

AI Based Interview Analyser

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Abstract—Modern recruitment processes require faster and more accurate candidate evaluation systems. Traditional interview methods mainly depend on human judgment, which can lead to bias and inconsistent evaluation results. The proposed system, AI Based Interview Analyzer, uses Artificial Intelligence (AI), Natural Language Processing (NLP), speech analysis, and facial behavior analysis techniques to analyse candidate performance during interviews. The system evaluates communication skills, confidence level, facial expressions, eye contact, speaking fluency, and answer quality using audio and video inputs.

The system processes candidate responses and behavioral patterns to generate automated performance reports and scoring results for recruiters. NLP techniques analyse spoken answers based on relevance and clarity, while speech analysis measures fluency and confidence. Experimental analysis shows that the AI Based Interview Analyzer improves recruitment efficiency, reduces human bias, and provides consistent interview evaluation. The proposed system can be effectively used in online recruitment platforms, campus interviews, and corporate hiring processes.

I. INTRODUCTION

Artificial Intelligence is transforming modern recruitment systems by making interview processes faster, smarter, and more efficient. Traditional interview methods depend heavily on human judgment, which may sometimes result in biased decisions, inconsistent evaluation, and increased recruitment time. In large organizations, handling interviews for a large number of candidates becomes difficult and time-consuming for recruiters.

To overcome these challenges, AI-Based Interview Analyzer systems are being developed using Artificial

Intelligence, Natural Language Processing (NLP), speech analysis, and facial behavior analysis techniques. These systems automatically analyse candidate performance during interviews by evaluating facial expressions, voice confidence, communication skills, eye contact, and answer relevance.

The AI-Based Interview Analyzer captures video and audio input from candidates and processes the information for interview analysis. Facial behavior analysis helps in identifying confidence, nervousness, stress, and engagement levels, while speech analysis techniques evaluate fluency, pronunciation, and communication quality. NLP techniques are used to analyse the correctness and relevance of candidate responses.

The proposed system helps recruiters generate automated performance reports and ranking scores for candidates. It reduces manual effort, minimizes human bias, and improves the accuracy of interview evaluation. The system can be widely used in online recruitment platforms, campus placement drives, corporate hiring systems, and virtual interview environments.

The main objectives of the proposed system are:

- To automate interview evaluation using AI techniques
- To analyse candidate confidence and communication skills
- To evaluate responses using NLP algorithms
- To reduce bias in recruitment processes
- To improve hiring efficiency and accuracy

The AI-Based Interview Analyzer provides an intelligent and reliable solution for modern

recruitment systems by combining AI technologies and real-time interview analysis techniques.

II. LITERATURE REVIEW

A. Artificial Intelligence in Recruitment Systems

Artificial Intelligence has become an important technology in modern recruitment and Human Resource Management systems. Many companies are using AI-based tools to simplify hiring processes and improve candidate evaluation accuracy. Traditional recruitment methods require significant human effort for conducting interviews, analysing resumes, and evaluating candidate communication skills. These methods are often time-consuming and may lead to biased decisions.

AI-based recruitment systems help organizations automate several recruitment activities such as:

- Resume screening
- Candidate ranking
- Online assessments
- Virtual interviews
- Performance evaluation

AI systems are capable of analyzing large amounts of candidate data quickly and efficiently. These systems can identify patterns in candidate behavior, communication style, and technical responses that may not be easily recognized through manual observation. As a result, organizations can make faster and more accurate hiring decisions.

Recent studies show that AI-powered interview systems improve recruitment efficiency and reduce the workload of HR departments. Companies are increasingly adopting AI-driven solutions to enhance the overall recruitment experience and minimize human errors in candidate selection.

B. Facial Expression Analysis in Interview Systems

Facial expressions play a major role during interviews because they help identify candidate emotions such as confidence, nervousness, stress, happiness, and hesitation. Facial behavior analysis techniques are widely used in AI interview systems to analyze candidate emotions and behavioral patterns in real time.

The facial analysis process generally includes:

- Face detection
- Facial expression analysis
- Eye contact tracking

- Head movement analysis
- Emotion identification

Tools such as OpenCV and media processing libraries are commonly used for implementing facial analysis systems. These systems help in understanding candidate engagement, confidence level, and emotional responses during interviews.

Several research studies have shown that facial expression analysis improves candidate evaluation by helping recruiters understand candidate behavior more effectively during interview sessions.

C. Speech and Audio Analysis Techniques

Speech communication is one of the most important factors in interview evaluation. AI-based interview analysers use speech processing and audio analysis techniques to measure candidate confidence, fluency, and communication quality.

Speech analysis systems evaluate various parameters such as:

- Speaking speed
- Voice pitch
- Tone variation
- Pronunciation clarity
- Pause frequency
- Confidence level

Natural Language Processing (NLP) algorithms are used to convert spoken responses into text format using Speech-to-Text technology. The generated text is then analysed to evaluate grammar, sentence structure, keyword relevance, and communication quality.

Advanced speech analysis systems can also identify stress or nervousness in candidate voices by analysing tone variations and hesitation patterns. Research shows that combining speech analysis with facial behavior analysis improves interview evaluation accuracy and provides a better understanding of candidate performance.

D. Natural Language Processing for Answer Evaluation

Natural Language Processing is widely used in AI interview systems for analyzing candidate responses during interviews. NLP techniques help evaluate whether candidate answers are relevant, grammatically correct, and technically appropriate.

The NLP process generally includes:

- Text preprocessing

- Tokenization
- Stop-word removal
- Keyword extraction
- Sentiment analysis
- Semantic analysis

Using NLP algorithms, the system can compare candidate responses with expected answers and generate relevance scores. Sentiment analysis techniques help identify positive or negative communication styles, while semantic analysis helps understand the meaning of candidate responses.

Modern AI interview systems use advanced NLP models and language processing techniques to improve language understanding and provide better answer evaluation accuracy. NLP-based answer evaluation helps organizations automate interview assessment and improve fairness in candidate selection processes.

E. AI Techniques for Interview Analysis

AI techniques are widely used in interview analysers for candidate evaluation and performance prediction. These techniques analyse interview data and generate performance scores based on candidate behavior, communication skills, and response quality.

The interview analysis process generally includes:

- Communication skill evaluation
- Confidence analysis
- Behavioral assessment
- Response quality analysis
- Automated scoring and reporting

AI-based systems improve interview consistency and reduce dependency on manual evaluation methods. Automated analysis helps recruiters save time and make more reliable hiring decisions.

Research studies show that AI-based interview analysis systems provide better efficiency, accuracy, and fairness compared to traditional interview evaluation methods.

F. Existing Online Interview Platforms

Many online interview platforms have integrated AI technologies to support virtual recruitment processes. These platforms provide features such as:

- Automated interview scheduling
- Video interview recording
- Candidate assessment
- Behavioral analysis
- Performance reporting

Popular AI-based recruitment platforms use facial behavior analysis, speech processing, and NLP technologies to evaluate candidates during virtual interviews. Some systems also provide real-time interview feedback and candidate ranking functionalities.

However, many existing platforms still face several limitations:

- Limited real-time analysis
- Incomplete behavioral reports
- High computational requirements
- Privacy and ethical concerns
- Limited evaluation accuracy

The proposed AI-Based Interview Analyzer aims to improve these limitations by integrating advanced AI techniques for better accuracy, transparency, and fairness.

III. SYSTEM ARCHITECTURE

The AI-Based Interview Analyzer follows a multi-layer architecture designed to automate candidate interview evaluation using Artificial Intelligence, Natural Language Processing (NLP), speech analysis, and facial behavior analysis techniques. The system processes video, audio, and textual information collected during interviews and generates performance analysis reports for recruiters.

The architecture is divided into different layers responsible for data collection, preprocessing, feature extraction, AI-based analysis, performance evaluation, and report generation. Each layer performs a specific function to improve the accuracy and efficiency of interview evaluation.

The system architecture of the AI-Based Interview Analyzer is designed to perform automated interview evaluation using AI technologies. The architecture consists of multiple layers including candidate input, preprocessing, feature extraction, interview analysis, scoring, and report generation. The system collects candidate video and audio data during interviews through webcams and microphones. The collected information is processed using preprocessing techniques such as face detection, noise removal, speech-to-text conversion, and frame extraction to improve data quality and system accuracy.



A. Candidate Input Layer

The first layer of the system collects candidate interview data through:

- Webcam video
- Microphone audio
- Candidate responses

This data acts as the primary input for AI-based interview analysis.

The system records:

- Facial expressions
- Voice patterns
- Communication behavior

- Spoken answers

These inputs are processed further for performance evaluation.

B. Data Preprocessing Layer

The preprocessing layer improves the quality of collected data before analysis. Raw video and audio data may contain noise, unnecessary frames, or unclear speech. Therefore, preprocessing is necessary to improve system accuracy.

The preprocessing tasks include:

- Face detection using OpenCV
- Audio noise removal
- Video frame extraction
- Speech-to-text conversion
- Image enhancement

This layer ensures that clean and structured data is provided for further analysis.

C. Feature Extraction Layer

The feature extraction layer identifies important behavioral and communication features from candidate interview data.

1. Facial Features

The system extracts:

- Facial expressions
- Eye contact
- Head movement
- Smile detection

These features help identify confidence and emotional state.

2. Speech Features

The system analyzes:

- Voice pitch
- Speaking speed
- Tone variation
- Fluency
- Hesitation frequency

Speech analysis helps measure communication quality.

3. Textual Features

Natural Language Processing extracts:

- Keywords
- Sentence structure
- Grammar quality
- Technical relevance

These features help evaluate candidate answers accurately.

D. Interview Analysis Layer

This layer is the core component of the AI-Based Interview Analyzer system. The extracted facial, speech, and textual features are analysed to evaluate candidate performance during interviews.

The system analyses:

- Confidence level
- Communication skills
- Behavioral patterns
- Speech fluency
- Answer relevance

Speech analysis techniques evaluate pronunciation, fluency, and confidence, while NLP techniques analyse the correctness and clarity of candidate responses. Facial behavior analysis helps understand candidate engagement, attention, and emotional behavior during interviews.

The interview analysis layer combines all extracted information and generates overall candidate performance evaluation results.

E. Performance Scoring and Report Generation Layer

The final layer generates automated interview reports and performance scores for recruiters. The system combines facial analysis, speech analysis, and answer evaluation results to calculate the final candidate score.

The generated report includes:

- Communication skill score
- Confidence analysis
- Technical answer evaluation
- Behavioral assessment
- Overall interview performance

The system provides recruiters with accurate and consistent evaluation reports, helping organizations make better hiring decisions while reducing manual effort and human bias.

IV. METHODOLOGY

The AI-Based Interview Analyzer is designed to automate interview evaluation using Artificial Intelligence, speech analysis, facial behavior analysis, and Natural Language Processing (NLP) techniques. The system analyses candidate video, audio, and textual responses to evaluate communication skills, confidence level, facial expressions, and answer

quality. The complete methodology consists of data collection, preprocessing, feature extraction, interview analysis, performance evaluation, and report generation stages.

In the first stage, candidate interview data such as video recordings, voice input, and textual responses are collected through webcams and microphones. The collected data is then pre-processed using techniques such as noise removal, face detection, frame extraction, speech-to-text conversion, and text cleaning. These preprocessing techniques improve the quality of data and help the system generate accurate results. After preprocessing, important features like facial expressions, eye contact, voice pitch, speech fluency, confidence level, and keywords are extracted from the interview data.

AI-based analysis techniques are used to evaluate candidate performance during interviews. Facial behavior analysis helps identify confidence, nervousness, stress, and engagement levels. Speech analysis techniques evaluate pronunciation, fluency, tone variation, hesitation frequency, and communication quality. Natural Language Processing (NLP) algorithms analyse answer relevance, grammar quality, sentence structure, and keyword matching. Based on the complete analysis, the system generates automated interview reports containing communication scores, confidence analysis, technical evaluation, behavioral assessment, and overall candidate ranking for recruiters.

Emotion Detection Formula

$$P(y_i) = \frac{e^{z_i}}{\sum_{j=1}^n e^{z_j}}$$

Where:

- $P(y_i)$ = Probability of detected emotion
- z_i = Output value of emotion analysis
- n = Number of emotion classes

Accuracy Formula

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Where:

- TP = True Positive
- TN = True Negative
- FP = False Positive
- FN = False Negative

These formulas help measure emotion detection probability and overall system performance accuracy.

A. Model Performance

The AI-Based Interview Analyzer was tested using interview video, audio, and textual datasets collected from multiple candidates. The system performance was evaluated using standard performance metrics such as Accuracy, Precision, Recall, and F1-Score. The proposed system effectively analysed candidate communication skills, confidence level, facial behavior, and answer quality during interview sessions.

The proposed AI-Based Interview Analyzer achieved high interview evaluation accuracy and improved recruitment efficiency compared to traditional manual interview methods. Speech analysis improved communication assessment, while NLP techniques enhanced answer evaluation quality by analysing grammar, relevance, and keyword matching. Facial behavior analysis helped identify candidate confidence and engagement during interviews. The integration of speech analysis, facial behavior analysis, and NLP techniques significantly improved interview evaluation performance and reduced manual effort.

B. Discussion

The results show that the proposed AI-Based Interview Analyzer performs more effectively compared to traditional interview evaluation systems. The system successfully analyses facial expressions, speech fluency, communication skills, and answer relevance in real-time. Facial behavior analysis improves confidence detection, while NLP algorithms enhance answer evaluation quality by analysing grammar, sentence structure, and semantic meaning.

The proposed system helps reduce human bias during recruitment by generating automated and consistent interview evaluations. Recruiters can use the generated reports to identify candidate strengths and weaknesses more efficiently. The integration of Artificial Intelligence, speech analysis, and NLP techniques improves recruitment speed, accuracy, and overall hiring efficiency. The experimental results confirm that AI-based interview analysis systems can provide reliable and intelligent solutions for modern recruitment processes.

V. PRACTICAL CONSIDERATIONS AND APPLICATIONS

A. Practical Considerations

The implementation of an AI-Based Interview Analyzer requires proper hardware, software, and secure data handling systems to ensure accurate interview evaluation. High-quality webcams and microphones are necessary for capturing clear video and audio inputs during interviews. Stable internet connectivity is also important for conducting real-time online interview analysis and maintaining smooth system performance.

Privacy and security are important practical considerations because the system processes sensitive candidate information such as video recordings, voice samples, and interview responses. Candidate data should be stored securely using encryption and access control mechanisms. Ethical AI practices should also be followed to ensure fair and unbiased candidate evaluation during recruitment processes.

The system must provide reliable speech analysis, facial behavior analysis, and NLP-based answer evaluation to improve interview accuracy. Proper preprocessing techniques such as noise removal, speech-to-text conversion, and text cleaning are necessary for generating accurate interview analysis results. Regular software updates and proper system maintenance help improve overall system efficiency and performance.

B. Applications

The AI-Based Interview Analyzer can be widely used in various recruitment and assessment environments. One of the major applications is in corporate hiring processes, where organizations can automate candidate screening and interview evaluation. The system helps HR teams reduce manual effort, save recruitment time, and improve hiring efficiency.

Other important applications include:

- Remote job interviews
- Technical skill assessments
- Customer service recruitment
- Call center hiring
- Internship evaluation systems
- Soft skill assessment platforms
- Campus placement drives
- Online recruitment systems

The AI-Based Interview Analyzer improves recruitment accuracy, reduces human bias, and provides intelligent candidate evaluation for modern hiring systems. The system also helps recruiters identify candidate strengths, communication skills, confidence levels, and overall interview performance more effectively.

VI. CONCLUSION AND FUTURE WORK

A. Conclusion

The AI-Based Interview Analyzer is an intelligent recruitment support system that automates candidate interview evaluation using Artificial Intelligence, speech analysis, facial behavior analysis, and Natural Language Processing (NLP) techniques. The system analyzes candidate facial expressions, speech fluency, confidence level, communication skills, and answer relevance to generate accurate interview performance reports.

The proposed system helps reduce human bias, improve recruitment efficiency, and provide consistent candidate evaluation. Speech analysis, NLP techniques, and facial behavior analysis improve the accuracy of communication assessment, answer evaluation, and candidate performance analysis. The experimental results show that the proposed system provides better interview evaluation accuracy and efficiency compared to traditional manual interview methods.

The AI-Based Interview Analyzer can be effectively used in online recruitment platforms, campus placement drives, corporate hiring systems, and virtual interview environments. The system provides a faster, smarter, and more reliable solution for modern recruitment processes.

B. Future Work

Future improvements in the AI-Based Interview Analyzer may focus on enhancing real-time interview analysis accuracy and improving behavioral assessment techniques. Advanced AI technologies can be integrated to improve speech analysis, facial behavior analysis, and answer evaluation under different interview conditions.

The system can also be improved by adding:

- Real-time multilingual interview analysis
- AI-based behavioral prediction
- Gesture and body language analysis

- Cloud-based recruitment integration
- Advanced candidate recommendation systems
- Real-time recruiter feedback systems

Future research can also focus on improving transparency, fairness, data security, and privacy protection in AI-based recruitment systems. These enhancements will make the system more efficient, scalable, and suitable for real-world recruitment applications.

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ORGANIZATIONS AND WEBSITES

- OpenAI – Provides advanced Artificial Intelligence technologies and Natural Language Processing models used in AI-based systems.
- IBM Watson – Offers AI solutions for speech analysis, language processing, and business automation.
- Google AI – Develops AI technologies including NLP, speech processing, and intelligent automation systems.
- Microsoft AI – Provides AI tools and cloud-based intelligent services for modern applications.
- AWS Machine Learning – Offers cloud-based AI and intelligent processing services for scalable applications.
- HireVue – AI-powered interview platform used for automated candidate assessment and recruitment.
- Talview – Provides AI-based hiring, online interview, and recruitment analysis solutions.
- Pymetrics – Uses AI and behavioral analysis techniques for candidate evaluation and recruitment.
- HackerRank – Provides technical skill assessment and coding interview platforms.
- Mercer Mettl – Offers online assessment and AI-based recruitment solutions.
- OpenCV – Open-source computer vision library used for face detection and image processing.
- NLTK – Natural Language Processing library used for text analysis and language processing tasks.
- spaCy – Industrial NLP library used for text preprocessing and language understanding.
- SpeechRecognition Library – Python library used for speech-to-text conversion and audio processing.

TOOLS AND MODELS

- Python – Programming language used for system development and interview analysis implementation.
- OpenCV – Used for face detection, facial behavior analysis, and image processing.

- NLTK – Natural Language Processing library used for text preprocessing and answer analysis.
- spaCy – NLP library used for keyword extraction and language understanding.
- SpeechRecognition Library – Used for speech-to-text conversion and audio processing.
- NumPy – Used for numerical computations and data processing.
- Pandas – Used for dataset handling and data analysis.
- Matplotlib – Used for visualization and performance graph generation.
- Flask – Web framework used for developing the interview analysis application.
- VS Code – Code editor used for system development and testing.

B. Models Used

1. Speech Analysis Model

Speech analysis techniques are used for:

- Voice confidence analysis
- Speaking fluency evaluation
- Tone variation analysis
- Pronunciation assessment

The speech analysis model helps evaluate candidate communication quality and confidence during interviews.

2. Natural Language Processing (NLP) Model

NLP models are used for:

- Answer relevance analysis
- Grammar checking
- Keyword extraction
- Sentence structure analysis

The NLP model evaluates candidate responses and helps measure communication quality and technical understanding.

3. Facial Behavior Analysis Model

Facial behavior analysis models are used for:

- Facial expression analysis
- Eye contact detection
- Head movement analysis
- Engagement detection

These models help identify candidate confidence, attentiveness, and emotional behavior during interviews.

JOURNALS

- IEEE Transactions on Artificial Intelligence – Publishes research on Artificial Intelligence and intelligent systems.
- IEEE Access – Multidisciplinary journal covering AI, NLP, speech analysis, and recruitment technologies.
- International Journal of Artificial Intelligence Research – Focuses on AI applications and intelligent automation systems.
- Journal of Artificial Intelligence Research (JAIR) – Publishes advanced research in AI, NLP, and intelligent systems.
- Elsevier Procedia Computer Science – Publishes papers on AI, data science, and intelligent systems.
- Springer Journal of Big Data – Covers data analytics, AI technologies, and intelligent applications.
- International Journal of Computer Applications – Research journal related to computer applications and intelligent systems.
- International Journal of Advanced Computer Science and Applications (IJACSA) – Covers Artificial Intelligence and software system applications.
- International Journal of Engineering Research and Technology (IJERT) – Publishes engineering and AI-related research papers.
- International Research Journal of Engineering and Technology (IRJET) – Includes research papers on AI-based systems and interview analysis technologies.
- Journal of Data Science and Analytics – Focuses on data analytics, AI applications, and intelligent systems.
- ACM Transactions on Intelligent Systems and Technology (TIST) – Publishes research on intelligent systems, NLP, and AI applications.