Project Report I
On

Virtual Self Assessment Model

Minor Project for Partial Fulfillment of the Requirements

for the Degree of

Bachelor In Technology

in

Computer Science and Engineering

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Introduction To Project:

Our project includes two major functionalities:

1) Essay Writing Analysis
2) Live Interview audio analysis

1) Essay Writing Analysis:

   Through text analysis, we will judge the accuracy and proficiency of the essay written by the user and gave them an automated score. This analysis will be done through a deep learning model created by us. The report generated will also be sent to the user with accuracy predicted to their email ids.

   Another feature in text analysis is to include plagiarism detection which will prevent a user from copying an essay from other online resources. The technique for plagiarism detection will be done through the Machine Learning model which will return the percentage of similar text.

2) Live Interview Audio Analysis:

   In the audio analysis, our project mainly focuses on voice to text and voice sentiment analysis. In voice sentiment analysis our model will predict different emotions in the voice of the user and will generate a confidence score based on these factors.

   In the audio analysis, we are also adding the feature of converting voice to text so as to help users, self asses their answers for future use. The answers will be mailed to their respective email id in the form of text. After performing voice to text conversion, our algorithm will also detect the number of repetitive words that will be highlighted, so as to help users assess and avoid the same in a real interview.

Literature Survey:

We reviewed several papers and blogs to improve our understanding of models used for various functionalities.

Plagiarism detection- We reviewed several techniques like fingerprinting, bag of words model and tools and API available. We are moving forward with affinity-based, frequent analysis model, using string sub matching and word frequency model, to detect plagiarism, even if, some paraphrasing is performed[2].
Automated Scoring- A quadratic weighted kappa model, to measure agreement between 2 different rates, namely LSTM and relu function over 5 fold epoch strategy will be used to improve accuracy[1][3].

Speech to text- A recurrent neural network-based approach, to improve accuracy over time will be used. In this Recurrent Neural Network(RNN) along with Connectionist Temporal Classification(CTC). The role of CTC is to make a sequence of repetitive characters without space into one. In RNN output is 10 times smaller than the input[4][5][6].

Audio Analysis- Support Vector Machines(SVM) are used for performing sentiment analysis on audio. It is a non-probabilistic model that uses a representation of text examples as points in multi-dimensional space.[7]

Proposed Methodology

The project will comprise of 2 major options, to either work on essay writing or live interview. The editor will be provided for essay writing and a live recorded session facility for interview practice, with a random question from our questions dataset and a timer, which will be coordinated on the server side. The recorded answer/text will be then sent to the database, hashed by user email id, and processing will be done on the server side, based on our models. The final output will be then sent to users, either real-time or on their email ids.

As mentioned above our project include two types of analysis:

1) Text Analysis
2) Speech Analysis

Text Analysis:

In text analysis, we will perform essay writing analysis and implement the automated scoring system and plagiarism detection.

The model used for automated scoring system consists of 2 Long Short Term Memory(LSTM) layers with a Dense output layer. The final layer uses the Relu activation function.

The model used for analysing essay is Frequent-itemset analysis, using string matching.

Speech Analysis

Speech analysis includes converting speech to text and doing voice sentiment analysis.

The Model used for converting speech to text is Recurrent Neural Network(RNN)

The model used for voice sentiment analysis is Support Vector Machines(SVM)

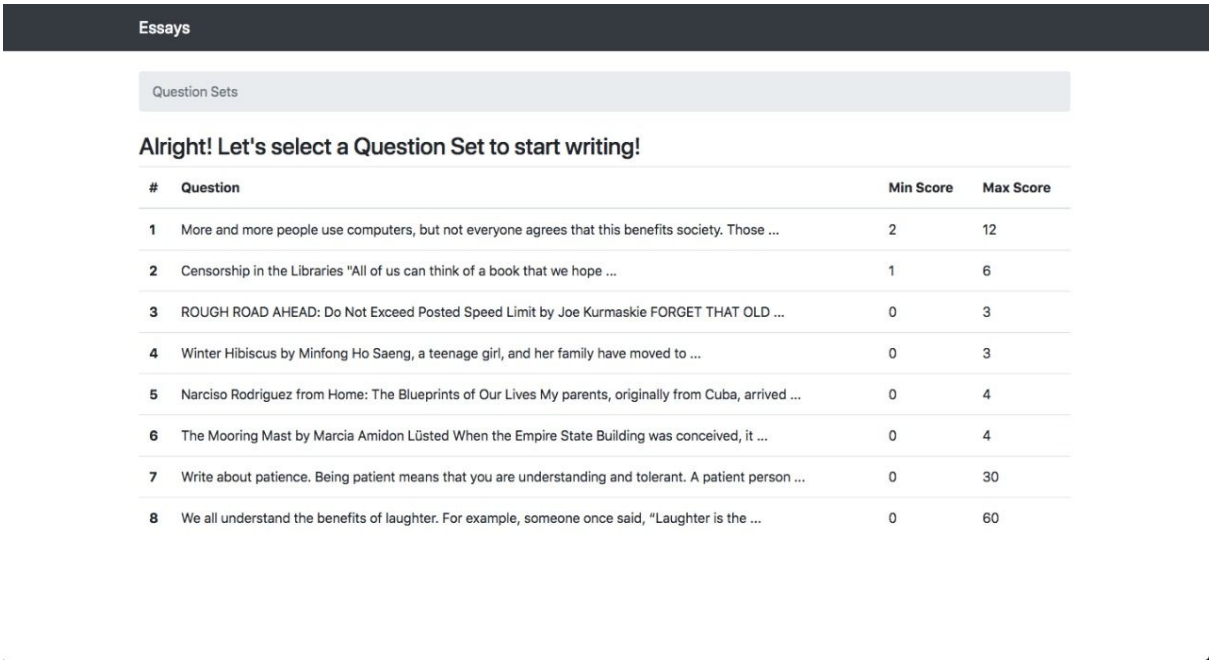
Progress So Far

We are strictly sticking to our proposed timeline and have completed one of the 4 deep learning models required to be integrated in the project. Also, we have finalised on design and overall UI and color theme of the project and have started working on them as well.

We have completely designed the Automated scoring judge on Essays, to be used up under Essay Practice section with complete user interface.

The model was developed using Quadratic Weighted Kappa Approach for weighted neural network using 5 cross validation and finally taking mean of all 5 values.
The model architecture consists of 2 Long Short Term Memory(LSTM) layers with a Dense output layer. The final layer uses the Relu activation function, which is an activation mathematical function which maps to the same value as input for all values greater than zero and zero for rest of values.

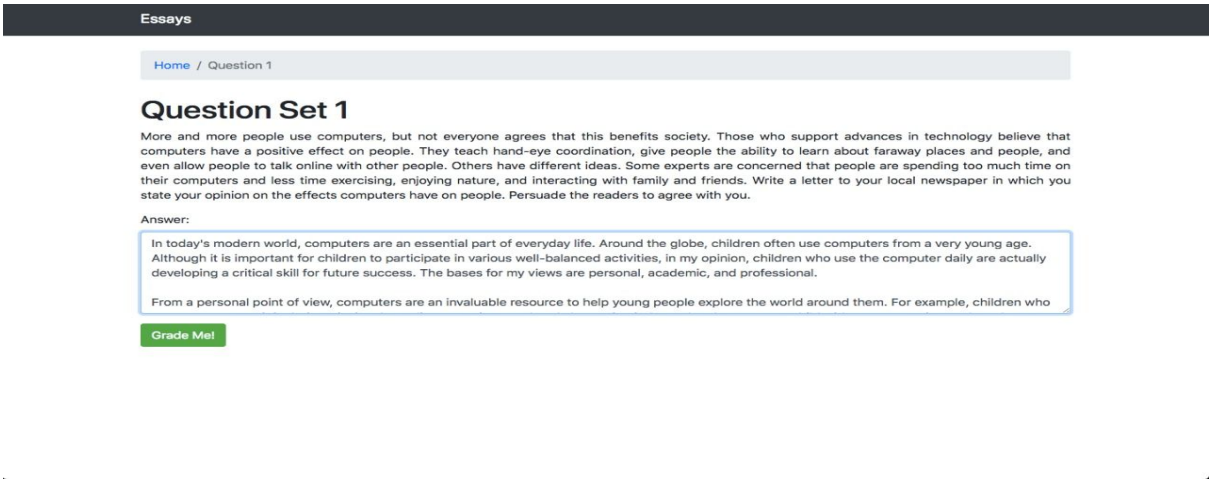
We included some set of questions for students to practice with minimum and maximum scores which they can get. The titles and scores defined were finalised after study of real life examples of similar techniques. Minimum scores usually suggest a competitive adaptability taken over all students in real life examples.



Question Sets included for practice

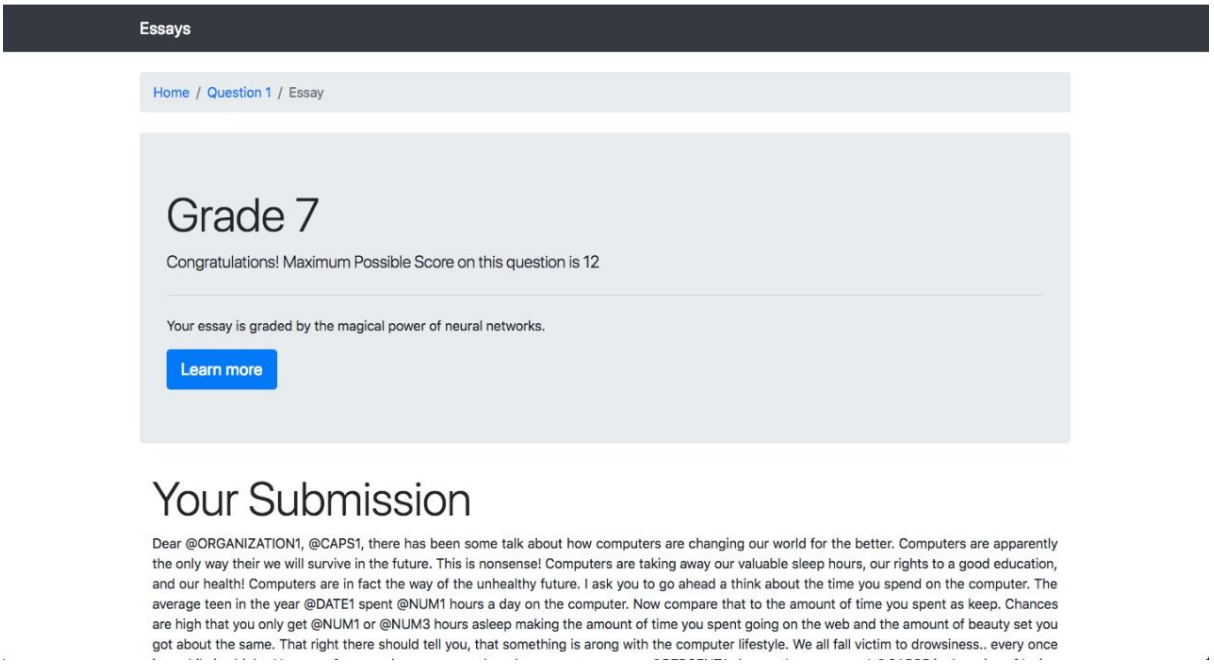
We developed a minimalistic user interface for easy access to users. Users can just click on any question and the editor along with problem statement will appear, for which user can type their essay. User has freedom over time and words limit, which

might be constrained in future iterations. User can submit their answers after which a score will be generated.



Essay submission screen

The users' answers will then be judged across various parameters like content, difficult vocabulary and appropriate use of words, length, segregation of paragraphs, etc. on basis of dataset of Hewlett foundation used during training period.



Score generation for users' answers

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