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Online Examination System

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Abstract - *Conduction of examination is nowadays a restless process. Taking an exam is intended to evaluate a student's knowledge and understanding of a particular subject or in general. In this pandemic physically conducting examinations is very dangerous and normally is an expensive, resource- consuming, and a time taking process. The major job requirements to take a successful exam includes generation of question paper, generation of answer key, a non-partial conduction of test and evaluation. Question paper setting requires a lot of effort and skilled human work and the same thing goes with the answer key generation. Moreover, manually evaluating tests take an ample amount of valuable time, money and other different resources. Standard evaluation of the answer sheet is always a concern in terms of human partiality. Our aim is to solve these problems and build an automated examination system using machine learning and other web technologies to provide a way for faculties to*
access their students by taking an exam which will be way easier and more effective.

***Key Words*: Online Examination System, Machine Learning, NLP, Web application.**

1.INTRODUCTION

Educational Institutions have evolved over the years, thanks to technological advancements. With smart classrooms and Learning Management Systems (LMS), it is now easier for teachers to conduct interactive learning sessions, map student's knowledge, and create progress reports. These advancements make it easier for students to learn efficiently and for teachers to evaluate students with less effort and in less time. But now the problem arrives while conducting a test to evaluate student's; performance beyond cheating. The aim of this work (Online Examination System) is to build an inexpensive, efficient and accurate software platform that generates questions automatically along with their answers respectively to conduct an online examination. Online examination if considered to match or exceed the reliability of human evaluators then it will reduce the cost, resources, and time required for conduction of standard examination.

2.RELATED WORK

We have done literature research about this topic using concepts of machine learning and natural language processing.

1. Hussein Al Bazar proposed an algorithm to distribute a form that prevented the system from producing test sets that could be duplicated and shared among close students. This ensured that in all the tests that were imminent baptism candidates did not receive the same questions [1].

2. Pooja Mahesh and K Selvajyothi developed an automated method of obtaining impersonation in online tests that require minimal human interaction. They used two biometric verification methods to confirm whether the test registrant was the same or not. They also used face-to-face techniques to see if baptism candidates continued in front of the screen during the test. If any damage is found, the supervisor will be notified immediately so that he or she can take the necessary steps to be recorded [2].

3. Indrashis Das, Bharat Sharma, Siddharth S. Rautaray, and Manjusha Pandey developed a system of examining answers written by candidates using Natural Language
Processing. They used Django with web framework and python language to process back. Data is collected from online testing programs and analysed by a model to accurately provide feedback marks. They also used SQLite for database purposes as well as HTML5, CSS, and JavaScript for advanced design [3].

4. V. Lakshmi and Dr. V. Ramesh proposed a system using neural networks and natural language processing. In this system ,employees create a response sheet and a key database of the testing process. The datasets are stored in the data storage and students enter their responses on the test page. The system automatically calculates the results using NLP and ANN algorithms. Prior to this assessment process, the pre-processing process is used for student-submitted responses. In this study, they used

the Artificial Neural Networks algorithm to compare responses and store marks in this database and test the same response using the Natural language processing [NLP] algorithm to identify system errors and store marks in the database and finally compare both marks and give the final result. Using these methods, they have achieved effective results. The results provided by the program were compared with tests performed by a technical member [4].

3. MATHEMATICAL MODEL –

3.1 TF-IDF –

Term Frequency — Inverse Document Frequency in short is written as TF-IDF is a method that quantifies a word that is present in the documents. To Signify the value of the word in the documents we have to compute the weight of each and every word. This technique is widely used in Information Retrieval and Text Mining [2].

TF-IDF = Term Frequency (TF) * Inverse Document Frequency (IDF)
t — term (word)
d — document (set of words)
N — count of corpus
corpus — the total document set

Term Frequency -
As the name suggests it measures the frequency of a word in a document, which highly depends on the document's length and the generality of the word. TF is independent to each document and word, hence TF is formulated as follows [3].

f(t,d) = count of t in d / number of words in d

Document Frequency –
It calculates the importance of a document in the set of corpus. It is somehow identical to TF, the only difference is that TF is the frequency counter for a term t in document d, whereas DF is the count of occurrences of term t in the document set N. In simpler words DF is the number of documents in which the word is present [4].

df(t) = occurrence of t in documents
Inverse Document Frequency –

IDF is the inverse of Document Frequency. It calculates the in formativeness of term t.

idf(t) = N/df
When a word occurs, and that word is not present in the vocab, then the DF will be zero. So we are unable to divide by 0, we add 1 to the denominator to Simonize the value. idf(t) = log(N/(df + 1)) So, to get the Final equation of TF-IDF we have to take the multiplicative value of TF and IDF.

We get -

tf-idf(t, d) = tf(t, d) * log(N/(df + 1))

The goal of using this is the Key phrase extraction which is referred to as to get the most important key phrases. The Key phrase extraction module uses TF-IDF along with ELMo based sentence embedding's to extract and prune out the unnecessary key phrases[5].

3.2 Bidirectional Language Model –

Basically, a language model is built to forecast a word given the preceding words. To do this we can use the Ngram model or RNN. Recurrent neural networks (RNN) gives us non-ending left context (words which are left of the target word). But to use both contexts and to check how well the word positions we use this model.

If we have given a sequence of N tokens (t1, t2, ..., tN), a forward language model computes the probability sequence by modelling the probability of tokens tk given the history (t1, t2, t3,...,tk) [3].

$$p(t_1, t_2, \ldots, t_N) = \prod_{k=1}^{N} p(t_k \mid t_1, t_2, \ldots, t_{k-1}).$$

A backward language model is similar except it runs over the sequence predicting the previous token given the future context.

$$p(t_1, t_2, \ldots, t_N) = \prod_{k=1}^{N} p(t_k \mid t_{k+1}, t_{k+2}, \ldots, t_N).$$

3.3 Embeddings from Language Models (ELMo) –

ELMo is one of the best techniques to create word representations. It uses a deep LSTM bi- directional model; it is very different from other techniques that are used to create word representations. ELMo uses the words which are in the context in which they are used and analyze them. Other techniques use a dictionary of words with respect to their corresponding vector. ELMo also allows the model to build the representations of the words which are not in the vocabulary [6].

We will use it in the Question creation, where the questions will be created based on the question file which is already predefined. Then after the question is created, both the question and the phrases will be able to give the correct answer with the help of the answer identification module. The module uses a pre- trained Bidirectional Attention Flow which helps to find the correct answer from a group of probable's.

The received responses are checked using Siamese LSTM which uses cosine distance or with the help of Euclidean between features vectors.

3.4 Siamese LSTM –

In LSTM there are two networks that are LSTMa and LSTMb which will check a pair of sentences.

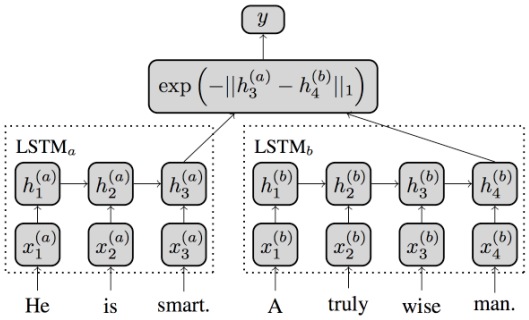

Figure: Siamese LSTM Model Architecture

Formula of LSTM at a unit time t is -

$$i_t = \sigma(W_i h_{i-1} + U_i x_t + b_i) \quad (1)$$

$$f_t = \sigma(W_f h_{t-1} + U_f x_t + b_f) \quad (2)$$

$$\widetilde{c} = tanh(W_c h_{t-1} + U_c x_t + b_c) \quad (3)$$

$$c_t = f_i c_{t-1} + i_t \widetilde{c_t} \quad (4)$$

$$o_t = \sigma(W_o h_{t-1} + U_o x_t + b_o) \quad (5)$$

$$h_t = o_t tanh(c_t) \quad (6)$$

Wi, Wf, Wc, Wo, Ui, Uf, Uc, Uo are the different weight matrices, and bi, bf, bc, bo are the different bias vectors [6].Because of the similarity, the 2-vector representation is measured with the help of Euclidean distance between the two. But if the exponent comes negative then the output will be either 0 or 1. It totally depends upon the similarity score from it, the answers are evaluated. After the test is completed the detailed report is displayed based on the performance of the student.

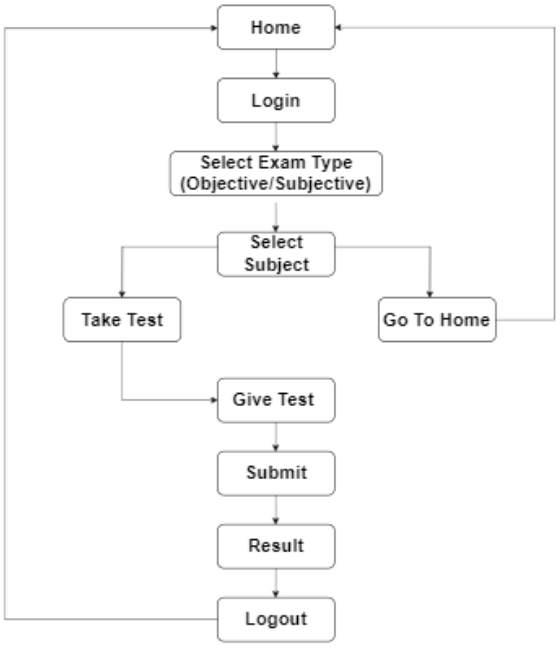

Figure: Block Diagram

4. FUTURE WORK

Future estimates include response tests using Natural Language Processing (NLP) and Manhattan Interim Model (LSTM). The proposed model cannot create complex problems. We can use Convolutional Neural Networks (CNNs) to find written formulas and translate them into model language. With the information already available, we can also use the machine's prediction model in the data

so that it can predict the marks students will receive next time. We can add a variety of solutions when it comes to impersonation. As of now, the model is not performing as well as expected due to computer hardware restrictions. A better utilization strategy can be added to the model to maximize its effectiveness.

5. CONCLUSIONS

In this project, we proposed an Online Examination System that can generate subjective as well as objective questions and their respective answers. The model generates questions as per the text provided and distributes the questions in different sets that no same set has the same questions. Impersonation detection systems also work perfectly by detecting if any candidate has cheated or not. The system we created is user friendly and anyone can use it. The system carries out unbiased evaluations, while this is a major problem in examinations that are taken offline as there is a high chance of biased evaluations. Anyone can run it on any browser with good and stable internet connectivity.

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