

THEORETICAL ANSWER EVALUATION USING NLP AND FUZZY LOGIC

Anamika Bharti¹, Deepika polekar², khushboo Solanki³, Prof. Jaspreet Kaur⁴

Dept. of Computer Engineering, Smt. Indira Gandhi College of Engineering, Navi Mumbai, Maharashtra, India

Abstract - Assessment of student answers to grade their overall understanding of a subject is a critical task. However grading can be monotonous and sometimes can be tedious task for the teachers. Automatic Grading can reduce tedium on teachers but it is complicated by free form student inputs. The main task of automatic grading system is to assign ordinal scores to student answers, based on “model” or ideal answers. Here we introduce a novel framework comprising of three building blocks Word Mover Distance (WMD), a statistical model Latent Semantic Analysis (LSA), Bilingual Evaluation Understudy (BLEU) and Fuzzy logic, a model based on degree of truth to output scores. In other words LSA is used to identify the semantic similarity between two concepts. Word Mover’s Distance (WMD), uses vector encoding of words to calculate the minimum cumulative distance that words from a reference solution need to travel to match words from a student answer. This cumulative distance assesses the distance between two documents in a meaningful way, even when they have no words in common. Fuzzy logic is a primitive model in this system which is used to output the final score based on inputs which are the outputs of LSA and WMD. This proposed method gives better precision, enhanced dependability of results, thus saving the effort and time of staff.

Key Words: Word Mover’s Distance, Latent Semantic Analysis, Bilingual Evaluation Understudy

1. INTRODUCTION

Evaluation is a systematic determination of a subject’s merit, worth, and significance, using criteria governed by a set of standards. The primary purpose of evaluation is to gain insight into student learning and knowledge enhancement. Different kind of paper-based examinations are conducted in academic institutions such as universities and technical colleges to evaluate student academic performance. Examinees are provided answer sheets in most of examinations conducted in universities and academics. These answer sheets include two types as marking sheets and writing sheets. The former is special mark sheet or OCR sheet and can be marked automatically in the marking through the current automatic marking systems. The latter is to write hand written answers and cannot be marked automatically most teachers take considerable time for marking examination papers. Manual evaluation of subjective answers has limitations like time consuming, delayed result declaration, availability of experts, and scope for bias. Developing an automatic marking system for the handwritten examination paper reduces the burden of the teachers. The evaluation is performed on the basis of similarity of meaning that user answer and answer stored in database. The evaluation is performed using statistical techniques—Enhanced Latent semantic analysis (LSA) and bilingual evaluation understudy (BLEU) along with soft computing technique, fuzzy logic. The BLEU technique gives a low score if the exact match of keywords is less in the student answer. The score generated by BLEU can be lower bound on minimum marks to be awarded to the student. The LSA technique assigns score for the

presence of keyword and semantic similarity of terms is also taken care. It does not consider the syntactic structure of the answers but measures the semantic aspect thoroughly. The scores generated using Enhanced LSA technique can be used as an upper bound on the maximum marks that can be assigned to the student answer. The hybrid technique combines the best features of LSA and BLEU. In the next section, a literature survey is conducted on various techniques to be used for evaluation of subjective answer..

2. METHODOLOGY

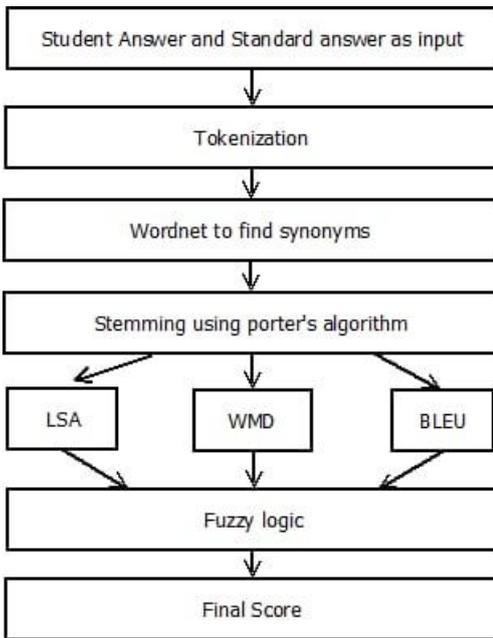
Phase 1: Take inputs The system gets inputs that are required for assessment. They are Model Answers Student Answer
Phase 2: Image Processing Module (CNN + LSTM) CNN :- Convolutional neural network it is type of artificial neural network Used in image recognition and processing that specifically designed to process pixel data LSTM :- LSTM stands for long short-term memory networks, used in the field of Deep Learning. It is a variety of recurrent neural networks (RNNs) that are capable of learning long-term dependencies, especially in sequence prediction problems. LSTM has feedback connections, i.e., it is capable of processing the entire sequence of data, apart from single data points such as images. This finds application in speech recognition, machine translation, etc. LSTM is a special kind of RNN, which shows outstanding performance on a large variety of problems.

Phase 3:- Performing Preprocessing: Once the input is acquired, preprocessing steps are performed on student and model answer. Data preprocessing mainly deals with removing noise, handle missing values, removing irrelevant attributes in order to make the data ready for the analysis. The first preprocessing performed is stemming to get all keyword to their root word.

Phase 4:- Processing Of Data: The techniques LSA, BLEU and WMD are applied to the preprocessed answer. Result generated from these techniques are the measure of similarity of model and standard answer. These results are passed to the fuzzy logic.

Phase 5:- Generation of Score: Results obtained from processed data is applied to fuzzy logic for score generation using madanis rules. The fuzzy logic model accepts three input variables LSA, WMD and BLEU with three membership functions (bad, average, and excellent) and one output variable (Final) with four membership functions (bad, ok, average, and excellent).

3. PURPOSE SYSTEM



4. TEST AND RESULT:

Testing is one of the most important phases in the software development activity. In software development life cycle (SDLC), the main aim of testing process is the quality; the developed software is tested against attaining the required functionality and System Implementation performance. Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Software testing also provides an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation.

Test Cases

Student's Answer

SYSTEM

SCORE

Teacher's Score

It is an interface to the service available by operating system for the computer user. It acts as interface between processors and operating system. These are general routine code in C++ and C. Types-process control-file manipulation device manipulation communication information maintenance.

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The various calls generated during the execution of a program are called as system calls. Below the application level stands

the GUI which provides an interface for user interface. The kernel handles all the system process , memory allocation , segmentation etc. It also undertake file and resource handling.

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system call is the interface between the user and an operating system.It is the call for the function of the operating system .They are the runtime written in different languages like c,Java etc..Types 1)Process control- when the process is getting executed in the main memory.

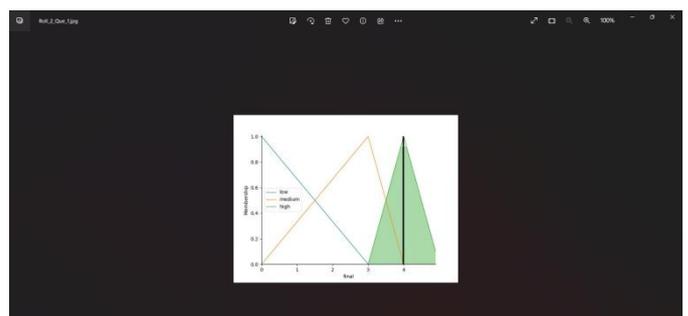
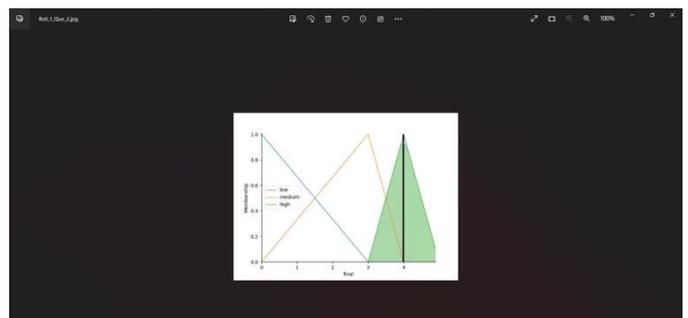
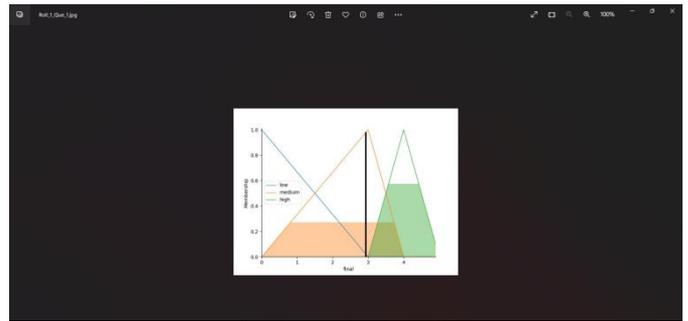
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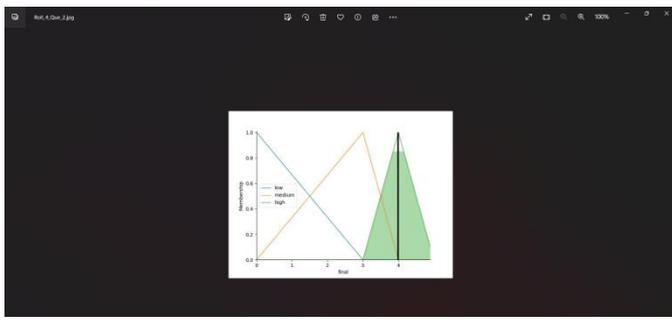
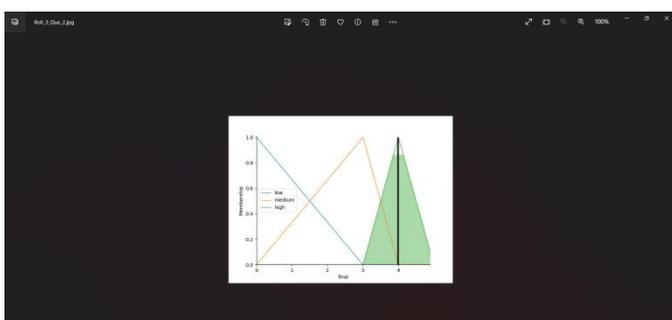
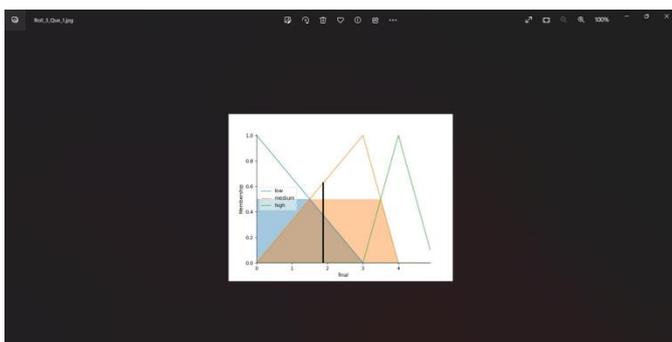
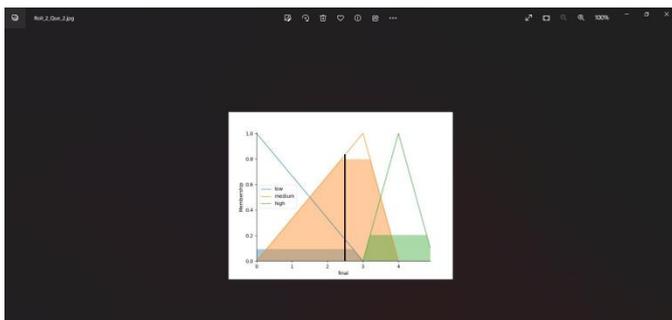
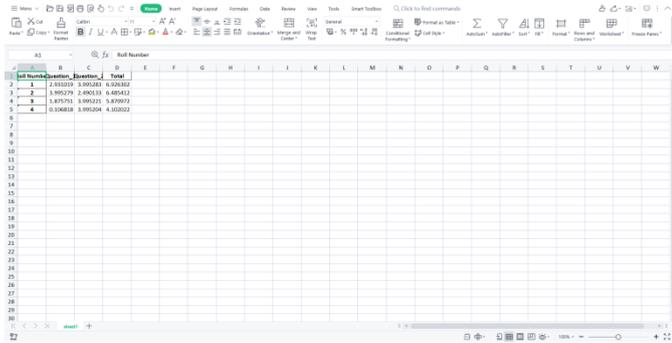
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5. IMPLEMENTATION SCREENSHOT:



Trial Number	low	medium	high
1	1.0	0.0	0.0
2	0.5	0.5	0.0
3	0.0	1.0	0.0
4	0.0	0.0	1.0

6. CONCLUSION:

Most of the evaluation systems available in online, evaluate only the objective type answers. The proposed system evaluates the descriptive type answers of students. Input size of file is reduced using pruning and stemming. The assessment performance of the clustering is improved due to

semantic method LSA used for text transformation. For evaluation, the proposed method uses the semantic similarity between words in sentences. It provides more effective evaluation of the learning process. The proposed Assessment algorithm evaluating the descriptive type answers in $O(n)$ time, for n number of answers. This system would be of great help for the academic institutions in reducing the work and time of evaluation and to speed up the publication of results.

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