

A Deep Learning based Self-Assessment Tool for Personality Traits and Interview Preparations

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Abstract—Many people face difficulty in analysing their own personality and to see whether they fit a particular job profile. Analysing our personality is very crucial, especially as a part of preparing for various types of interviews, as our responses reflects how we think and act, thus imprinting our first impression on the panelists. Studying personality traits has been proved to be an emerging stream using Machine Learning and Artificial Intelligence. Our idea is to create a platform to identify the personality traits of an individual and provide aid in suggesting changes, if required, in these traits. Our aim is to provide a helping hand for analysing how a person performs in various types of interviews like Video interview, Personal Interview, Group Discussions, etc. to ensure high-gear performance in final interviews. In our approach, we have used the Natural Language Processing (NLP) algorithm to analyse user's input in Group Discussion module, so as to provide additional context to the user. Sentiment Analysis of user's responses in Scenario Based Questions module results in how affirmative or negative the user's response is with respect to the expected solutions. For Video and Telephonic Interview modules, we have used MobileNet architecture and CNN algorithm to predict user's confidence level based on his/her facial expressions and voice modulation

Index Terms—behavioral analysis, machine learning classifiers, sentiment analysis, natural language processing, audio analysis, video analysis

I. INTRODUCTION

People face difficulty in analysing their own personality and to see whether they fit a particular job profile. There are not many who can help these people in recognising their traits and revamp their characteristics. Faced with myriad suggestions on personality development, people often tend to be clueless about their own persona. Analysis of our personality before appearing for interviews is very important, as our answers reflect how we opt to think. Also, answering in a way that it highlights our qualities which are perfect for the profile offered is always a plus point.

People with great technical knowledge sometimes fail in behavioural interview rounds because they do not know what

answer is expected by the interviewer. The main aim of behavioural interview is to know the emotional capacity of a person along with determining the mental fitness quotient of the candidate. Thus, it is essential to know about which profiles can one's personality suit in best beforehand.

For analysing one's personality traits from their responses, we need to process their content with the help of NLP algorithms and Sentiment Analysis algorithms[2]. These help us find how we tend to react in a particular situation and depending on this, we can determine in which profiles/domains can such attitude and approach be best used in.

Profiles which encourage client interactions require people who can put their thoughts firmly and confidently in front of people, with polite and mild facial expressions. For analysing the firmness and confidence in the candidate's voice, we have used Convolution Neural Network to classify our two dataset, containing audio notes of both genders- male and female. These 2000 audio files are then classified into 8 emotions- neutral, happy, sad, surprised, disgust, angry fearful and calm, depending on which, we get our desired output.

Expressions play an important role in the times of interaction with clients. They represent your surety for what you say, and your willingness to listen to others. We have used TensorFlow and OpenCV for image analysis[1]. Multiple snapshots of our video feed as input to our twice-trained model, whose collective single output represent the confidence level of the entire video input.

In this paper, analysis of user's personality traits, depending on his responses in each of various interview modules is done. The four interview modules considered here are- Group Discussion, Scenario Based Questions, Video and Audio Interview. The outputs of each of these modules will help suggest profiles to the user which would be the best fit for his/her qualities and personality.

II. LITERATURE SURVEY

Facial landmarks can be used to recognise facial expressions. In this approach, the author has made use of a feature vector to identify various facial landmarks and also normalise them to remove size variations. Similar vector is used to calculate neutral pose and the difference in these two vectors can be then used to recognize the emotions with the help of random forest classifier[3].

Sentiment Analysis depends completely upon emotion dictionary. However, depth models can map data with affective semantics even by using complex mapping functions. A CNN-SVM model can well serve this purpose. The input vector is fed to CNN which acts as an automatic learner, and SVM acts as the final classifier. An interesting approach of converting words into symbolic vectors using word2vec has been used by the author. This vector acts as the actual input to the CNN-SVM depth model[5]. For combining sentiment analysis with data visualization, in 2018, sentiment analysis using data mining to analyse reviews on mobile phones was proposed. In this paper, the collected data is processed and then depending on the frequency of each extracted word, its size in the wordcloud is determined. Thus by using 'syuzhet' packet in R, words are categorised into different emotions, based on which a graph displaying number of positive and negative reviews is given as output[2].

In 2019, a TensorFlow based personality recognition engine was proposed which used asynchronous videos as inputs to find the personality traits of the interviewee. The deep learning model was a CNN model, which recognised nonverbal clues along with their attributes. This AI- based interview application had an accuracy of about 90.9% to 97.4% . The model took into consideration a large number of video frames. A feature extraction mechanism was passed over each frame using OpenCV. The classifier used here was a Convolution Neural Network, which classified each image with its results with an accuracy of more than 90%[1].

III. METHODOLOGY

The three following modules of Group Discussions, Scenario Based Interviews and Video Interviews are integrated together to form a system used for self assessment of personality traits. This system can be useful in preparing soft skills for interview preparations

A. Group Discussion

In this module, the user will select one topic from the given list. Each topic has some points, which are scraped from a webpage along with their description. These points are stored in a list with their description. A universal library contains all synonyms of all scraped words. When user gives his points on a particular topic, our python code analyzes the input, perform lemmatization on it, tokenize it and store it in a different list as shown in Fig 1. This list is then compared to the topic list and dictionary. The words associated to that particular topic, along with their meaning are looked upon in the universal dictionary. If present, we continue the loop. Finally, in the end, all the

scraped words which haven't been covered by the user are given out as suggestions to the user along with the description of each point. Thus, providing the user insights on additional talk points during the group discussions.

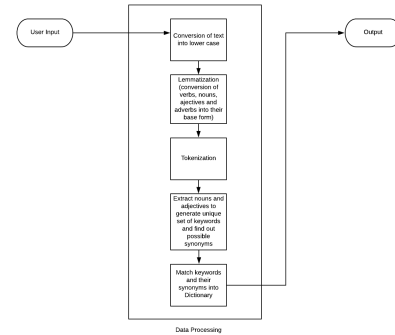


Fig. 1. User- Input and Synonym matching

B. Scenario Based Interview

In Scenario Based Interview, we have 8 predefined genres of questions like-

- 1) Work Ethics
- 2) Dependability
- 3) Team Spirit
- 4) Dedication and Time Management
- 5) Customer Relations
- 6) Problem Solving Skills
- 7) Work Under Pressure
- 8) Positive Attitude

A few example questions may be like:

- 1) Tell me about a time you had to collaborate with a coworker who was difficult to work with.
- 2) Describe a situation where you weren't satisfied with your job. What could have made it better?
- 3) Tell me about a time you had to work with an important customer or a difficult manager.

The user input will be analysed on the basis of the polarity of user responses. For training the model for calculating polarity of words, we have used 2 datasets- Twitter tweets and Hotel reviews. Using the NLTK library-SentimentIntensityAnalyser, depending on the words the user uses, the polarity of the sentence will be calculated as shown in Fig 2, according to which the results of his personality traits would be given as output [6,7].

C. Video Interview

We have calculated the confidence level of the user by using facial expression recognition principles[3]. We have used Tensorflow and OpenCV in our paper for the same. Our video analysis process can be divided into 3 parts:

- 1) Loading the XML file to detect face : For detecting faces, we have used the Frontal Face Alt classifier. This classifier contains our labelling python code.

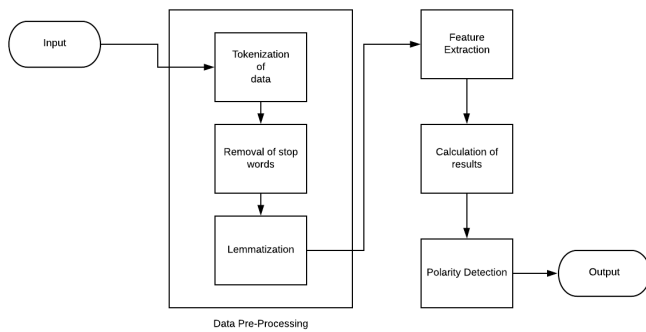


Fig. 2. Polarity calculation of input data

- 2) TensorFlow Image Classifier- Retrain the network : Here, we have created an image classifier which detects if a person is confident or not, and displays the result on the OpenCV window. We create 2 sub-dictionaries here- one of confident face images, and other of not confident face images. After cleaning these images, we have retrained it using the Mobilenet Model, one of the fastest and accurate models for image analysis.
- 3) Calculating and labeling images with the percent of confidence: Finally, after retraining the data, when we give our video as an input, several snapshots of the video are taken which are fed to our trained model. These snapshots which act as an input for our model then collectively determine the confidence level percentage of the entire video film.

For audio analysis, we have used 2 datasets to train our model-RAVDESS and SAVEE, each containing 1000 to 1500 audio notes of different actors and actresses with 8 emotions: neutral, calm, happy, sad, angry, fearful, disgust and surprise[4]. For feature extraction purpose, we have used the LibROSA python library for audio analysis[8]. Each audio note has been timed for 3 secs for getting the same number of features from each audio. This being a classification problem, we have used Convolution Neural Network, which gives highest accuracy in this case (around 70 percent)[5]. The user recorded file is fed as input audio file to the model, which then predicts the gender in the audio file with 100 percent accuracy and emotion with around 70 percent accuracy as shown in Fig 3. If used more training data, this accuracy measure could be increased.

IV. RESULTS

In Group Discussion module, we analyse the user's points for each topic and provide additional content/points which are not covered by the user for those topics. Scenario Based Questions module output displays the level of positivity and negativity in user's answers in various genres of questions and their respective output (genre wise). Percentage of confidence level after facial expression recognition is given as output of the third module, which is the Video Interviews. Gender and Confidence level in voice is determined by examining the

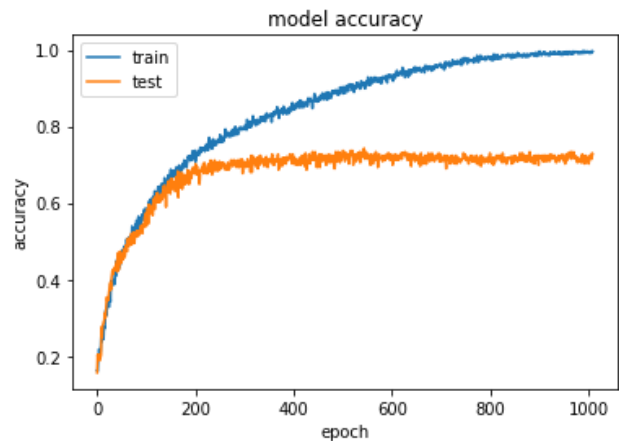


Fig. 3. Tuning model: accuracy of 70 percent

user's voice modulation in Telephonic Interview module. Finally, after combining the results of each of the four modules, we determine which profile would suit the user's personality more and suggestions are given accordingly.

V. CONCLUSION AND FUTURE WORK

Inspecting our own personality traits can help us identify which fields we can flourish more, where our attitude and personality can prove to be a valuable asset. In future work, predicting companies along with the profiles, which would be best suited to the user's personality and qualities can be done. This would help the user focus and specialize more on specifics. More specifications related to the profile like working hours, company wise-pay, etc can be predicted in order to provide a complete package of interview preparation.

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