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# Virtual Recruitment System using Machine Learning and Artificial Intelligence

Ankita Kumari<sup>1</sup>, Nirankar Nath Singh<sup>2</sup>, Siddhi Rani<sup>3</sup>, M.A.R.Shabad<sup>4</sup>

U.G. Student, Department of Computer Engineering, Sinhgad Academy of Engineering, Kondhwa, Pune, India<sup>1</sup>

U.G. Student, Department of Computer Engineering, Sinhgad Academy of Engineering, Kondhwa, Pune, India<sup>2</sup>

U.G. Student, Department of Computer Engineering, Sinhgad Academy of Engineering, Kondhwa, Pune, India<sup>3</sup>

Professor, Department of Computer Engineering, Sinhgad Academy of Engineering, Kondhwa, Pune, India<sup>4</sup>

**ABSTRACT:** Artificial Intelligence can make recruiting process faster by automation, efficiently handling assessments, processing resumes, analyzing candidate's personality and making unbiased decisions. Machine learning algorithms, AI and data analytics can be used for screening, assessing and recruiting. Computer vision can be leveraged in virtual recruitment, which include face detection and recognition. Face Recognition begins with extracting the coordinates of features such as width of mouth, width of eyes, pupil, and compare the result with the measurements stored in the database and authenticate (facial metrics). This can be further processed for desired output, like for proctoring assessments and determining personality of candidates by processing images and videos captured using Image processing algorithms. Speech recognition i.e., text to speech and speech to text APIs have enabled recruiters for better proctoring and interacting with candidates.

**KEYWORDS:** Face detection, Face recognition, Facial Expressions Analysis, Cascade Classifier, Fuzzy logic, CV Analysis

## I. INTRODUCTION

To create a virtual recruitment system using artificial intelligence which will help automate some parts of high volume tasks of recruiting workflow like screening, assessments, personality analysis etc, and help selecting potential candidates, and can help save recruiter's time. With an emphasis on virtual engagement, the online remote exam, also conducted by AI assistance, prevents cheating and recognizes the candidate's identity, without their physical presence. This can be done by using facial recognition technology. The adoption of artificial intelligence has also benefited in video interviews and discussions. It offers objective insights into the soft skills of the candidates like their creative and critical thinking capabilities. Both I/O psychology and computer science scholars have suggested that artificial intelligence (AI) may surpass humans in recognizing or predicting an applicant's personality for screening job applicants because applying AI techniques to audio-visual datasets can achieve more reliable and predictive power than human raters. "AI is a branch of computer science that seeks to produce intelligent machines that responds in a manner similar to human intelligence", and it aims to extend and augment human capacity and efficiency of mankind in tasks of remaking nature. In this project, we are planning to have company wise selection criteria, eligibility and test designs. For now, it has been planned from the perspective of helping students to have a deep insight and practice of the recruitment process of various companies and for various job profiles. This can be scaled up in future for organization's use.

## II. RELATED WORK

Object Detection is a computer technology related to computer vision, image processing and deep learning that deals with detecting instances of objects in images and videos. We will do object detection for detecting the face here, using something known as Haar Cascades. Haar Cascade classifiers are an effective way for object detection. This method was proposed by Paul Viola and Michael Jones in their paper. Haar Cascade is a machine learning-based approach where a lot of positive and negative images are used to train the classifier. Positive images are images that contain the images which we want our classifier to identify. Images of everything else, which do not contain the object we want to detect, are negative images. We will use Cascade Classifiers to and Python Imaging Libraries for face comparisons and recognition. After authentication, the assessment part comes, where proctoring is done, video is captured, which further

gets processed. Then comes the AI interview, where there is speech to text and text to speech conversion and the interview is conducted by pyttsx3 engine, and the responses are processed using Fuzzy Logic, to find the best match for answers. Fuzzy Logic is based on degree of correctness by evaluating membership values, rather than crisp logic, which has only two results, true and false. It has multiple logic values between 0 and 1.

### III. METHODOLOGY

#### STEP -1: REGISTRATION PROCESS

OpenCV is a python library for image and video processing. It bestows various functions for image and video capturing and manipulating. We capture the image of candidate using VideoCapture() method of cv2, set an infinite loop and use read() function to read image frames using cv2 instance.

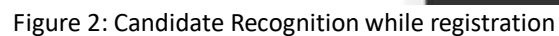
- The facial image is captured(object detection technique) from the frame using HaarCascade Classifiers, training it with face detection xml file. The image is stored in the database.
- Python Imaging Library is free open source library for opening , saving and manipulating many different image file formats. During login, user's image is retrieved from database, it is converted into numpy array, some operations are performed on the image to detect and save face locations, face landmarks(eyes, nose, etc), and face encodings(128 dimension face encoding of face).
- The known face encodings will read and compared with the image captured during login. After authentication, the candidate is directed to Aptitude Test page.

#### STEP-2: APTITUDE TEST

- Question Sets has been generated and stored by admin, which will be retrieved randomly from the database.
- The candidate is given a choice to select the exam to appear.
- The questions are displayed , and the camera is on to capture candidate's expression during the assessment, which will be further processed in the backend.
- If the competence criteria is met, the candidate is directed to AI Interview process.

#### STEP-3:AI- BASED INTERVIEW

- Pyttsx3 is a text to speech conversion library in python , it is invoked by pyttsx3.init() to get a reference to a pyttsx3. A connection is made to the database and questions are retrieved, which are recited by pyttsx3 engine.
- The response of candidate will be recorded by using Recognizer class of Speech recognition library of python, which converts the speech to text and stores it.
- To analyse the response given by the candidate and compute the accuracy, Fuzzy logic is used. FuzzyWuzzy library of python uses fuzzy extractors to extract keys, perform string matching and determine the correctness of the response, we can set a correctness criteria
- To analyse the expressions of candidates, Keras pre-trained CNN model is used. The model is loaded in hdf5 format, facial expressions are detected, offsets are applied and emotions are detected. Here, for face detection, haarcascade\_frontalface\_default xml file is used.
- Graph of candidate's emotion is generated using Matplotlib and using statistic module of python, the overall result(mode) is found.
- The expressions and interview result will be generated, and result will be displayed.

Figure 1: Aptitude Questions



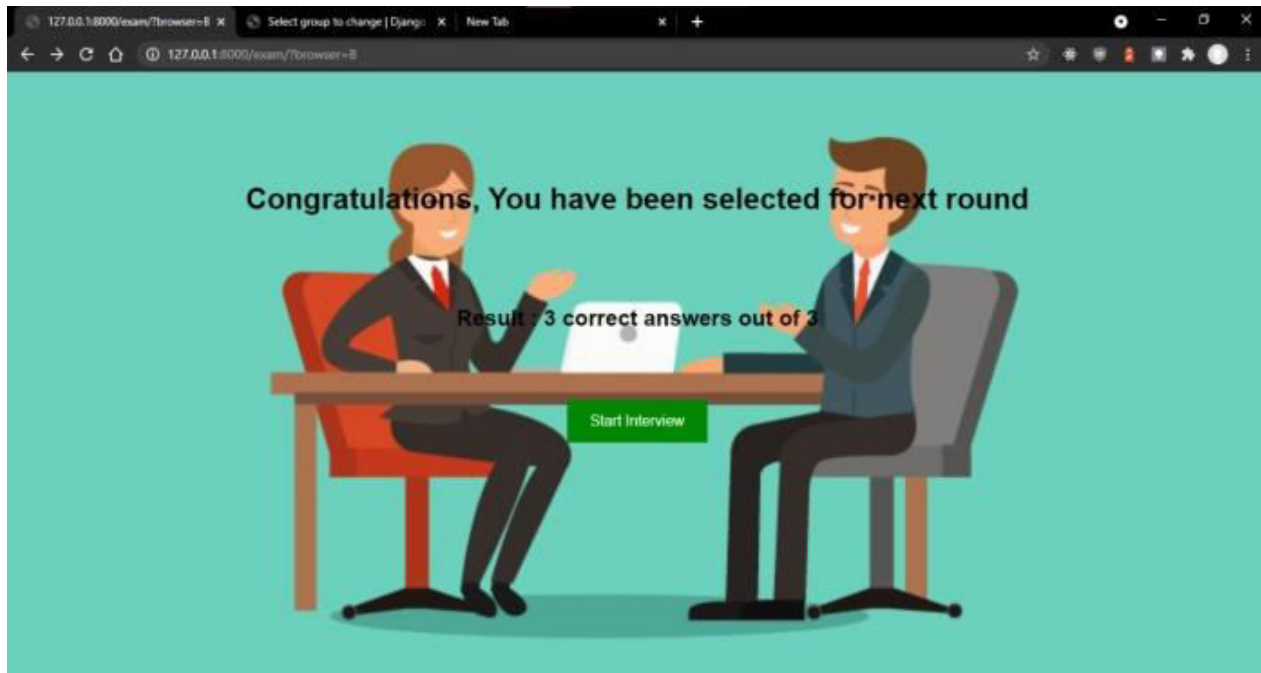


Figure 3: Interview Procedure

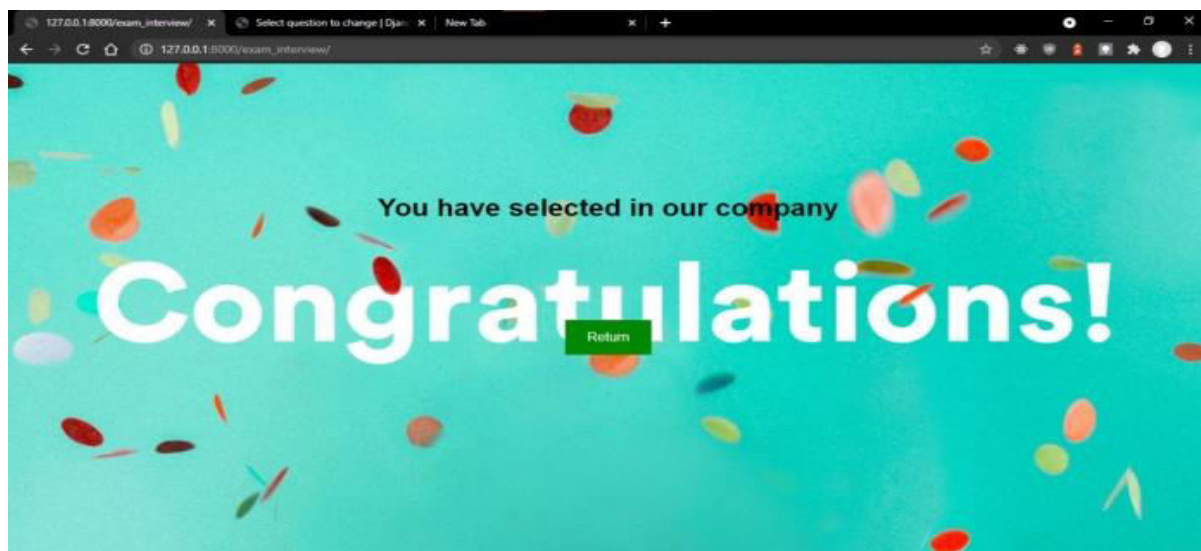


Figure 4: Final Output After Interview

## V. CONCLUSION

We have implemented the Virtual Recruitment System using face detection, face recognition and expressions analysis using Haar Cascade Classifier, and we found out that it is successfully allowing only authenticated users to appear for the assessment. We are also analysing the personality of the candidate by processing the facial expressions of the candidate during Assessment and AI interview using Keras CNN model. We allowed various users to use the system developed by us and it worked successfully. We are also using Fuzzy Logic to process the response given by the candidate during interview and extract the required answer and give the feedback.



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