

Automation of HR Interview using Deep Learning and NLP

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Abstract: *The face of HR nowadays is frequently a portal rather than a specific individual. Nowadays, almost all businesses make HR services available to everyone online and through technology. Apps, which have significantly altered the way human resource management is done. These changes frequently emerge from the need to reduce expenses while increasing or improving services. Recent study demonstrates that organizations that successfully embrace sophisticated HR technology tools perform better than those that do not. Simple HR process automation no longer ensures a competitive advantage because organizations have already automated basic HR administration. Instead, businesses must figure out how to use technology to update their HR procedures and promote their HR brand.*

Keywords: HR Interview

I. INTRODUCTION

The process of hiring and employee development to raise the value of human capital within the company is referred to as human resources management. The following processes are generally included in human resource management: analysis of the labour market, planning for personnel needs, hiring needed personnel, training needed personnel, management of salaries, benefits, and incentives, evaluation of effectiveness, resolution of conflicts, and communication with all staff members at all levels. The impact of human resource management on the organization's tangible and intangible assets is one reason why effective systems of human resource management must be developed.

- Providing leadership and enhancing competitiveness through the introduction of modern methods of human resource management.
- Lack of formal management techniques.
- Low efficiency of application of benchmarking as a result of lack of attention to adaption.
- Methods and models under existing corporate standards.

II. LITERATUE SURVEY

[1]. An Automated System for the Assessment of Interview Performance through Audio and Emotion Cues

Author: K. Priya, S. Mohamed Mansoor Roomi, P. Shanmugavadivu, and P. Kalaivani, Patrice Wira.

Year: 2019

It is a difficult and understudied problem to automatically analyze and rate interviewee performance. With the help of the analysis of multimodal signals like speech and facial images, the suggested work offers a computational structure to count the interviewee's performance in the context of conversation and provide performance feedback. The interview's video was divided into audio and visual frames. The face is recognized from the visual frames, and using a histogram of oriented gradients, their emotions are deciphered. Support Vector Machine is used to categorize the facial expressions. Happy, scared, sad, neutral, surprised, disgusted, and angry are the facial expressions that can be categorized. The Mel Frequency Cepstral Coefficient characteristics are retrieved from the auditory cues and are divided into three categories: fluent, non-fluent-pause, and non-fluent-stammer. The candidate's fluency and emotion are combined to determine the candidate's performance score. According to this automatic analysis, interview performance is rated as bad, average, or high.

SVM and the Histogram of Oriented Gradients Advantages: This automated analysis offers ratings for interview performance, including bad, medium, and high.

Inaccuracy of less than 70% is a drawback.

[2]. Feature Selection for Job Matching Application using Profile Matching Model

Author: Leah G. Rodriguez and Enrico P. Chavez,

Year: 2019

Abstract: Technology development has significantly accelerated the hiring process in today's workforce. Companies now use tools that aid in recruiting talent as additional tools are developed. A job matching application system is being developed for a job recruitment agency in the Philippine province of Pangasinan specifically as part of this ongoing research project. This essay suggests a method for the hiring manager to use to extract pertinent data from resumes and evaluate it in light of certain criteria. The proposed system is instructed to adopt a clustering technique after the attributes have been identified in order to compare the job seekers' profiles to the specifications of the positions that potential employers have posted. This enables the agency to identify qualified applicants for a specific job in many organizations and to make better judgements.

Cosine Similarity is the methodology.

Advantages: It seeks to pinpoint the key characteristics required for the suggested job matching system's profile matching model.

Disadvantages: The HR interview procedure is not computerized

[3]. TensorFlow Based Automatic Personality Recognition Used in Asynchronous Video Interviews

Author: Hung-Yue-Suen, Kuo -En-Hung and Chien-Liang Lin,

Year: 2019

Abstract: The automated analysis of the video interviews to identify certain personality traits has boomed as an active research subject with applications in the personality computing, human and computer interaction, psychological testing thanks to the advent of artificial intelligence (AI). Convolutional neural network models have been created as a result of developments in computer vision and pattern recognition based on deep learning (DL) techniques. These models accurately identify nonverbal cues given by people and attribute personality qualities to them by using a camera. In this paper, an end-to-end AI interviewing system was created using asynchronous video interview (AVI) processing and a Tensor Flow AI engine is used to perform Automatic Personality Recognition which is based on the features extracted from the AVIs and the true personality scores from the self-reported questionnaires and the facial expressions of 120 real job applicants. The testing findings demonstrate that our AI-based interview agent can accurately identify the "big five" characteristics of an interviewee with a recognition rate ranging from 90.9% to 97.4%. Our study also shows that, despite the lack of extensive manual annotation and labelling, the semi-supervised deep learning strategy fared unexpectedly well in terms of APR, despite the lack of large-scale data. The AI-based interview agent can be used in addition to or in instead of the current self-reported personality evaluation techniques that job candidates may manipulate to produce socially acceptable results.

Methodology: CNN and semi-supervised DL techniques

Advantages: This strategy had a 90% accuracy rate.

Disadvantages: It requires additional training time.

[4]. Natural Language Processing based The Interviewing Chatbot

Author: Jitendra Purohit, Aditya Bagwe and Rishabh Mehta

Year: 2019

Abstract: Recently, recruiters have discovered that it is taxing to inform all of their prospects about the interview procedure, which makes conducting interviews difficult. Additionally, when there are several applicants, engaging with them and performing other screening tasks adds to the recruitment issues already there. When it comes to attending the mass interviews, candidates often have common problems, which the proposed solution, JARO, addresses. Unpredictability in the questions, different days and times of the day, the interviewer's mood, the location of the

interview, and the list goes on are a few of the difficulties encountered. As a result, JARO proposes a chatbot that would conduct interviews by analyzing the candidates Curriculum Vitae (CV), from which it would then create a set of questions to be asked to the candidate. This expedites the interview process towards an objective decision-making process. The technology will have functions like automated interviewing and resume analysis. In addition, the software would use a Natural Language Processing (NLP) model, which is particularly helpful in this process, to ask questions based on the candidate's prior responses. The software would examine the data gathered following the interview process to find the best candidate for the position being offered. Thus, the major goal of the JARO chatbot project is to speed up the hiring process.

Methodology: NLP

Advantages: The software would ask questions based on previous responses of candidate based on NLP.

Disadvantages:

It works only for the text data.

[5].Simplified Recruitment Model using Text – Mining on Psychometric and Aptitude Tests

Author: Shreya Sawleshwarkar, Nisha Ranganani, Vijeta Mariwalla and Aparna Halbe,

Year: 2018

Abstract: Job recruitment is now a time-consuming procedure for the HR department in the current working environment. Additionally, as seen by the frequent job changes, employee unhappiness, and general inefficiency, the outcomes of the current recruitment procedure are frequently unsatisfactory. With the help of the suggested model, we hope to streamline and automate the procedure while also adding a focus on psychometric assessments. The personality, aptitude, and other traits of applicants can be mapped to the employment they are seeking for using psychometric exams. Text mining is done on the responses using a scoring system to create a shortlist for a certain position. If necessary, this model can be applied to many recruitment fields and positions.

Methodology: Text Mining

Advantages: Using text-mining through in a test-taking format for general as well as psychometric analysis is certain to improve these statistics for reasons mentioned previously.

Disadvantages:

It is not suitable for audio and video-based inputs.

It will work for only text data.

III. PROPOSED SYSTEM

The Automated HR interview system is a web application where the candidates will be able to login to the system to start the interview.

Thus, the entire methodology is divided into four main phases

- Speech Processing
- Facial expression recognition
- Text Classification
- Report Generation

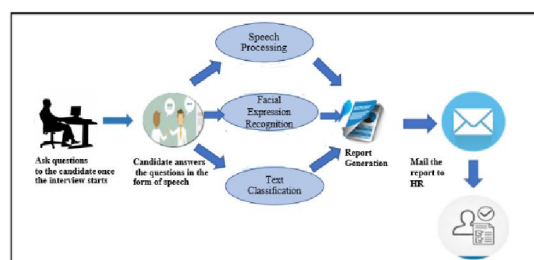


Fig.3.1 System Architecture

Describes the overall process of the project. We are passing candidate answers and facial emotions and speech details as input. System will automate the HR interview process using deep learning and generates interview score.

In this project we have split by following modules:

- Data Collection
- Model Training
- Emotion Prediction
- Interview Score Calculation

1. Data Collection:

In this module we are collecting face and audio emotion dataset from kaggle.com both dataset contains seven classes like Neutral, Happy, Angry, Sad, Surprised, Disgust, Fear classes of face images and audio.

Data collection is a crucial step in automating HR interviews using deep learning and NLP. Data Volume: Collecting a large volume of data is important to train deep learning models effectively. The more data you have, the more accurate your models are likely to be. It's recommended to collect at least several hundred transcripts of previous HR interviews.

Data Quality: The quality of the data you collect is also important. Ensure that the transcripts are clean and well-formatted, without any personally identifiable information. If the data is noisy or contains errors, it can negatively impact the accuracy of the models.

Data Labeling: To train the deep learning models, the data will need to be labeled with relevant tags or categories. For example, you may want to label transcripts with positive or negative sentiment, or with key topics discussed in the interview, such as education, work experience, and skills.

Data Privacy: Ensure that you follow best practices for data privacy and data protection. This includes obtaining consent from candidates to use their data and ensuring that any personally identifiable information is removed from the transcripts. Data Source: You may be able to collect data from your own organization's past HR interviews. Alternatively, you can use publicly available datasets or outsource the data collection to a third-party provider.

2. Model Training

In this module we have used CNN algorithm to train the model to train the collected dataset. In this module we extract the image features and audio features from the corresponding dataset and train the model using CNN.

Data Preprocessing

The data collected for training the models will need to be preprocessed. This includes cleaning and standardizing the text data, and converting it into a format that can be fed into the deep learning models. Embedding Layers: Embedding layers are used to convert the text data into a numerical representation that can be processed by the deep learning models.

These layers learn to represent each word or phrase as a dense vector, which captures the semantic meaning of the text. Model Evaluation: Once the models have been trained, they need to be evaluated to determine their performance. This can be done using metrics such as accuracy, precision, recall, and F1 score. It's important to evaluate the models on a separate validation dataset to ensure that they are not overfitting to the training data.

Model Deployment: Once the models have been trained and evaluated, they can be deployed in the automated HR interview system. The system will use the trained models to analyze the text data provided by the candidates and provide feedback on their performance.

3. Emotion Prediction

In this module we are predicting the candidate emotions from his voice and face using the CNN algorithm. Based on the detected emotion our system will assign the score for the candidate.

Data Annotation

To train deep learning models for emotion prediction, the data needs to be annotated with the relevant emotions expressed in the candidate responses. It's important to use a standardized set of emotions, such as happiness, sadness, anger, fear, and surprise.

Emotion Detection Models: CNNs, and transformers. These models can be trained on the annotated data to learn to predict the emotions expressed in the candidate responses. Feature Extraction: In addition to the text data, other features such as tone of voice, facial expressions, and body language can be used to predict emotions.

These features can be extracted using computer vision or audio processing techniques. Evaluation Metrics:

Once the emotion detection models have been trained, they need to be evaluated to determine their performance. This can be done using metrics such as accuracy, precision, recall, and F1 score. Emotion Feedback: The emotion predictions can be used to provide feedback to the candidate on their emotional expression during the interview. This feedback can help the candidate improve their emotional intelligence and communication skills.

4. Interview Score Calculation

Defining Evaluation Criteria: The first step is to define the evaluation criteria for the interview. This includes factors such as communication skills, technical knowledge, problem-solving ability, and cultural fit. Each criterion can be assigned a weight based on its importance. **Score Calculation:** The scores for each criterion can be calculated based on the analysis of the candidate responses using deep learning and NLP. For example, the communication skills score can be based on the candidate's fluency, grammar, and emotional expression. **Aggregation of Scores:** Once the scores for each criterion are calculated, they can be aggregated to provide an overall interview score. The weight assigned to each criterion can be used to adjust the contribution of each score to the overall score. **Feedback to Candidates:** The interview score can be used to provide feedback to the candidates on their performance during the interview. This feedback can include strengths and weaknesses and suggestions for improvement. **Continuous Improvement:** The interview score calculator can be continuously improved by analyzing the performance of the candidates and identifying areas for improvement in the evaluation criteria and the score calculation algorithm

IV. DESIGN

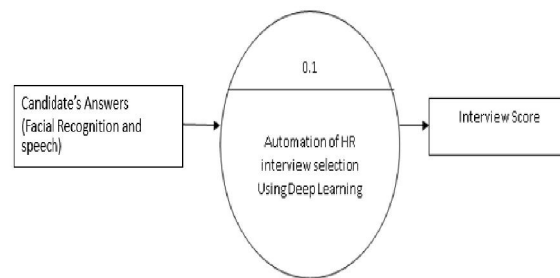


Fig 4.1 Data flow diagram of the overall design

The first step is to collect data from various sources such as resumes, job descriptions, and interview questions. This data is used to train the deep learning models for natural language processing. **Natural Language Processing:** The next step is to preprocess the data and apply NLP techniques such as word embeddings, named entity recognition, and sentiment analysis to extract relevant features from the candidate responses. **Emotion Detection:** Emotion detection models are trained to predict the emotions expressed in the candidate responses, using both textual and non-textual data such as tone of voice, facial expressions, and body language. **Interview Scoring:** The candidate responses are evaluated based on predefined evaluation criteria, and scores are assigned for each criterion. The scores are then aggregated to provide an overall interview score. **Feedback:** The system provides feedback to the candidates on their performance during the interview, including strengths and weaknesses and suggestions for improvement. **Continuous Improvement:** The system continuously learns from its performance and uses the feedback in order to improve the performance of all the deep learning models and also the evaluating criteria. **Deployment:** The final step is to deploy the system for use in real-world scenarios. This involves integrating the system with existing HR software and ensuring that it meets the performance and security requirements.

V. CONCLUSION

In conclusion, automation of HR interview using deep learning and natural language processing (NLP) has the potential to transform the hiring process, making it more accurate, efficient, and effective. By leveraging these advanced technologies, the system can extract relevant information from candidate responses, predict emotions, evaluate responses against predefined evaluation criteria, and provide feedback to candidates. Implementing an automated HR

interview system using deep learning and NLP requires careful planning, data collection, model training, and continuous improvement. However, the benefits are significant, including reduced hiring bias, improved candidate experience, and better identification of the best candidates for the job. The success of an automated HR interview system also depends on the ethical considerations surrounding its development and deployment. It is essential to ensure that the system is fair, transparent, and respects the privacy of candidates. Overall, an automation of HR interview system using deep learning and NLP has the potential to revolutionize the hiring process, making it faster, more accurate, and more efficient. By leveraging the power of these advanced technologies, organizations can identify the best candidates for the job and improve the overall hiring process.

Analysis of existing human resources software allowed people to select the outstanding tasks in the automation of human resource management in project-oriented organizations. The system and the guidelines for its implementation in the companies has also been developed. Good academic records and sound technical knowledge alone are not enough to guarantee a Job. The thought process, personality or behavior and the potential of the candidate needs to be considered. Thus, HR interview is conducted by every company to decide how much a candidate is mentally prepared, devoted and how good are his/her work ethics. Other skills such as soft skills, interpersonal skills, communication skills, emotional intelligence, social intelligence and social skills of the candidate are judged. Conducting a physical HR interview consumes a lot of resources, money and time. With the advancement in technology, an automated HR interview system can help in evaluating a candidate's overall personality. It can evaluate candidate's body language, facial expression and voice tonality during the interview. Thus, an efficient automated HR interview system can help in deciding the perfect candidate for the job

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