**REPORT ON STUDENT GRADING SYSTEM USING FUZZY LOGIC**

As a project work for course

**SOFT COMPUTING TECHNIQUES (INT 246)**

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**STUDENT GRADING SYSTEM USING FUZZY LOGIC**

**ABSTRACT:**

Fuzzy approach is based on premise that the key elements in human thinking are not just numbers. Decision maker’s response to the different alternatives and preferences to the various attributes may be sometimes expressed in linguistic variables.

Now days evaluation of marks is getting critical and more time-consuming day by day for teachers in colleges/schools. There are many factors upon which evaluation of a semester depends. For e.g., MTE marks, CA Marks, Attendance marks and ETE marks etc. For a normal human brain, it is very hectic to write down the records and calculate each factor for obtain the TGPA/CGPA of students. So here fuzzy logic comes in power in which the approach is going to help the teacher to take out the records of the students and going to predict/obtain the TGPA/CGPA along with the performance graph of students. This approach is handy for teachers as well so that they can consume less time for this task. This is what “STUDENT GRADING SYSTEM USING FUZZY LOGIC” do.

**ACKNOWLEDGEMENT:**

We would like to thank our mentor - Prof. POOJA RANA for her advice and inputs on this project. Many thanks to our friends and seniors as well, who spent countless hours to listen and provide feedbacks.

**INTRODUCTION:**

Fuzzy logic is branch of logic specially designed for representing knowledge and human reasoning in such a way that it amenable to processing by a computer.

Fuzziness pertains to uncertainty associated with a system i.e., the fact that nothing can be predicted with exact precision.

Fuzziness is property of language. Its main source is the imprecision in defining and using symbol. A fuzzy set is a collection of distinct elements with a varying degree of relevance or inclusion.

There are two commonly used ways of denoting fuzzy sets.

First, If X is the universe of discourse and x is a particular element of X, then a fuzzy set A defined on X may be written as a collection of ordered pairs: A = {(x, µA(A))}, x € X Where each pair (x, µA(A)) is called a singleton, where x is followed by its membership function µA(A)).

Second, Singleton can also be written as µA(x)/x and fuzzy set A can also be represented as, A = ∑௫௜ xi/µA(xi)

Membership function also known as characteristic function can take value between 0 and 1 and indicates degree of membership. Since there are infinite numbers between 0 and 1, infinite degrees of membership are possible.

Fuzzy approach is based on premise that the key elements in human thinking are not just numbers. Decision maker’s response to the different alternatives and preferences to the various attributes may be sometimes expressed in linguistic variables.

**TEAM MEAMBERS AND CONTRIBUTION:**

**AVEEK SINHA: -**

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Contribution:

* Coding (CGPA & ETE Part): JOINT
* Inbuild Datasets implementation
* Graph Plotting (CGPA, ETE)
* ML (SK FUZZY LOGIC)

**ABHISHEK SAINI: -**

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Contribution:

* Coding (CA & MTE Part): JOINT
* Graph Plotting (CA, MTE)
* Report
* ML (SK FUZZY LOGIC)

**PYTHON LIBERARIES/MODULES:**

* **NUMPY: -** NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python. In Python we have lists that serve the purpose of arrays, but they are slow to process.

NumPy aims to provide an array object that is up to 50x faster than traditional Python lists.

The array object in NumPy is called Nd array, it provides a lot of supporting functions that make working with Nd array very easy.

Arrays are very frequently used in data science, where speed and resources are very important.

* **SK FUZZY: -** Scikit-Fuzzy is a collection of fuzzy logic algorithms intended for use in the SciPy Stack, written in the Python computing language.
* **MATPLOTLIB: -** Matplotlib tries to make easy things easy and hard things possible. We will generate plots, histograms, scatterplots, etc.,to make our project more appealing and easier to understand.

**SCREESHOTS:**

**Text

Description automatically generated**CODE –

A picture containing text, screenshot, indoor

Description automatically generated

OUTPUTS –

Graphical user interface

Description automatically generated

CGPA and MTE Prediction Graph

Graphical user interface

Description automatically generated

ETE and CA Prediction Graph

Text

Description automatically generated

CGPA OUTPUT

**WORKING OF PROGRAM:**

Fuzzy logic contains three terms that are Antecedents that means Input, Consequent means output and one more we have used here that is known as membership function. To obtain the membership function in our program we have used an inbuilt function of python “trimf” and “trapmf” that are going to generate membership value. As firstly we have designed a function for MTE input of Antecedent using arrange function, as in LPU MTE is of 40 marks so we have taken the range up to (1, 41, 1) with increment of value 1. After that we have categorized the result of MTE as “POOR”, “AVERAGE” and “GOOD”. The Universe set is used to get the values and trimf function will design a triangular membership function in which 3 values we have passed. And trapmf will design a trapezoidal membership function in which we have passed 4 values. And similarly, we have passed the same thing for ETE and CA as well, but with the difference in arrange as it will be from 71 as ETE is of 70 marks in LPU and 31 for CA because it is of 30 Marks in LPU.

As we also have calculated the CGPA which we have considered our output that’s why we have used their Consequent. In this the arrange will up to (1, 11, 1) as of 10. The automf function will draw the output graph of values automatically. As we have defined 5 values that are “POOR”, “MEDIOCRE”, “AVERAGE”, “DECENT”, “GOOD”.

Now to obtain the CGPA we have defined some rules that are also known as “FUZY RULES”. Let’s say we have defined a rule in the code as well that is:

rule1=ctrl. Rule(ca['average’] &mte['poor']&ete['good'],cgpa['good']) on this rule the fuzzy will predict the CGPA based on inbuilt Datasets that are implemented in the code. The tipping is done here so that those fuzzy values can be converted in Normal Numeric Values, which is known as Defuzzification.

So, we passed some random values here as for CA we have defined in the rule it is “AVERAGE”, so we passed 16. MTE we have defined “POOR”, so we passed 5. ETE, we have defined “GOOD”, so we passed 61. And after these values our Logic is predicting the value of CGPA that is 9.150583927157562

**CONCLUSION:**

It is our team’s hope that this document will be of huge help with understanding of our little project as we have used a different approach which has proved beneficial for us and easy for us to understand the concept of Machine Learning concept “FUZZY LOGIC”. Thou the project is small but what our mentor taught us we successfully implemented that concept in our small project to get the accuracy of Prediction. We are very much enthusiast to work upon new ML related Projects in future and to gain more knowledge on different algorithms and concepts of Machine Learning.

**REFERENCES:**

TOOLS USED:

* Jupyter Notebook
* Python Language
* PANDAS (Python Library)
* NUMPY (Python Library)
* MATPLOTLIB (Python Library)
* SK FUZZY (Fuzzy Logic)

CONCEPTS LEARNT:

* Mentors Notes and Online Tutorials (Various Platforms/Sites)

**GITHUB LINK FOR CODE:**

**https://github.com/aveeksinha/Student-grading-system**