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Survey on Techniques used for Evaluation of Exam Answer Papers

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Abstract - *An evaluation of the exam paper takes too much time and energy. In this paper, we illustrate the working of the computerized or automatic evaluation of the exams paper. The manual evaluation of paper is time-consuming and exhausting, but using computerized evaluation of exam paper it helps to standardize the paper correction method in an efficient and accurate.*

Many techniques are implemented for evaluation exam paper using Natural language processing [NLP] techniques. NLP is used to check grammatical errors in the exam paper, checking syntactic analysis, semantic similarity and store in the database. After using multiple methods grade the answer sheets and give marks accordingly. The cluster techniques are the grouping of the same elements into one group and have more than one algorithms. The cluster methods have NLP techniques like Latent Semantic Analysis [LSA] and Bi-Lingual Evaluation Understudy [BLEU]. LSA is an NLP technique used to find the semantic similarity between the two sets of documents. BLEU is an algorithm for evaluating the quality of text between two sets of documents. Artificial Neural Network [ANN] is one of the important algorithms in artificial intelligence that is used to compare the answer with the standardized answer and find an accuracy rate between them and decide mark and store in the database.

Key Words: Natural Language Processing, Artificial Neural Network, Artificial Intelligence, Automatic Evaluation, Descriptive Answer Evaluation.

1. INTRODUCTION

The major difficulty in educational institutions or any government and private universities is an evaluation of the exam paper. At present, evaluation of exam paper is done manually depend on teachers which is time-consuming and takes lots of effort from the evaluator. Multiple system is developed to evaluate the objective and subjective type answers. The major concern in the system is the students' way of answers varies from one student to another. The manual evaluation of the answer may be accurate, but it takes a huge amount of time. In the automatic evaluation of answers, it overcomes the drawback of manual evaluation. Techniques are used to evaluate the student descriptive type answer using Natural Language Processing [NLP] techniques. The cluster techniques are the grouping of the same elements into one group. The main clustering method to do multiple techniques like data mining, data analysis, pattern recognition, information retrieval. Clustering techniques consist of more than one algorithm. The cluster methods have NLP techniques like Latent Semantic Analysis [LSA] and Bi-Lingual Evaluation Understudy [BLEU] [3-1]. LSA is the NLP technique used to find the semantic similarity between the standard set of documents with students answers. BLEU is an algorithm to measure the quality and similarity of text between standard and students answers [3-4]. Natural Language Processing [NLP] is one of the topics in the Data Science and linguistics using machine learning to achieve the goal of artificial intelligence. NLP allows computers to understand human language. NLP is a broad concept that has multiple techniques that can be used in an automatic evaluation of the exam paper. It is used to find the grammatical error, spelling checking, POS tagging, semantic similarity checking and ontology. And other techniques is ANN, ANN is a computation model affected by the flow of information that means complex relationships defines between input and outputs and give different result depend on different patterns [9] ANN process is used to evaluate the answer and generate marks according to every student's answer sheet with a standard answer.

The main objective of this paper is by using multiple techniques for evaluating student answers and achieve the goal of the automatic evaluation of exam paper with less time consuming and more accurate.

2. TECHNIQUES USED

2.1 NLP Techniques

Natural Language Processing [NLP] is a part of artificial intelligence, which teach machine or computer to understand human languages. NLP is extensively used for machine translation, automatic evaluation of the exam paper, text summarization, etc. NLP techniques are used for evaluation of answer paper are as follows:

2.1.1 Tokenization

Firstly, the faculty will upload the standard answer in the database, then the answer sheet of the student is to upload the text format using an image pre- processing [8]. Then the text is retrieved from the database then tokenization is applied. Tokenization is a process that splitting the sentence into words and tokenized, so that to match the semantic meaning of the sentences. It is implemented by Natural Language Toolkit [NLTK] [6].

2.1.2 Part-of-Speech Tagging (POS Tagging)

Natural Language Toolkit [NLTK] use important function call Part-of-Speech Speech tagging [6]. POS tagging assigns each word which is tokenized in the sentence with a suitable POS tag which is useful in information retrieval, word sense disambiguation and assign different tags to the words.

2.1.3 Stop Word Removing

Stop word are referred to as a useless word which are removed from the answer sheet. It is implemented by English word dictionary and NLTK so commuters can understand [6]. Answer of student varies from one student to another student so to remove the stop word in the students' answers key sentence is retrieved from the database and removal process is done.

2.1.4 Stemming Words

Stemming is a process to find the meaning of words in the sentences. It is implemented by using the NLTK module called Porter Stemmer [6]. After the tokenization process, the key sentences are stemmed and give the proper tense meaning of words in the sentences.

2.1.5 Checking Semantic Similarity

It is implemented using Cosine Similarity. Semantic analysis is done to check the similarity between two sentences [6]. Each sentence in the answer sheet the database and grade the answers.

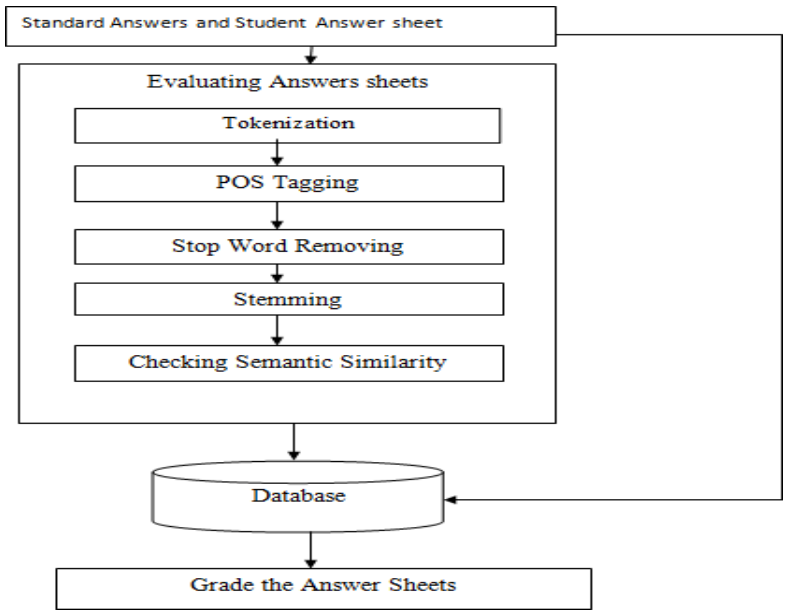

Fig 1. System Design for NLP Technique for evaluating the exam paper.

2.2 Latent Semantic Analysis [LSA]

Latent Semantic Analysis [LSA] is an NLP technique based on a mathematical model proposed by Laundaues, Foltz and Laham in 1998. It is techniques for creating a vector representation of a document gives you a way to compare the document for their similarity by calculating the distance between a vectors [8]. I.e. it supports semantic similarity matching between texts. This technique use singular-value decomposition it take layer matrix of Term Document Frequency [tdf] [3]. The matrix store recurrence of each word in the document. For each element in the matrix, the entropy value is calculated. Singular - value decomposition [SVD] of resulting matrix return matching pattern between documents [3]. This technique takes one document as a student and another as evaluating document compare the similarity with each other and generate a grade. LSA was applied to the evaluation of student answer Auto Tutor tool which is developed at Tutoring research of the university [4]. It is a fully automated computer tutor which assist the student in different subjects. It present questions and answer entered through the keyboard by the student [4]. LSA techniques the evaluate the quality of student answer then we can see that the performance of LSA was equivalent to manual evaluation.

2.3 Bilingual Evaluation Understudy [BLEU]

Bilingual Evaluation Understudy [BLEU] algorithm proposed Papioeni et al is an n- gram co-occurrence searching procedure. The core idea of BLEU algorithm is to analyze and measure the similarity between the student answer with a standard answer and have score accordingly In this technique input text in one language and it is converted into another language by machine then n-grams matches between the machine translation [3-8]. BLEU algorithm applied to perform a comparison of input with standard translation each word is match with standard translation in the system and count words. Once a word is matched then it will not take into consideration. The comparison returns the minimum count of each word [8]. These minimum counts are added and divide by frequency of candidate translation. The resulting word is called Modified Unigram precision [MUP]. MUP value of each word is compared where the number of words used for determining MUP may range from 0 - 1 [8].

BLEU is applied in ATENA system developed by prez et al [4]. This system is used for evaluating answer in English and Spanish [4]. It has the liberty to choose the language between English and Spanish. In this system standard answer is compared with student answer. Before comparing with standard answer is implemented BLEU algorithm [4]. So that it provide accurate marks for the student answers.

2.4 Other Techniques

2.4.1 Artificial Neural Network [ANN]

Artificial Neural Network or ANN is an information processing paradigm and it is composed of a large number of highly interconnected processing elements working to solve problems. NLP is important algorithms used in machine learning. In this method, there are 2 types of data for evaluating the answers sheet. One is a standard answer which is correct answer other is actual student answer which is to evaluate by comparison. ANN algorithms used to evaluate the student's answers by making a comparison with the standard answer and generate marks accordingly [9]. Here the answer is checked by comparing the text using words. It compares student's answers with correct standard answer which is store in database and every single word of student's answers is checked with a correct standard answer [9]. If it is matched with a standard answer score is implemented. After score increased it is assigned with the ANN algorithm. Then final score is divided by making summation of an assigned score of all cumulative words in the sentence [9]. In this ways, ANN algorithms grade the answer sheet accurate and efficiently.

3. CONCLUSION AND FUTURE SCOPE

This paper discusses techniques used for automatic evaluation of exam paper using Natural Language Processing [NLP] techniques and Artificial Intelligence algorithms. NLP techniques are used to detect the grammatical error in the exam paper, checking semantic similarity, syntactic analysis and store in the database and achieve an improvement in performance.

Artificial intelligence algorithms like Artificial Neural Network [ANN] generate marks by comparing the actual answer with student's answers and gives marks accordingly and store in the database [9]. Finally, the correction of the exam paper is achieved by comparing marks that are stored in the database and appropriate final marks are given. Further evaluation is done by faculty members.

In the future, Deep Learning and Machine learning methods can be used for efficient and accurate correction for handwriting reorganization of students answer sheets and correcting exam paper, there will be many places we need to improve constantly**.**

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