MockAI : Smart Recruitment Counseling using Artificial Intelligence

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Abstract— Preparing for job interviews is very difficult. A lot of candidates are not prepared for the interviews and so they are not able to fetch their dream jobs. Mostly candidate's selection is based on the answers given in the interview. People will definitely hire those candidates who show interest and positive attitude. Using deep learning techniques we are proposing an application framework which would help candidates in preparing for the interviews. This involves multiple neural networks working separately for predicting different sections of an interview and providing real-time feedback and a report. Using CNN emotional analysis is performed on the video stream and Recurrent neural networks are utilized for sentiment analysis. Further, this Recurrent neural network with LSTM units is utilized for chat-bot interaction during the process. The chat-bot ask the questions to the candidate and candidate's response is recorded and analysis is done. All these analyses together will try to prepare the candidate for the interview as a whole.

Keywords— Chatbot , Deep Learning, Facial Expression Recognition, Sentiment Analysis

I. INTRODUCTION

Most of the students who are pursuing graduation or post-graduation face their first interviews and many of them fails the opportunity due to lack of experience in giving an interview. A typical interview involves an aptitude test followed by group-discussions, technical interview and hr interview. The selection of candidate depends upon factors like their communication skills, their technical skills and other features. Hence we are proposing a application framework which utilizes the power of neural networks for providing analysis during the interview process. Neural Networks have special ability of self feature extraction and it tries to mimic the human brain by the means of feed-forward and back-propagation. The Convolution neural network has bought a new heights in image classifications. Combining the ability of the neural networks and website we are hoping to provide a solution for interview preparedness.

Rest of the paper is organized as follows, Section I contains the introduction of the proposed framework, Section II contain the related work for emotion analysis and sentiment analysis using neural networks, Section III contains the limitation of the system Section IV contains the proposed framework and related diagrams, Section V contains the architecture of the framework. Section VI is the mathematical model for the system. Section VII contains the results .Section VIII concludes proposal work with future directions.

II. RELATED WORK

This section focuses on the related work in the field of neural networks

1**. Sentiment Analysis with Deeply Learned Distributed Representations of Variable Length Texts**
The authors suggest various implementation of deep-learning methods for evaluation for sentiment on the data set for analytic. The data set used for this analysis was of IMDB Movie data set and Stanford Sentiment Tree bank data set. For Sentiment Analysis the authors utilizes Deep Recursive-Neural Networks and LSTM (Long Short Term Memory) for both binary and fine classification tasks. The Authors conclude by comparing the different models performance for sentiment analysis[8]

2. **Recursive Deep Models for Semantic Compositionality Over a Sentiment Tree bank**
The authors suggest the use of Recursive Neural Network which provides a higher accuracy in prediction of sentiments. The data set utilized for this is Sentiment Tree bank. The semantic word spaces are useful but are unable to express the context on the longer texts.[9]

3. **Speech emotion recognition using convolution long short-term memory neural network and support vector machines**

In this paper, the authors proposed a speech emotion recognition technique using convolution long short-term memory (LSTM) recurrent neural network The technique provides a outputs phoneme- based emotion probabilities to every frame of an input utterance. Then these probabilities are converted into statistical features of the input utterance and used for the input features of support vector machines system to classify the utterance-level emotions. [10]

4. **Emotion-detecting Based Model Selection for Emotional Speech Recognition**

The paper suggests models for emotion detection from the speech and shows performance measures of various models for emotion recognition from speech. The technique utilized for this is adaptive technique. The Author states that the accuracy of the speech recognition reduces when the emotions are considered. His approach presents a way of modeling the data for emotion recognition [11]

2.5 **Speech emotion recognition based on Fuzzy Least Squares Support Vector Machine**

The paper suggest a new method for emotion detection in speech using Fuzzy Least Squares Support Vector Machines. FL VS SVM can be utilized for constructing a hyper plane to recognize four speech emotion in Chinese language. The paper states that FL-VS SVM can achieve a higher correct rate and better performance and accuracy. [12]
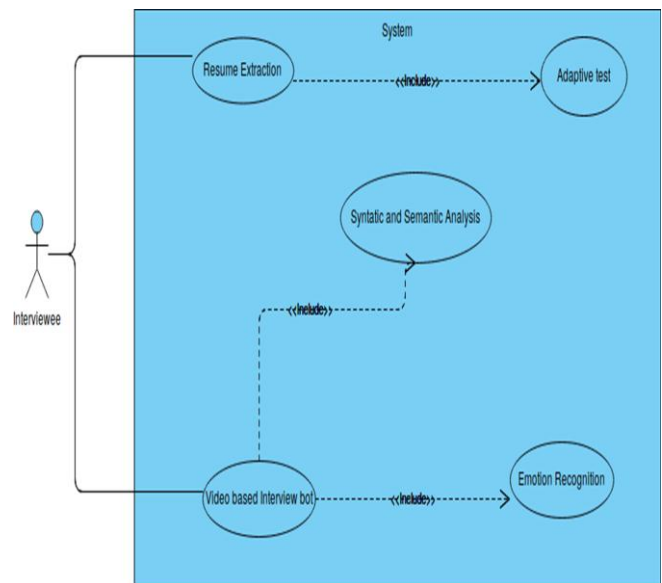
III.   LIMITATION OF EXISTING SYSTEM

It's very difficult for any machine to conduct or simulate the behavior of the interviewer during the course of the interview. Many candidates fail to clear interview because they don't know how to answer a specific question and how to speak confidently in front of interviewer even though they have a specific required skill set. Some of the observations made in a interview are learning purpose :

1. There can be a difference in the evaluation method by each interviewer. This also means that there could be a chance that a candidate who could have got selected good rejected because of wrong evaluation. [2]

2. Visual Appearance - Candidates dressing style may lead to a decision which is biased from the side of the interviewer. eye-contact, communication skills could also lead to biased interview grade. [2]

3. A Study suggests that the candidate which belongs to the same race, caste or other features similar to the interviewer may have a higher chance of selection. [1]

4. In an interview, interviewer tries to study the body language of the candidate, especially facial emotions, many candidates fail here because their speech and the body language does not match. [2]

Generally, before the interview, an aptitude test is taken which involve the majority 3 sections : Aptitude Test , Technical Interview, HR Interview. For preparing aptitude

round the candidates usually go through lots of books and websites. For cracking the aptitude test, one should have their basics clear and should have done a lot of practice. For preparing for an interview, candidates usually refer books and practice in front of the mirror or request their friends to take interviews. Many hiring agencies also provide services like mock interviews for candidates. For helping candidates to improve themselves and get their dream jobs, we decided to create a system which would allow candidates to improve their chances for selection. wide range of different examples of sentimental answers. RNN's are better at remembering the sequences which are generally required for to remember the sequence of words in a sentence. Sentiment Analysis is a important aspect of the framework as the humans tends to agree and get impress more with the positive sentiments. Further LSTM's are also utilized for creating chat bot interaction this LSTM is trained using the data which is collected from the students who got the campus placement. This data set consist of features like questions,answers given by the student and their placement status. This data set is also utilized for evaluating the correctness of the answer provide by the candidate by using techniques like cosine similarity and naive bayes. Along with the use of neural network, proposed framework also utilizes audio analytic and visualization for better feedback.
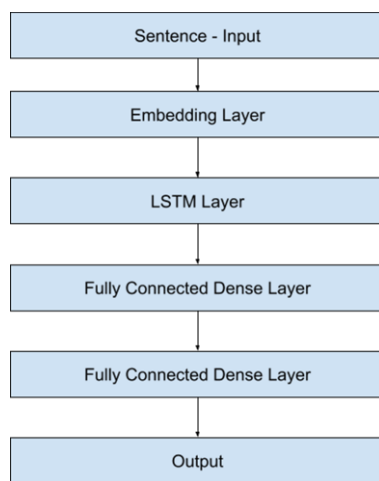
IV.   PROPOSED SYSTEM

4.1 Proposed Framework

The proposed framework utilizes different neural networks for various different tasks which together provides a detailed analysis of the interview given by the candidates. Neural networks like CNN (Convolution Neural Network) are utilized for the for the emotion analysis. The Training data set utilized for this process is FER2013 data set. This data set contains 28,709 images which are classified into 7 different

categories, among this only 5 categories are utilized as the categories like fear and disgust have less images and the CNN was not able to identify this emotions as they where more related to other emotions. The Data set was further enlarged by use of Data Augmentation. By means of transfer learning we can further increase the accuracy of the model. For the transfer learning purpose we are utilizing VGG16 architecture. RNN with LSTM(Long Short Term Memory) is utilized for sentiment analysis over the IMDB Movie data set as it have wide range of different examples of sentimental answers. RNN's are better at remembering the sequences which are generally required for to remember the sequence of words in a sentence. Sentiment Analysis is a important aspect of the framework as the humans tends to agree and get impress more with the positive sentiments . Further LSTM's are also utilized for creating chat bot interaction this LSTM is trained using the data which is collected from the students who got the campus placement.
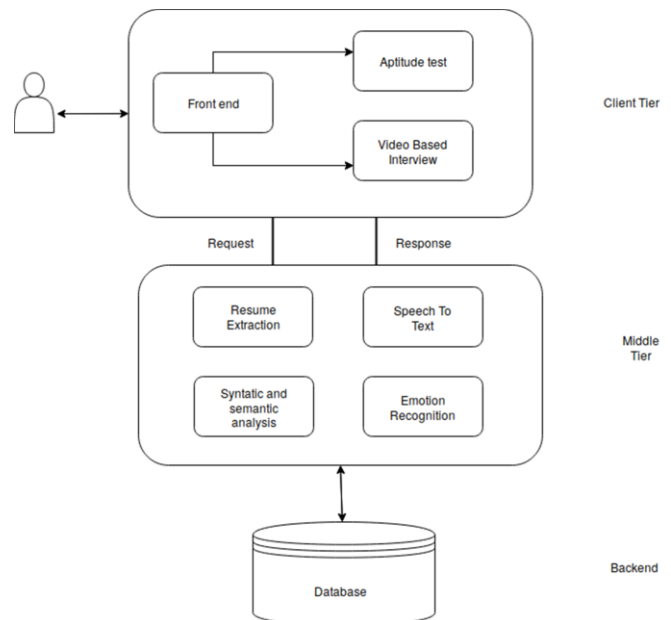

4.2: VGG 16 Architecture

This data set consist of features like questions,answers given by the student and their placement status. This data set is also utilized for evaluating the correctness of the answer provide by the candidate by using techniques like cosine similarity and Naive-Bayes. Along with the use of neural network , proposed framework also utilizes audio analytic and visualization for better feedback.

V. ARCHITECTURE OF THE SUGGESTED FRAMEWORK

Proposed System would be having a Three Tier Architecture, the reason behind choosing three-tier architecture is to get users information from the database, process the speech to text, And emotion recognition and syntactic and semantic analysis. The Client side is the frontend and it consists of the adaptive aptitude test and voice-based interview. The Application is based on the DjangoFramework for web development using python, python language provides a great level of abstraction and has a lotof libraries for machine

learning and data analysis. Theback end and middle tier are the major processing element of the system and consists of all the requiredfunctionality and processing the information from front-end to the database The middle tier consists of resumeextraction, speech to text conversions, syntactic and semantic analysis of candidates response, emotion recognition.

5.1 Architecture of proposed system

VI. MATHEMATICAL MODEL

Let the proposed system be S,

S={I,O,M,P}

I=Input to the system

O=Output of the system

M=Methods/Technique used in implementation of the system

P=Parameters affecting the system

where,   P={speed,accuracy}

Speed and Accuracy affects the system.

Input to the system

Let I = {I1,I2,I3} where,

I1 = Input from microphone for hearing users response

I2 = Text which is obtained from the conversion of speech to text

I3 = Questions obtained from the database

Output of the system

Let O={O1,O2,O3,O4} where,

O1=Sentiment Analysis of the Answer provided by the user

O2=Emotion Detection of the Answer provided by the user

O3=Accuracy of the answer compared to the answers in the database

O4=Adaptive Test Level

Let

CNL = Candidates new level

CUL = Current user level

QDL = Question Difficulty level

L1 = Learning level

CDL = Current difficulty level

If Candidate gives right answer:

$$CNL = \frac{CUL+(CUL*QDL)}{L1}$$
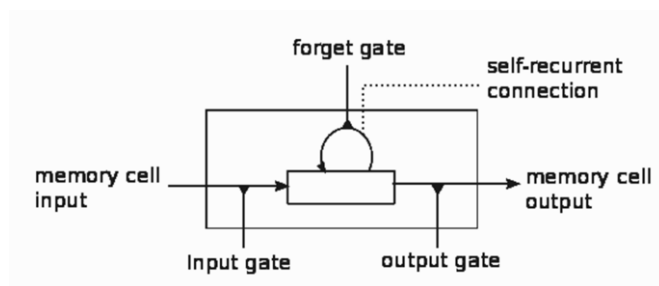
$$QDL = \frac{CDL - (CUL * QDL)}{L1}$$

else:

$$CNL = \frac{CUL - (CUL * QDL)}{L1}$$

$$QDL = \frac{CDL + (CUL * QDL)}{L1}$$

Methods/Algorithm Utlized:

Let M={M1,M2} where,

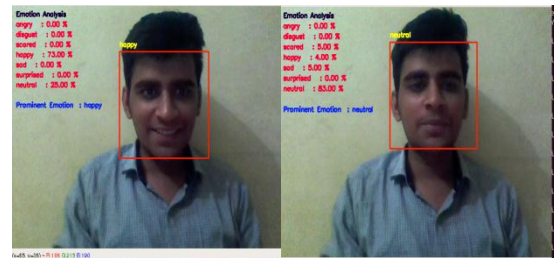M1=Recurrent neural network with LSTM (Long Short Term Memory) for Sentiment Analysis
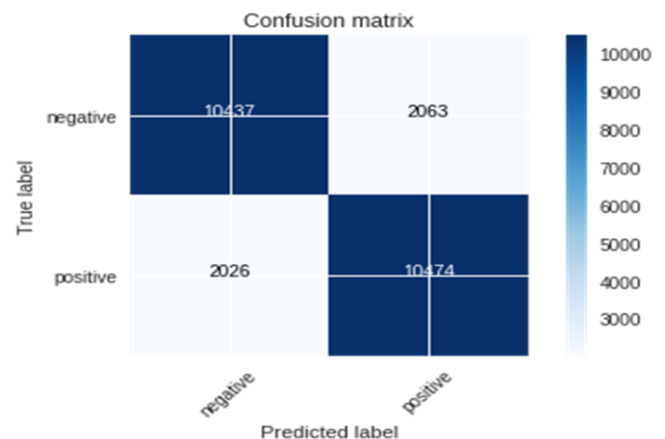

5.1 : Lstm cell structure

$$SigmoidActivation = \sigma(x) = \frac{1}{1+e^{-x}}$$

$$Prediction = \hat{y} = \sigma\left(\sum_{i}^{n} w_i * x_i\right) + bE(y, \hat{y})$$

$$= -y * log(\hat{y}) - (1 - y) * log(1 - \hat{y})$$

VII.   RESULTS AND DISCUSSION

The CNN trained for emotion analysis gave an accuracy of 62% on testing data set when trained on 100 epochs and a batch size of 64 and learning rate of 0.002 with the adam optimizer. The Sentiment Analysis using RNN provided an test accuracy of 86.64% when trained on 16 epochs and a batch size of 128.

7.1 Confustion matrix for sentiment analysis

VIII.   CONCLUSION AND FUTURE SCOPE

Using Deep learning and neural networks we can induce a intelligenece in a system which can take interviews a 3d model can further be utilized for making the process more geniune .The framework could further extend its functionality for actually be utilized in hiring of candidates and streamline the process. We can also use VR for real interview experience.We have this would help candidates to improve their skills and get them their dream jobs.

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