IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11442

AI Based Interview Evaluator: An Emotion and Confidence Classifier

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Abstract: An innovative initiative at the nexus of cutting-edge technology and human skill development is the AI Based Interview Evaluator: An Emotion and Confidence Classifier. This initiative, which aims to transform interview preparation methods, makes advantage of state-of-the-art AI capabilities by putting affective computing to use as an evaluator and interviewer. The technology surpasses conventional techniques by integrating speech-based emotion detection and facial expression analysis, providing aspiring professionals with an engaging learning environment. Driven by the necessity to tackle the inadequacies of traditional interview preparation, the project seeks to offer users individualized question development, adaptive learning, and real-time feedback. The system offers a holistic approach to interview skill including modules for facial and speech-based emotion detection, chatbot functionality, and interface with NLP and LSTM networks. The system promises a comprehensive approach to interview skill enhancement. Although the project offers benefits like instantaneous feedback and adaptability to other domains, it also recognizes issues with data dependency, context understanding, and ethical considerations. All things considered, the AI Interview Evaluator aims to reinvent interview preparation by giving users a priceless tool for refining their abilities and increasing their self-assurance in actual interview situations.

Keywords: AI Based Interview Evaluator, AI interview, Facial Expression Analysis, Deep Face, Machine Learning, Convolution Neural Network, Speech-based Confidence Detection, Librosa, Random forest algorithm.

I. INTRODUCTION

An innovative project at the nexus of cutting-edge technology and human skill development is the AI Interview Evaluator: an Emotion and Confidence Classifier, which stands out in the quickly changing field of artificial intelligence and its many applications. The project's clear goal is to redefine interview preparation techniques by utilizing cutting-edge AI capabilities to offer an extensive and dynamic training environment. Essentially, the AI Interview Evaluator uses state-of-the-art methods from affective computing to perform the combined roles of interviewer and evaluator. This software goes above and beyond traditional interviewing practices with its combination of speech modulation assessment and facial expression analysis.

This project is in line with the current movement to use artificial intelligence to mimic real-world situations, Providing interviewees with an exclusive and indispensable resource. The creation of models that can identify human emotions from speech patterns and facial expressions is an intriguing field of research in this field. Deep learning techniques are used in this multidisciplinary discipline to develop reliable and effective emotion detection systems. There are many uses for emotion detection; earlier techniques frequently depended on feature engineering and explicit rules, but deep learning has completely changed the field. Deep neural networks are perfect for capturing complicated patterns in speech signals and facial expressions because they can automatically learn hierarchical representations from raw input.

II. PROBLEM STATEMENT

Interview evaluation using deep learning is an interesting and evolving application that holds significant potential. The scope of using deep learning in interview evaluations can encompass various aspects of the hiring process, from analysing verbal and non-verbal communication to assessing candidate suitability for a particular role. Deep learning models can be applied to transcribe and analyse spoken language during interviews. This includes assessing fluency, vocabulary, and communication skills. Deep learning models can analyse facial expressions to gauge the emotional state of the candidate. This can provide insights into their level of confidence, sincerity, and enthusiasm.

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III. OBJECTIVES

To create an application which performs the following functionalities:

- **Real-Time Interview Experience:** The AI-based interview evaluator provides candidates with a real-time, interactive interview environment that closely mirrors the experience of an actual interview, allowing them to engage with the system as they would with a human interviewer.

- **Feedback Generation:** The AI-based interview evaluator generates customized feedback messages that offer constructive advice to candidates, helping them address their nervousness and improve their interview performance.

- **Interactive Support:** The AI-based interview evaluator offers interactive support through a chatbot interface, enabling candidates to ask questions and seek advice on improving their confidence during interviews, fostering a dynamic and personalized learning experience.

- **Facial Expression Analysis:** Facial expressions are a rich source of emotional cues, and computer vision techniques can be used to detect and analyse them. Deep learning models, such as convolutional neural networks (CNNs), can be trained to recognize facial expressions associated with specific emotions like happiness, sadness, anger, surprise, fear, and disgust.

- **Speech-Based Emotion Detection:** Speech carries a wealth of emotional information through intonation, pitch, rhythm, and other acoustic features. Techniques like signal processing and machine learning can be used to extract relevant features from speech signals and classify them into different emotional states.

IV. EXPECTED OUTPUT

The Interview Evaluator is designed to significantly enhance interviewees' skills by providing dynamic and realistic interview simulations. Through the incorporation of affective computing techniques such as facial expression analysis and voice modulation, the system aims to offer a nuanced evaluation of emotional cues, thereby improving users' overall communication effectiveness.

Its adaptive question generation capability tailors interview questions to the user's experience level, providing a personalized preparation experience that closely mirrors real-world scenarios. By engaging with the system, users are expected to gain increased confidence and preparedness for actual interviews, ultimately leading to improved performance.

Additionally, the system's comprehensive evaluation metrics are anticipated to provide valuable insights for targeted skill development. The project aims to achieve high user engagement and satisfaction, leveraging user feedback to continually refine and improve the system's effectiveness.

V. LITERATURE SURVEY

1. Real Time Mock Interview using Deep Learning

Rohan Patil, Akash Butte , Sahil Temgire ,Varun Nanekar [1], proposed “Real Time Mock Interview using Deep Learning” research , which entails creating a deep learningpowered real-time mock interview system to help individuals improve their interviewing techniques. Acknowledging the current trend toward virtual interviews, the system offers users access to a web application that allows them to rehearse and mimic virtual interviews. Convolutional neural networks (CNNs) are used for facial expression recognition, speechto-text conversion is used for grammar checking, and deep learning techniques are integrated for detailed feedback on a variety of aspects, such as facial expressions, head A I Based Interview Evaluator : An Emotion And Confidence Classifier Dept. of Information Science and Engineering, AJIET, Mangalore. 6 nodding, reaction time, speaking rate, and volume.

Through graphical comparisons, the technology makes it easier for users to track their progress across several mock interviews. The literature review covers relevant research on automatic personality recognition, action selection, grammatical specification language, dialog state tracking, and text-based emotion detection. demonstrating the relevance of these concepts to the proposed system. The proposed system aims to enhance social skills, particularly relevant to job interviews, through a real-time social cue recognition system. The project demonstrates potential benefits for users in improving their interview performance and receives positive feedback from participants.

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2. AI-based Behavioral Analyzer for Interviews

Dulmini Yashodha Dissanayake , Venuri Amalya , Raveen Dissanayaka , Lahiru Lakshan [2] ,Proposed " AI-based Behavioral Analyzer for Interviews/Viva" ,which represents the drawbacks of online interviews in terms of catching subtle nonverbal clues, the system utilizes machine learning and deep learning models to provide a thorough behavioral analysis. With an emphasis on important components like mood, eye movement, smile, and head movements, the system reaches astonishing accuracy levels of over 85%. Moreover, the use of a Big Five trait-based personality model facilitates a comprehensive assessment of applicants. To ensure the robustness and reliability of each component, the project uses a variety of datasets for training. The method enables group comparisons and environment-based evaluations in addition to offering insights into the behavior of individual interviewees through rigorous analysis and model training. The findings from surveys with professionals underscore the significance of the system in addressing challenges associated with virtual interviews. Overall, this project contributes substantially to the field, offering a sophisticated tool for behavior analysis that goes beyond existing systems' capabilities.

3. Chatbot-based Interview Simulator: A Feasible Approach to Train Novice Requirements Engineers

Muhammad Laiq, Oscar Dieste [3], Proposed Chatbot-based Interview Simulator: A Feasible Approach to Train Novice Requirements Engineers, This study examines the inadequate preparation provided to beginning requirements engineers in requirements engineering (RE) courses, with a specific focus on interview skills improvement. An AIbased interview simulator created using the Design Science Methodology for Information Systems is the suggested remedy. The goal of the six-cycle refined simulator is to improve interviewing abilities through natural dialogue with requirements engineers. It highlights appropriate interview techniques, including the use of summaries, context-free questioning, and the introduction of common natural language errors like ambiguity and incompleteness. Positive feedback from student testing indicates that the research is producing favorable results. Context-free, context-related, and meta-questions are all understood by the A I Based Interview Evaluator : An Emotion And Confidence Classifier Dept. of Information Science and Engineering, AJIET, Mangalore. 7 simulator, and it reacts accordingly. Furthermore, a generalized architecture for RE tools utilizing IBM Watson technology has been delineated. The paper concludes with plans to further test the simulator in a real RE course, with the intention of eventually making it available for free use within the RE community. The project addresses a gap in interview training for requirements engineers and leverages AI and natural language processing technologies to provide an effective educational tool.

4. Improved Residual Networks for Image and Video Recognition

Ionut Cosmin, Duta Li, Liu Fan, Zhu Ling Shao [4], these authors proposed "Improved Residual Networks for Image and Video Recognition," which describes the notable advancements made to the Residual Network (ResNet) architecture, a popular convolutional neural network (CNN) configuration. The three main aspects of ResNets that are the focus of the suggested improvements are the projection shortcut, the residual building block's structure, and the information flow across network levels. The authors show that across a range of tasks and datasets, including as ImageNet, CIFAR-10, CIFAR100, COCO, Kinetics-400, and Something-Something-v2, they consistently improve accuracy and learning convergence. Introducing a stage-based network design, optimizing the projection shortcut to minimize information loss, and creating a building block with additional spatial channels to learn more potent spatial patterns are among the main achievements. The suggested method enables very deep training. The experiments showcase the effectiveness of the proposed architecture by successfully training a 404-layer deep CNN on ImageNet and a 3002-layer network on CIFAR-10 and CIFAR-100, surpassing the capabilities of the baseline ResNet. The results suggest that the proposed approach overcomes optimization challenges associated with increasing network depth, establishing new milestones in the depth of CNNs.

5. An Innovative Emotion Recognition and Solution Recommendation Chatbot

Ashlin Deepa R N, Prathyusha Karlapati, Mrunhaalhini Reddy Mulagondla, Pavitra Amaranayani [5], proposed "An Innovative Emotion Recognition and Solution Recommendation Chatbot", Here, it presents a web-based chatbot that recognizes emotions and recommends solutions to help people manage them on their own. The system uses artificial intelligence, natural language processing, and machine learning algorithms to address the common mental health issues caused by work-related stress, unstable relationships, and other factors. Users engage with the chatbot by submitting images, choosing a category, and providing text data that describes their mood. Machine learning algorithms, in particular Random Forest, analyze the user's text description to recognize A I Based Interview Evaluator : An Emotion And Confidence Classifier Dept. of Information Science and Engineering, AJIET, Mangalore. 8 emotions accurately, achieving an impressive accuracy and F1 score of 97.55% and 0.969, respectively. The chatbot functions as a virtual therapist, suggesting customized solutions, such as the system's methodology involves front-end components for user interaction and back-end processes for emotion analysis and recommendation generation. The project demonstrates the potential of AI-driven chatbots in providing accessible and personalized mental health support, with Random Forest identified as the optimal algorithm for emotion recognition.

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DOI: 10.17148/IARJSET.2024.11442

6. Emotion Classification Using Deep Learning

Chinmayi R, Narahari Sreeja, Aparna S Nair, Megha K Jayakumar, Gowri R, and Akshat Jaiswal's[6] research on "Emotion Classification Using Deep Learning" endeavors to enhance emotion recognition through a comprehensive model framework that integrates deep learning methodologies for analyzing both speech and facial expressions. With the overarching goal of improving human-computer interaction, the study meticulously targets the accurate identification of a wide spectrum of emotions, encompassing happiness, sadness, rage, hatred, surprise, and fear. Utilizing a robust dataset comprising 90 samples from the Amrita Emote database for testing and 25,838 samples from the FER2013 image database for training, the research employs sophisticated Convolutional Neural Networks (CNNs) for image processing, alongside Recurrent Neural Networks (RNNs) for speech processing tasks. Emphasizing the pivotal role of emotion detection in fostering overall human wellbeing, especially in the realm of identifying emotional disorders, the study underscores the paramount importance of precise emotion recognition. Furthermore, the system employs a repertoire of advanced techniques, including pre-emphasis filtering, framing, cepstral conversion, and Mel-frequency Cepstral Coefficients (MFCC), for robust feature extraction from speech signals, thereby contributing significantly to the advancement of emotion classification through state-of-the-art deep learning methodologies. This comprehensive approach not only enhances our understanding of emotional cues but also facilitates the development of more empathetic and responsive human-computer interfaces, ultimately enriching the quality of interactions in various domains.

7. Conversation-Driven Approach for Chatbot Management

Guilherme G. Andrade, Geovana R. S. Silva, Francisco, C. M. Duarte Jr [7], proposed "A Conversation-Driven Approach for Chatbot Management", this project presents the Chatbot Management Process (CMP), an all-encompassing technique intended to tackle the difficulties associated with maintaining and modifying chatbot content once it has been deployed. Three major phases make up the CMP, which is centered on developing the Evatalk chatbot for the Brazilian Virtual School of Government: manage, create, and evaluate. The approach places a strong emphasis on user interaction-driven, cyclical content evolution and human-supervised learning. It helps people with different skill sets to collaborate by clearly defining roles for the chatbot team. Positive results from the validation of the Evatalk project included a 160% increase in knowledge base examples, a decrease in human hand-off rates, and stable user satisfaction. Version control, content management, and model training are made easier with the help of tools like EvaTalk Admin, Data Repository, and Model Trainer included in the suggested design. The project's A I Based Interview Evaluator : An Emotion And Confidence Classifier Dept. of Information Science and Engineering, AJIET, Mangalore. 9 use of containerization enhances scalability, reproducibility, and simplifies the deployment process. Overall, the project underscores the significance of post-deployment content management and offers a systematic approach to enhance chatbot performance and user experience.

8. Interviewee Performance Analyzer Using Facial Emotion Recognition and Speech Fluency Recognition

Yashwanth Adepu, Vishwanath R Boga ,Sairam U [8],proposed "Interviewee Performance Analyzer Using Facial Emotion Recognition and Speech Fluency Recognition", In order to analyze interviewee performance, this research develops two multiclass classification models and offers an automated method. The suggested system makes use of video that was taken during interviews, from which frames are extracted to recognize facial emotions and audio to recognize speech fluency. By combining the HaarCascade classifier, Gabor filters, and Convolution Neural Network, the facial emotion identification model achieves higher accuracy in less training time. Using Mel Frequency Cepstral Coefficient characteristics and logistic regression, the speech fluency recognition model classifies speech into four categories: fluent, stuttering, cluttering, and pauses. The interviewee's performance is rated based on the combined forecasts of the two models. The system's increased accuracy is a result of the usage of logistic regression for speech fluency recognition and Gabor filters for facial emotion recognition. The research includes a literature survey, dataset details, and a detailed explanation of the proposed system's components and flow. The datasets comprise FER2013 and ck+ for facial emotion recognition and various speech datasets for speech fluency recognition. The system is presented as a prototype, acknowledging the need for additional metrics such as posture and gestures for a comprehensive interview analysis in future research.

9. Human Emotion Recognition using Convolutional Neural Network in Real Time

Anushree Deshmukh ,Arti Mishra, Abhishek Adivarekar ,Rohit Pathar [9], proposed "Human Emotion Recognition using Convolutional Neural Network in Real Time", this study employs convolutional neural networks (CNNs) to recognize emotions in real time from facial photos. The study tackles the problem of teaching machines to analyse emotions similarly to humans. The suggested multi-class classifier divides face photos into seven categories based on emotion: anger, happiness, fear, sorrow, disgust, surprise, and neutral. It was trained on the fer2013 dataset. In order to reduce overfitting, the experiment investigates various CNN architectures, including both shallow and deep networks, and uses dropout. The deep network attains an astounding 89.98% accuracy rate. The study goes so far as to use a webcam in real time to demonstrate the model's accuracy in identifying emotions for several faces at once. The model's distinctiveness and effectiveness are enhanced by the employment of swish activation mechanisms in completely connected layers.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

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DOI: 10.17148/IARJSET.2024.11442

10. Speech Emotion Recognition using Deep Learning Techniques

Ruhul Amin Khalil, Edward Jones, Mohammad Inayatullah Babar [10], proposed "Speech Emotion Recognition using Deep Learning Techniques", it offers a comprehensive examination of the challenges and advancements in Speech Emotion Recognition (SER) while emphasizing the crucial role of precise emotion identification in Human-Computer Interaction (HCI). Through a thorough review of conventional SER methods, the study advocates for the adoption of Deep Learning approaches, showcasing various models such as Deep Boltzmann Machines (DBMs), Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Deep Neural Networks (DNNs). By leveraging benchmark databases like IEMOCAP, Emo-DB, and SAVEE, the researchers empirically evaluate the effectiveness of these techniques in recognizing emotions from speech signals. A comparative analysis reveals the superiority of Deep Convolutional Neural Networks (DCNNs) over traditional algorithms, highlighting the potential of Deep Learning to streamline emotion recognition tasks without the need for manual feature extraction. The study underscores the significance of integrating Deep Learning into SER systems for HCI applications, ultimately paving the way for future advancements and addressing challenges in the field. Furthermore, the research discusses the implications of these findings for improving user experience and interaction with computer systems, emphasizing the importance of accurate emotion recognition in HCI. Additionally, the study identifies future research directions, including the exploration of multi-modal approaches combining speech and other modalities for enhanced emotion recognition. Finally, the paper acknowledges the ongoing challenges in SER, such as dealing with noisy data and cultural variations in emotional expression, suggesting avenues for overcoming these obstacles through continued research and innovation.

11. AI -Based mock interview evaluator: An emotion and confidence classifier model

R. Mandal, P. Lohar, D. Patil, A. Patil and S. Wagh. [11] "AI -Based mock interview evaluator: An emotion and confidence classifier model," 2023 International Conference on Intelligent Systems for Communication, IoT and Security (ICISCoIS), Coimbatore, India, 2023, pp. 521-526, doi: 10.1109/ICISCoIS56541.2023.10100589.Abstract: Interviews are extremely important for a candidate because it is the time when all your hard work is put on the line to get some desired fruitful outcomes in life. It is extremely important in our educational system and recruitment process since they aid in the selection of the right candidate based on the required skills. Mock interviews can boost our confidence and communication skills which can help to perform better. This paper proposed an AI-based mock interview platform that would operate as an intermediatory between the actual interview and preparation mode. Our system will assess the user based on an aggregation of three parameters called emotions, confidence, and knowledge base. Emotion is judged based on facial expression using deep learning CNN algorithm which will classify the emotion among the 7 categorical emotions and confidence evaluation is based on speech recognition using natural language processing and Pydub audio python libraries. For knowledge assessment, keyword mapping, semantic analysis technique is used and web scraping module will extract keywords from received replies and map them to online resources. Hence this system will not only lower the stress and anxiety before an actual job interview but also improve the candidate's confidence.

12. Automate Traditional Interviewing Process Using Natural Language Processing and Machine Learning

Pasindu Senarathne, Malaka Silva, Ama Methmini, Dulaj Kavinda, Prof.Samantha Thelijjagoda [12], Proposed "Automate Traditional Interviewing Process Using Natural Language Processing and Machine Learning", The Smart Interviewing System (SIS) is an advanced software application that uses deep learning and contemporary Natural Language Processing (NLP) methods to completely transform the conventional interviewing procedure. The system, which was created with the Python programming language and the ReactJS framework, can handle both written and oral interviews. It functions by translating spoken language into text-based inputs, which enables automatic assessment of applicants' answers. The algorithm predicts scores for each response using sophisticated evaluation parameters derived from deep learning principles, giving interviewers a more precise and effective way to choose eligible applicants. Through a significant reduction in the time and effort needed for candidate selection,Through its innovative approach, the system addresses common flaws in traditional interviewing processes that involve human biases and timeintensive operations. The research methodology includes the use of voice recognition, keyword matching, and machine learning models such as Word2Vec and Doc2Vec for evaluating written test answers. Overall, the SIS represents a cutting-edge solution to A I Based Interview Evaluator : An Emotion And Confidence Classifier Dept. of Information Science and Engineering, AJIET, Mangalore. 11 enhance Human Resources Management, offering a reliable and automated approach to identify the most suitable candidates for various job positions.

13. A Generic Review of Web Technology: DJango and Flask

Nuruldelmia Idris, Cik Feresa Mohd Foozy, and Palaniappan Shamala's [13][proposed research on "A Generic Review of Web Technology: Django and Flask" provides a comprehensive examination of web technology, tracing its historical development, current state, and potential future advancements. Emphasizing the pivotal role of web services in modern daily life, the study underscores the significance of bandwidth and high-speed internet connectivity. Delving into the fundamental languages of web development, including HTML5, CSS, and JavaScript, the research elucidates their importance in crafting visually appealing and functional websites.

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DOI: 10.17148/IARJSET.2024.11442

Furthermore, the article delves into Python's historical context, benefits, and its current and prospective applications within web development, attributing the inception of web technology to Sir Tim Berners-Lee. This holistic analysis sheds light on the evolution of web technology, providing insights into its past, present, and future trajectories.

VI. REQUIREMENT SPECIFICATION

Hardware requirements

This application is designed to run on the minimum possible configuration of hardware.

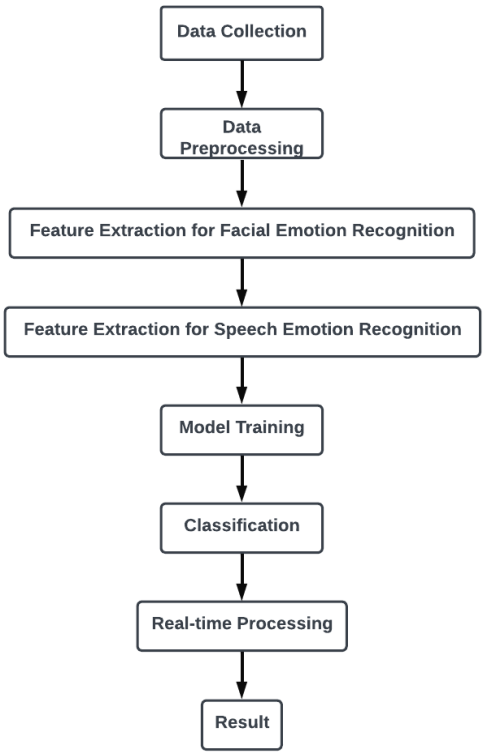
- RAM: 8GB
- Processor: AMD Ryzen 5 10th generation
- Hard disk: compatable

Software requirements

- Tool: PyCharm
- Language: Python 3.6
- Tensorflow
- Keras
- Pandas
- Flask
- Scikit-Learn, Matplotlib and Librosa

VII. SYSTEM DESIGN

Building an emotion recognition system involves several essential stages that form the framework for developing and evaluating such a system. The process typically begins with data collection, where a diverse dataset of facial expressions and corresponding speech samples labelled with emotions is gathered. This dataset serves as the foundation for training and evaluating the emotion recognition models. Following data collection, the next step is data preprocessing. During this stage, the collected data is cleaned and prepared for analysis. This involves tasks such as removing noise, standardizing formats, and ensuring the data is in a suitable form for feature extraction and model training. Feature extraction is a critical step in the process, as it involves extracting relevant features from the facial images and speech signals. For facial emotion recognition, features such as facial landmarks or action units are extracted to represent emotional expressions. Similarly, for speech emotion recognition, acoustic features like Mel-frequency cepstral coefficients (MFCCs) or spectrograms are extracted to capture emotional content embedded in the speech signals.



Steps taken to process the datasets.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

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Once the features are extracted from the collected data, the subsequent stage involves model training, where distinct models are developed for facial and speech emotion recognition utilizing either machine learning or deep learning algorithms. These models are trained on the extracted features obtained from their respective datasets, aiming to grasp the intricate patterns associated with various emotional states. Following model training, the classification phase ensues, where the trained models are utilized to categorize new instances of facial expressions and speech signals into predefined emotion categories. Leveraging the learned patterns, these models analyse incoming data to predict the emotions conveyed within the input. Real-time processing emerges as a critical aspect, particularly in applications necessitating immediate emotion recognition. This necessitates the implementation of a system capable of processing live facial and speech data in real-time, thereby offering instantaneous emotion predictions. Subsequently, the system's performance is evaluated using metrics like accuracy, precision, recall, and F1-score, providing valuable insights into its efficacy in accurately recognizing emotions. Based on the evaluation outcomes, areas for enhancement and future research directions can be delineated to augment the system's performance and functionalities. In essence, constructing an emotion recognition system entails a series of interrelated stages, encompassing data collection, preprocessing, feature extraction, model training, classification, real-time processing, and result evaluation. Each stage assumes a pivotal role in crafting a resilient and efficient system capable of discerning emotions from facial expressions and speech signals accurately.

VIII. RESEARCH METHODOLOGY

A number of crucial phases are included in the study technique for creating an AI-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 labeled facial expressions and speech samples that cover a wide range of emotions and interview scenarios. This dataset is then preprocessed to remove noise and standardize features, ensuring it is suitable for training the deep learning models.

IX. CONCLUSION

In summary, the AI-Based Interview Evaluator system presents a robust approach for assessing the confidence and emotions of interviewees. Going beyond traditional evaluation methods, it integrates various inputs, including text, audio, and video, to provide a comprehensive assessment. Employing advanced deep learning architectures such as Convolutional Neural Networks (CNNs) for facial expression analysis and Librosa for speech-based emotion detection, the system demonstrates its commitment to leveraging cutting-edge Machine Learning techniques. The use of Deep Face technology enhances accuracy in facial expression analysis, while the integration of a chatbot interface ensures adaptable communication, catering to diverse user preferences.

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