

# AI Based Scrutiny Bot for E-interview Using Natural Language Processing and Emotion Recognition

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**Abstract:** The introduction of artificial intelligence has reshaped job application and selection practices. The use of the internet in the organization has efficiently revolutionized the way of recruitment in an efficient manner. We aim to optimize the recruiting process with AI. One-way interviewing is now a standard method for screening in the first round providing an efficient, fair, and structured method for conducting interviews. E-interviews can be carried out in a personal location such as a home anytime. When it comes to hiring, it does not cut jobs but accelerates the process by removing manual tasks and make recruiters far more productive. The field of computer science AI can be used to quickly fill positions but with the right person. The bot can automate the process of hiring from screening to interview scheduling. This can benefit the company with cost-reduction, time-efficiency, accuracy and consistency during the recruitment. The system is smart enough to capture facial expression, speech using speech recognition and convert it to text. HR departments can save their time by analyzing the skills, experience, and knowledge of candidates by using algorithms and generate results in less duration of time.

**Index Terms - artificial intelligence, e-interview, bot, speech recognition.**

## I. INTRODUCTION

In today's world, technological advancements do have some real-life effects which have to vary and made the recruitment process much simple and easy. One-way interviews also known as the asynchronous interview, or digital interview that enables us to conduct online video interviews in an automated manner. The interviews are conducted via websites using the internet. It provides a structured method fair enough for conducting online interviews and is now the standard method for screening the candidates. These kinds of interviews are preferred by the new generation as it saves cost, time, and is convenient for both candidates and recruiters to find the correct person from a large number of applications. By using AI in the field of recruiting makes interviews useful for understanding their activities, perspectives, motives, and, experiences. E-interviews have lots of benefits as the whole process can be automatically divided into several steps. It is useful for interviewing individuals who are physically mobile or socially isolated. E-interviews can be carried out in a personal location such as a home. Researchers and participants can be comfortable and still maintain their personal space and if necessary, keep their specific whereabouts private. It allows decision-makers to access more detailed information and it reduces operational cost. The company has to choose the correct person from a large number of candidates. This modern recruiting software allows a company to know his or her skills for a particular position. Interviewing a lot of candidates at the same time is time-consuming. This is becoming a problem for HR departments. AI-based software can help to speed up the process. There is always a risk of poor hires and wasted interviews operational money. This method can improve the process and generate more accurate results that will also decrease the overall cost. Since the internet has been applied in an organization, it has efficiently transformed the technique of recruitment. By using Artificial Intelligence, Natural language Processing, Speech Recognition we can expedite the process of recruitment.

## II. LITERATURE REVIEW

**Van Esch, Patrick, J. Stewart Black, and Joseph Ferolie [1]** this work tells a system based on AI for recruitment. The organization must consider candidate pre-use technology perceptions when implementing e-recruitment strategies. Here, the technology used is the latest one. The organization use AI for the recruitment process. It helps to develop a positive mindset of potential candidates for the organization for job likelihood as well as AI.

**Akash Balachandar and Anusha D Kulkarni [2]** in this paper authors developed a recruitment system that helps in the selection of the right candidate with the help of a chatbot. The chatbot helps in easy recruitment of the right candidates as it automates time-consuming tasks. Internally it works to maximize the probability of the correct next state using the generative model. The common challenge faced while conducting the recruitment process was a large amount of resumes but manually filtering those resumes from Application Tracking Systems (ATS) and mapping them to job opening was a difficult task for recruiters [2]. Extraction of good candidates from a pool of applicants and engaging them to appropriate positions is important. Technology can play an important role in making the life of a recruiter easy with Artificial Intelligence and different Machine Learning algorithms.

**Saravanan, Akash, Gurudutt Perichetla, and Dr KS Gayathri [3]** the authors have performed recognition of facial expressions by classifying the images of human faces into one of seven basic emotions. This process is done with the help of the Convolutional Neural Network (CNN) model. Six convolutional layers were used with two max pooling layers and two fully connected layers. And at the final, this model achieved a final accuracy of 0.60. In the case of image recognition and classification, convolution is very effective as compared to a feed-forward network. Convolution allows reducing the number of parameters in a network accordingly and hence takes the advantage of spatial locality. One of the biggest advantages is mainly the use of many layers which

helps in the prevention of memorization. Also, these multi-layer networks learn features at the level of abstraction and hence it can be generalized very well. There is a high level of accuracy present for real-time purposes.

**Umer Iftikhar and Dr. Tim Morris [4]** the authors developed an emotion-based system that helps the person to listen to music depending on the mood. This system extracts the features of a person and hence classifies the emotions of a person. PCA technique is used for pattern recognition. And hence the testing is done using different techniques. The advantages of the system are music played as per the person's emotions. It determines the mood of the person. These emotions can be used for entertainment, security and, Human Machine Interface (HMI). The biggest limitation is that the camera should capture full frontal image and accuracy rates are extremely low.

### III. DATASET

We use dataset fer2013 taken from the Kaggle website, which comprises 37K different image pixels containing 29K training images, 4K testing images, and 4K validation images. The image pixels are structured in 48 x 48 pixel gray-scale images of faces. In each face the same amount of space is occupied by each image and processed images are aligned centered. It is used for the prediction of facial emotions and contains pixels for 6 different emotions. The digit between 0 to 6 represents emotions mapped to integers. To classify expression we used features extracted by convolutional neural network using pixel data. We build the CNN model in Keras trained using fer2013 dataset.

Integers	Emotions
0	Angry
1	Disgust
2	Fear
3	Happy
4	Sad
5	Surprise
6	Neutral

Table 3.1 Integers mapped with emotions.

### IV. HARDWARE REQUIREMENTS:

**4.1 Webcam:** The webcam captures live screenshots of the candidates during the interview. The images are stored in the database and further processed using OpenCV for classification of the emotions. Webcam used here is normal PC webcam having the minimum quality of 4-5 megapixels. To attain more accuracy webcam should be used.

**4.2 Microphone:** The microphone is used to capture the audio processed using speech recognition. The Speech Recognition library converts speech to text. The answers have been stored in textual in the database. The microphone used here can also be a normal microphone as provided in earphones with 3.5 mm jack.

### V. SYSTEM ARCHITECTURE

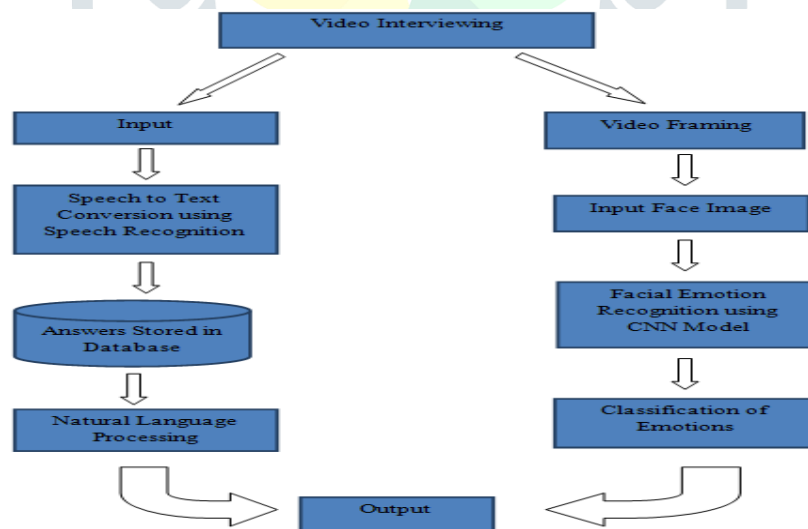


Figure 5.1. Architecture Design.

The interview questions are displayed in text format on the right side and a small window on the left side shows the live video of the candidate giving interview captured by a camera. The candidate answers the questions using webcam and microphone. The voice input has been converted to text form with speech recognition library in python. Natural language processing is used on the text for checking whether the answers are relevant. The screenshots of candidates are captured for understanding facial expressions which will show how they react. The trained CNN model trained in Keras using dataset fer2013 predicts the facial expression from an input face. After combining all the results system generates output.

There are 2 modules in the system:

- Candidate Module:** The candidate uploads all details including a resume. The search window used for searching job posts on the basis of location, company and can apply for opening positions. The candidate fulfilling the criteria mentioned by the company is shortlisted and receives a call for an interview. The candidates can schedule an interview at any time between specified dates mentioned by companies.

- b) **Company Module:** Registered Companies post job vacancies. The call for an interview is sent to shortlisted candidates by company. The company can view information of the shortlisted candidates. The company stores the questions and answers in the database for an interview according to their requirements based on which analysis done. The results are generated at the end.

**VI. IMPLEMENTATION**

**6.1 Emotions Detection**

Face detection has the ability to detect face from any frame or input image. The output of the detected face is shown in the bounded box with facial coordinates. Facial recognition identifies the faces belonging to different persons face. Facial recognition is done in Python using OpenCv library. We use Face Recognition library from python for accurately detecting the faces. Using the dataset fer2013 from Kaggle we build the CNN model in Keras to detect emotions [17]. The emotions can be detected and classified as happy, sad, fear, neutral, surprise, disgust, or angry. CNN has different layers that easily transform the input volume into an output volume.



Figure 6.1 Different facial expressions [13].

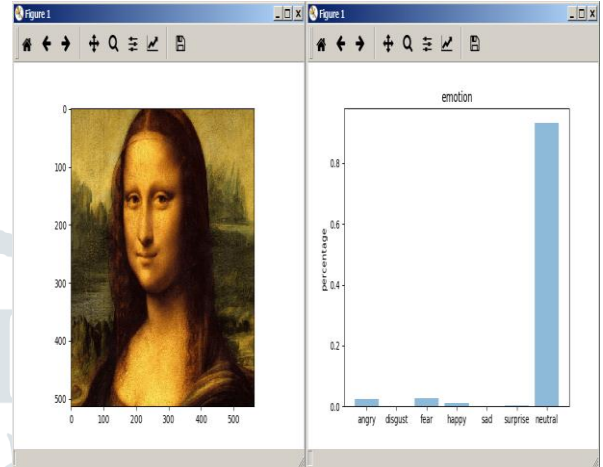


Figure 6.2 Facial emotions Prediction [12].

**6.2 Text Preprocessing**

The Natural Language Toolkit (NLTK) is used for preprocessing the textual form. Tokenization is performed separately on every answer converted into text form with the help of NLTK. Some specific keywords of answers for every question which should be present in the answers are stored in the database to check whether candidates give relevant answers or not. Depending on the no of keywords from answer matched with keywords stored in database count is generated for every answer. These counts are combined at the end and the final count is generated. Grammar check is performed using NLTK library in python. Sentiment analyses uses Textblob for interpreting and classifying emotions into positive, negative, and neutral from the answers stored in text format with NLTK. It tells how candidates react while answering. The two properties of Textblob polarity and subjectivity understand the various factors. The subjectivity refers to opinion, emotion, or judgment. The positive or negative sentiments are referred to as polarity.

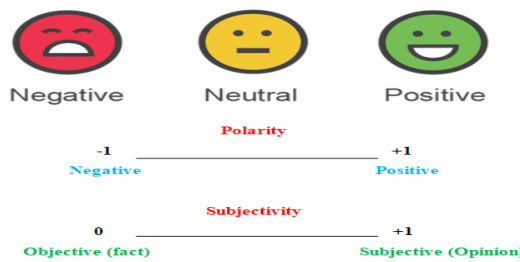


Figure 6.2 Sentiment analysis using Textblob.

**VII. RESULTS**

The evaluation is done by combining all the results produced to generate final score of the candidates. The questions are stored in MCQ as well as descriptive form. The MCQ answers helps in reducing the storage size by saving the answers in options. We have generated separate pie charts for NLP, Sentiment Analysis, Grammar Check, Facial Emotions and final marks evaluation is done by combining all the results and marks evaluation of candidates are obtained in pie chart.

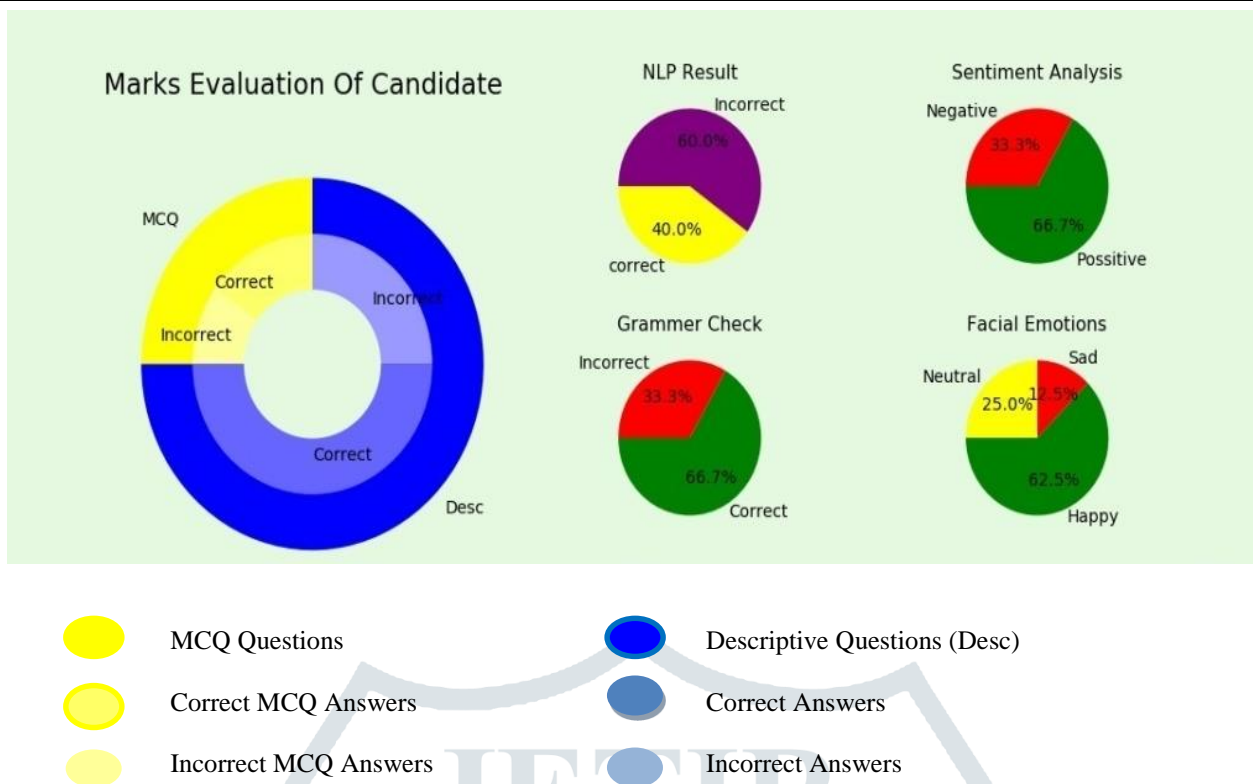


Figure 7.1 Marks evaluation of candidate generated by system.

## VIII. CONCLUSION & LIMITATIONS

We developed a recruitment bot for hiring better candidates. Their performance is evaluated using different techniques. Natural language processing, sentiment analysis, and facial expression analyses their response and perform classification. HR can compare the skills of different candidates for better decision making. The system is flexible enough to allow candidates to give interview anytime and recruiter can view their results anytime. The model trained using dataset fer2013 generates precise results. The model has the ability to make real-life predictions. The system can be used for screening to reduce the tedious task of HR.

Some limitations of the system are that it requires a proper internet connection, camera, and microphones for functioning. Speech recognition is unable to record accurate answers in a noisy place. The camera needs proper light for capturing screenshots of faces.

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