A Framework Based on Fuzzy Inferencing for Measuring the Student's Cognitive Level Learning According Bloom's Taxonomy

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Abstract—Grading plays an important role in the academic results of students. Traditionally "absolute grading" based on marks obtained by students in courses and converting them into Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) in terms of alphabetical equivalence. Bloom's Taxonomy is widely used around the world for defining cognitive level of learning.

This research work investigates the application of Fuzzy Logic (FL) by creating a framework to address the complexities involved in a traditional "absolute grading system" in line with Bloom's Taxonomy. In the proposed framework, marking scheme of students in terms of sessional marks, midterm marks and final term marks have been used as a reference with a case study. Questions have been tagged by experts as per Bloom's Taxonomy and are given as inputs to the fuzzy framework. Initially there are two fuzzy inferencing systems one having inputs pre-examination (sessional marks, midterm marks) and second has final marks according to Bloom's Taxonomy. The outputs of both Fuzzy Inferencing System (FIS) are used as input to the third part of the framework, which is based on Hybrid Subtractive Cluster Artificial Neural Fuzzy Inferencing System (HSC-ANFIS) whose output captures the complexities involved in "traditional absolute grading" system in terms of FL. The results have shown that in comparison to the original absolute grading scheme, Fuzzy based framework was able to capture the complexities involved in traditional grading system more effectively. The framework was able to show result based on true learning of course according to Bloom's cognitive level.

Keywords— fuzzy logic, bloom's taxonomy, FIS, HSC-ANFIS