject knowledge and explanation is less and network connectivity is very good then effectiveness is poor.

41. If subject knowledge and explanation is good and network connectivity is very less then effectiveness is very poor.

42. If subject knowledge and explanation is good and network connectivity is less then effectiveness is poor.

43. If subject knowledge and explanation is good and network connectivity is good then effectiveness is fine.

44. If subject knowledge and explanation is good and network connectivity is very good then effectiveness is fine.

45. If subject knowledge and explanation is very good and network connectivity is very less then effectiveness is very poor.

46. If subject knowledge and explanation is very good and network connectivity is less then effectiveness is very poor.

47. If subject knowledge and explanation is very good and network connectivity is good then effectiveness is good.

48. If subject knowledge and explanation is very good and network connectivity is very good then effectiveness is excellent.

 6.4 Implementation of effectiveness analysis Methodology with Fuzzy Logic

In this paper we use fuzzy logic in effectiveness analysis and improvement methodology. Shows four input variables and one output variable effectiveness.

We have defined input variables ‘Communication skills’, ‘subject knowledge’, ‘Explanation or delivering of lecture’, ‘Network connectivity’ with the help of four membership functions very less, less, good, very good. Similarly, the output variable ‘effectiveness’ is defined as very poor, poor, fine and excellent.

6.5 Fuzzy graph is given by following algorithm:

First Parameter: Communication- Range

plot(x, y, 'r');
clear
clc
x=linspace(0,100,1000);
y=[];

for i=1 : 1000
    if x(i)<15
        a=0;
    elseif ((x(i)>=15) && (x(i)<25))
        a=(x(i)-15)/10;
    elseif( (x(i)>=25) && (x(i)<30))
        a=(30-x(i))/5;
    elseif( (x(i)>=30)&& (x(i)<50))
          a=(50-x(i))/20;
    else
       a=0;
    end
    y=[y, a];
end

Graphical representation:



Conclusion: We conclude that how different factors affect effectiveness of teaching in online mode and why offline teaching or classroom teaching is required. If we fulfill all the necessary parameters then online teaching is best for learning and in very less time we can teach and learn more to the students.

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