A Convolutional Neural Network Approach to Interview Simulation and Evaluation

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Abstract- *Artificial Intelligence (AI) is transforming a wide range of industries by enabling machines to perform tasks that traditionally required human intelligence, such as perception, decision-making, and natural interaction. In the context of recruitment, traditional interview methods often focus primarily on technical skills, neglecting important aspects like emotional intelligence and candidate confidence. This paper presents an AI-powered mock interview evaluator that offers a more holistic assessment by analyzing emotional expressions and confidence levels in real time. The system combines Convolutional Neural Networks (CNNs) for facial emotion recognition and Recurrent Neural Networks (RNNs) for analyzing speech and body language. Trained on a diverse dataset of mock interviews, the model can detect emotions such as happiness, sadness, anger, and surprise, while also estimating confidence through multimodal analysis.*

Keywords- Artificial Intelligence, Convolutional Neural Networks, Emotion Recognition, Interview Evaluation, Real-Time Analysis.

I. INTRODUCTION

Interview evaluation plays a vital role in sectors such as recruitment, academic assessments, and psychological analysis, as it helps determine a candidate's suitability based on various factors. Traditional interview methods rely heavily on subjective assessment of verbal responses and non-verbal cues like facial expressions and body language. However, such manual evaluations are often inconsistent, biased, and difficult to scale. Although some organizations use digital tools to assess communication skills, they often overlook emotional intelligence and confidence—two critical indicators of a candidate's potential.

This paper proposes an AI-powered Interview Evaluation System using Convolutional Neural Networks (CNNs) for real-time facial emotion detection. The system captures and analyses candidates' facial expressions during mock interviews to classify emotions such as happiness, anger, sadness, and surprise, and assess confidence levels. By integrating computer vision and deep learning, this contactless and automated system ensures objective, consistent, and efficient evaluation. It includes user-friendly interfaces for candidates and HR personnel, with data securely stored in an encrypted cloud database for result tracking and analysis.

The rest of this paper is organized as follows. Section II reviews existing facial emotion detection systems and their limitations. Section III describes the proposed system architecture and CNN-based emotion detection methodology. Section IV presents experimental results and system performance evaluation. Finally, Section V concludes the paper and suggests directions for future enhancements.

II. LITERATURE SURVEY

The literature survey is a critical step in the software development process, helping to understand existing technologies, identify gaps, and validate the feasibility of proposed systems. In the context of facial emotion recognition for interview evaluation, numerous studies have focused on deep learning techniques, particularly Convolutional Neural Networks (CNNs), for real-time facial analysis. This section reviews prominent related works that lay the foundation for the proposed system.

Emotion Classification Using DeepLearningbyChinmayi R et.al.[1] Sreeja Narahari, Aparna S. Nair, and Megha K. Jayakumar from the University of Michigan–Dearborn explore a dual-modal deep learning approach that combines Convolutional Neural Networks (CNNs) for facial image processing and Recurrent Neural Networks (RNNs) for speech-based emotion detection. The model classifies six emotions, including happiness, sadness, rage, and fear, using datasets such as FER2013 and Amrita Emote. By employing techniques like Mel-frequency Cepstral Coefficients (MFCC) for speech and advanced feature extraction methods, the model achieves high accuracy. This research aims to enhance human-computer interaction by building emotionally intelligent systems capable of detecting and responding to human emotions in real-time.

Real-Time Mock Interview Using Deep Learning byRohan Patil et.al.[2] and colleagues from DYPIEMR Akurdi, Pune, propose a system that simulates virtual interviews by leveraging CNNs for facial expression analysis and speech-to-text for evaluating grammar. The system provides real-time, graphical feedback on various aspects such as facial expressions, speaking patterns, and reaction times, enabling candidates to track progress over multiple mock interviews. By offering personalized feedback and improving confidence and communication skills, the system demonstrates how deep learning can be applied to interview preparation and performance enhancement.

Human Emotion Recognition Using Convolutional Neural Network in Real Time byRohit Patharet.al.[3], Abhishek Adivarekar, Arti Mishra, and Anushree Deshmukh from Mumbai University introduce a CNN-based model capable of classifying seven distinct emotions (anger, happiness, fear, sadness, surprise, disgust, and neutral) from facial images in real-time. Utilizing the FER2013 dataset, the model incorporates dropout regularization and Swish activation functions to enhance performance, achieving an accuracy of 89.98%. The system supports webcam integration for real-time multi-person emotion detection, showcasing its practical applicability in dynamic, live environments for human-computer interaction.

Human Emotion Analysis Using Convolutional Neural Network byPunit Prajapati et.al.[4], Sumil Jain, and Parmar Tarun from the Department of Computer Science in India propose a dual-channel CNN architecture for human emotion recognition. One channel processes the entire face, capturing global features, while the other focuses on localized facial features such as the eyes and mouth, which are crucial for detecting subtle emotional cues like surprise or fear. This fusion of global and local features significantly improves the model's accuracy and robustness, making it ideal for applications such as sentiment analysis, virtual assistants, and emotion-aware robotics.

Facial Emotion Detection Using Deep Learning by Akriti Jaiswal et.al.[5], A. Krishnama Raju, INCET 2020, Belgaum, India.This paper presents a deep learning-based facial emotion detection system using CNNs. It follows a three-step pipeline—face detection, feature extraction, and emotion classification—and demonstrates high accuracy using FER-2013 (70.14%) and JAFFE (98.65%) datasets. The study highlights the advantages of CNNs over traditional methods for processing facial expressions in images.

Facial Expression Recognition Using Computer Vision by Daniel Canedo et.al.[6], António J. R. Neves, University of Aveiro, 2019.This review surveys FER techniques, including LBP, PCA, and Gabor filters, while addressing challenges like lighting, pose variation, and uncontrolled environments. The authors advocate for multimodal FER systems combining visual and non-visual inputs for more robust real-world performance, identifying key areas for future research.

Facial Emotion Recognition: State of the Art Performance onFER2013 byYousif Khaireddin et.al.[7], Zhuofa Chen, 2021
This work leverages VGGNet CNN architecture to achieve 73.28% accuracy on the FER2013 dataset without extra data. It emphasizes the power of fine-tuning and optimization in deep learning models to handle facial variability and environmental challenges in FER tasks, establishing a strong benchmark in the field.

The literature survey highlights the evolution of emotion recognition, from early methods to advanced AI models like CNNs and RNNs. While traditional techniques were limited in accuracy, deep learning has significantly improved emotion classification through facial and speech data. However, challenges such as lighting variations, dataset requirements, and privacy concerns remain. The survey emphasizes the need for continued refinement in emotion detection to enhance human-computer interaction.

III. METHODOLOGY

A number of crucial phases are included in the study technique for creating an Emotion-based interview evaluator that can classify emotions and confidence from speech patterns and facial expressions. First, the goal of developing a system that can precisely identify emotions and confidence levels in real-time is outlined in the issue statement, which is well-defined. To comprehend the state of the art in affective computing, deep learning, and emotion recognition systems, a comprehensive examination of the literature is done. The research method is guided by well-defined research aims and problems, with a particular emphasis on deep learning models for multimodal integration, speech emotion identification, and facial expression recognition. With an emphasis on experimental or quasi-experimental methods, the research design is selected in accordance with the data and resources that are available. Data collection involves gathering a diverse dataset of labelled facial expressions and speech samples that cover a wide range of emotions and interview scenarios. This dataset is then pre-processed to remove noise and standardize features, ensuring it is suitable for training the deep learning models.

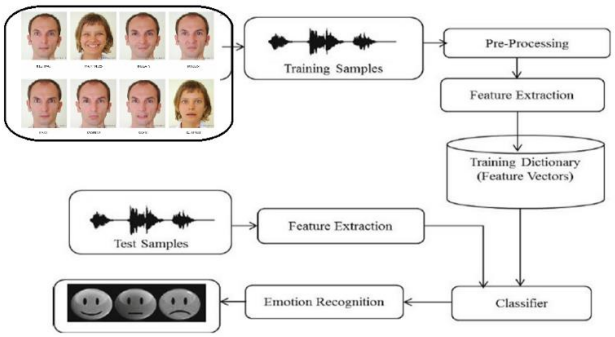


Figure 1: Emotion detection Pre-Processing

1. **Dataset Collection and Preprocessing:**

Gather and pre-process facial expression data sets in order to train the CNN model, maintaining diversity and quality.

2. **CNN Model Development:**

Fine-tune/build and train a CNN to recognize the facial emotions during interviews in form of video/image inputs.

3. **HR Module:**

Develop HR UI to view emotion results of a particular candidate which is stored during interviews.

4. **Candidate Module:**

UI to take interview from candidates on this platform and it will capture facial expression of answers given.

5. **Cloud Storage:**

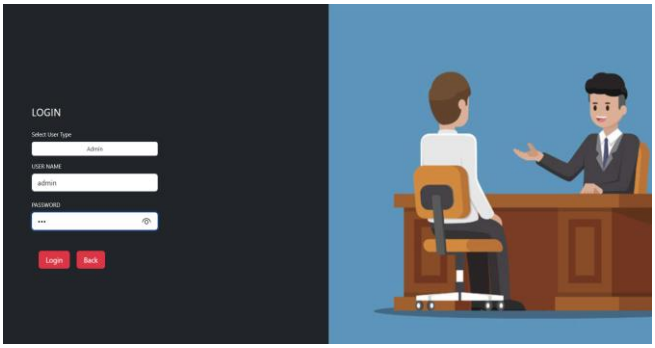
Build secure cloud infrastructure to store and handle all data also the responses from candidates including emotion analyses.

6. **Admin Module:**

Develop admin UI to manage the system like add questions, view results for particular candidate.

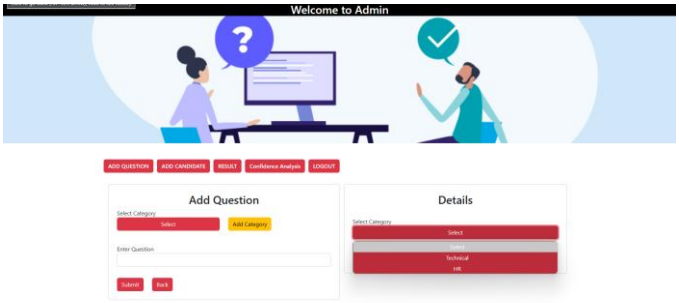
IV. SNAPSHOTS

Snapshot 1: Front Page for the Admin and HR to Login

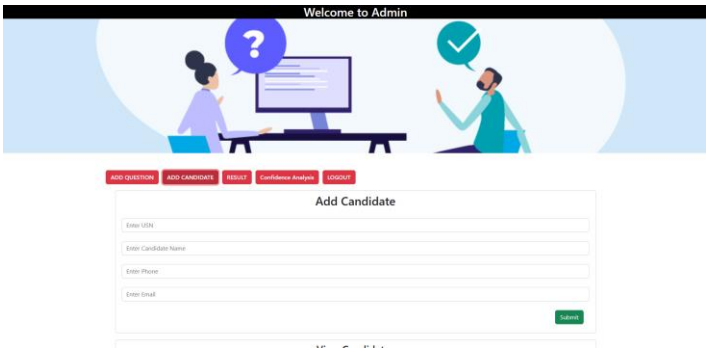


Snapshot 2: Login Page for the Admin and HR

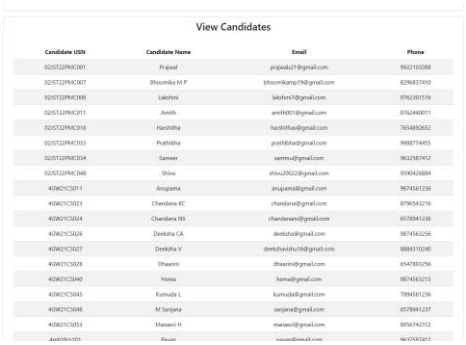
Snapshot 3: Home Page for different options such as adding questions, adding candidates, viewing results and analyzing confidence of all the candidates.



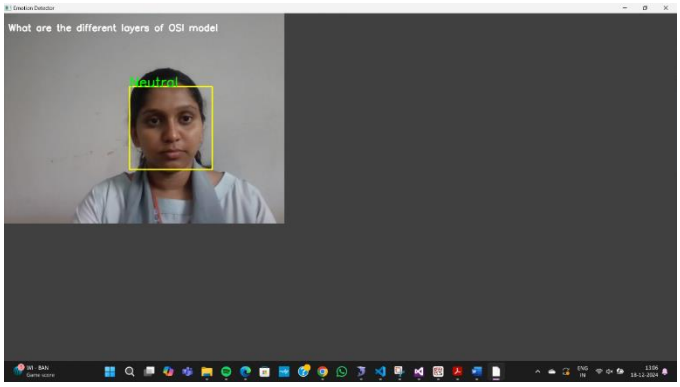
Snapshot 4:Adding Questions Page for the Admin by creating



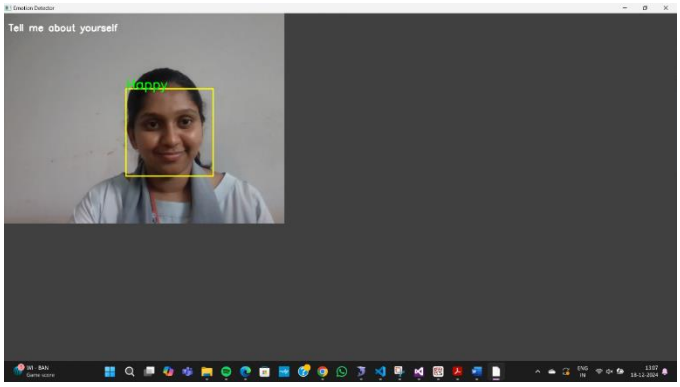
Snapshot 5: Adding Candidate Page for the admin by enteringcandidate's details such as USN, Name, Phone number and Email.



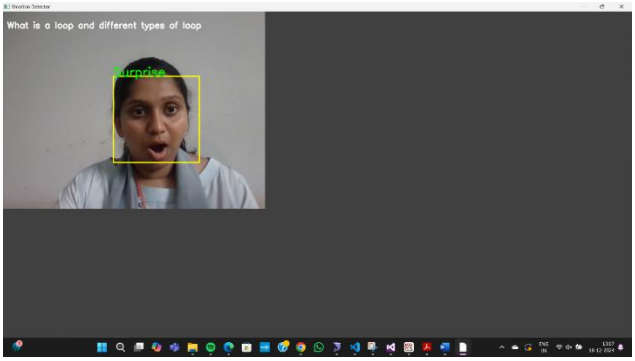
Snapshot 6: Candidate Viewing Page of all the existing candidates



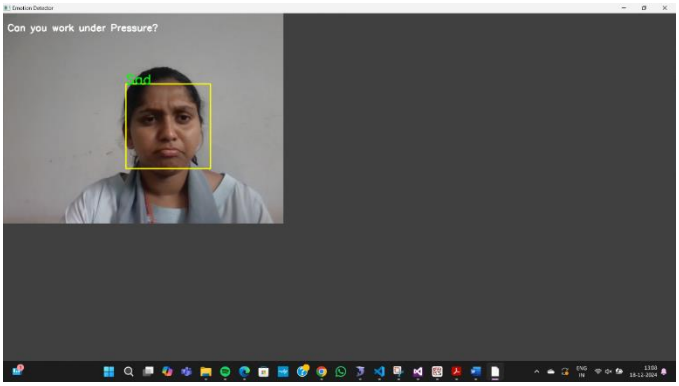
Snapshot 7: Neutral Emotion Detected by the Model



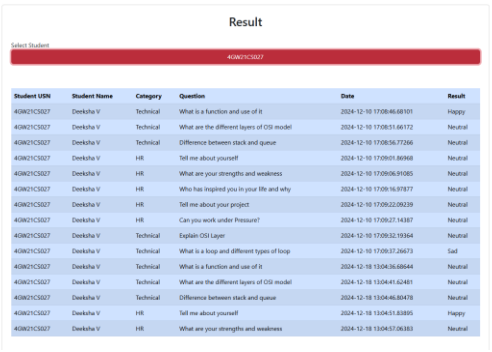
Snapshot 8: Happy Emotion Detected by the Model



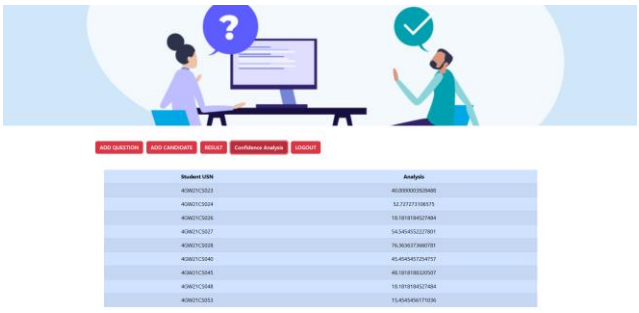
Snapshot 9: Surprise Emotion Detected by the Model



Snapshot 10: Sad Emotion Detected by the Model



Snapshot 11: Result Page of the selected candidate displaying emotion for each question along with the candidate's USN, Name and category of thequestion answered



Snapshot 12: Confidence Analysis Page of all the existing candidates displaying the candidate's USN along with the confidence for each candidate

V. FUTURE SCOPE

In the future, several major enhancements can be implemented on top of the "Analysing Interviewee with Facial Emotion Detection Using CNN" project. The accuracy of emotion detection may be improved by integrating advanced CNN architectures or hybrid models for more robust evaluations regarding candidate emotional states. These could

be a series of real-time feedback during an interview process to both the candidates and the people taking interviews.

Combining multimodal data sources, for example voice tone analysis and physiological metrics, could lead to a more nuanced understanding of the candidate. Further, adding personalized feedback reports and an adaptive questioning style can also help customize the interview experience to provide in-depth insights. Adding more deep metrics to the analytics dashboard for Admin and HR, as well as increased data protection with advanced security implementations would increase system efficiency USERS TRUST. Finally, different language support and integration with AI-driven interview platforms could increase the reach of the system on a global scale while adding to its utility.

VI. CONCLUSION

Facial emotion detection using Convolutional Neural Networks has been a phenomenal step toward the objective evaluation of the emotional states of the person being interviewed. Thus, this research is conducted with the very goal of developing an advanced version of the technology that could further aid decision-making across various kinds of interviews, from recruitment purposes to even academic assessments, by providing real-time insights into interviewee behaviour.

Specifically, this system enables identification and classification of different emotions with respect to facial expressions based on robust capabilities of CNNs. The proposed work shall encompass the comprehensive approaches of data acquisition and preprocessing, model development and training,real-timeemotion detection, and ethical considerations. These will be key components such as face detection and alignment, normalization, and augmentation are crucial for preparing quality input to a CNN model and hence its robustness and accuracy.

It is, therefore, in the final analysis that facial emotion detection-based interviews using CNN are likely to revolutionize the process of interviews with a more accurate, fair, and efficient way of assessing the emotional response. This application has thus been able to showcase how state-of-the-art deep learning techniques, combined ethically with implications taken with utmost care, are definitely going to pave the way for a number of advanced tools bettering the quality and effectiveness overall for interview evaluation.

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