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# Next-Hire: An AI-Powered Job Recruitment Platform

Divan Sha Rebak<sup>1</sup>, Srikanth S<sup>1</sup>, Akilan B<sup>1</sup>, Rajapandi P<sup>1</sup>, Mrs.S.Saranya<sup>2</sup>

Department of Artificial Intelligence and Data Science, Christ the King Engineering College, Anna University, Coimbatore, India<sup>1</sup>

Assistant Professor, Department of Artificial Intelligence and Data Science, Christ the King Engineering College, Anna University, Coimbatore, India<sup>2</sup>

**ABSTRACT:** This paper presents NEXT-HIRE, an AI-powered end-to-end recruitment platform that automates the complete hiring pipeline. The system integrates Sentence-BERT (SBERT) for semantic resume screening, a Gradient Boosting Classifier (GBC) for aptitude evaluation, Code2Vec for coding skill assessment, a fine-tuned T5 Transformer for personalized interview question generation, MFCC + BiLSTM for voice proficiency analysis, and a Spatiotemporal Attention Network for facial behavior recognition. A VRM-rendered HR Avatar conducts the virtual interview. All module results are aggregated into a weighted performance index for objective, data-driven hiring decisions. Testing confirms that NEXT-HIRE significantly improves recruitment accuracy, reduces bias, and shortens hiring cycle time.

**KEYWORDS:** Recruitment Automation, SBERT, Gradient Boosting, Code2Vec, T5, MFCC, BiLSTM, HR Avatar, Multimodal AI

## I. INTRODUCTION

Modern recruitment processes are plagued by manual resume screening, keyword-based filtering, subjective interviewer bias, and the absence of standardized behavioral assessment. As candidate pools grow and role requirements become more specialised, traditional methods fail to deliver consistency, fairness, or efficiency. Artificial Intelligence and Machine Learning offer transformative solutions: semantic embeddings capture contextual meaning beyond keywords; ensemble classifiers objectively score cognitive ability; code representation models evaluate program structure rather than mere output correctness; and multimodal deep learning models can quantify speech quality and facial engagement during interviews.

NEXT-HIRE integrates all these capabilities into a single unified web platform, automating every stage from candidate registration to final hiring decision. The system provides role-based dashboards for administrators, recruiters, and candidates, and an AI-driven HR Avatar that conducts standardised virtual interviews. This paper describes the system architecture, AI modules, implementation, and experimental results.

## II. RELATED WORK

Qin et al. [1] proposed automatic skill-oriented question generation for intelligent job interviews using deep learning, demonstrating the feasibility of NLP-based question personalisation. Lee et al. [2] explored VR combined with generative AI chatbots for interview simulation, showing that avatar-based interaction yields richer behavioural data. Mishra et al. [3] reported improvements in assessment consistency using multimodal AI-driven mock interviews. In the domain of behavioural analysis, Vinciarelli et al. [4] established foundational work in social signal processing, while Nakano and Ishii [5] demonstrated eye-gaze behaviour as a reliable engagement indicator. Despite these advances, no existing system integrates the full pipeline from semantic resume matching through multimodal interview analysis into a single automated platform. NEXT-HIRE addresses this gap.



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### III. SYSTEM ARCHITECTURE

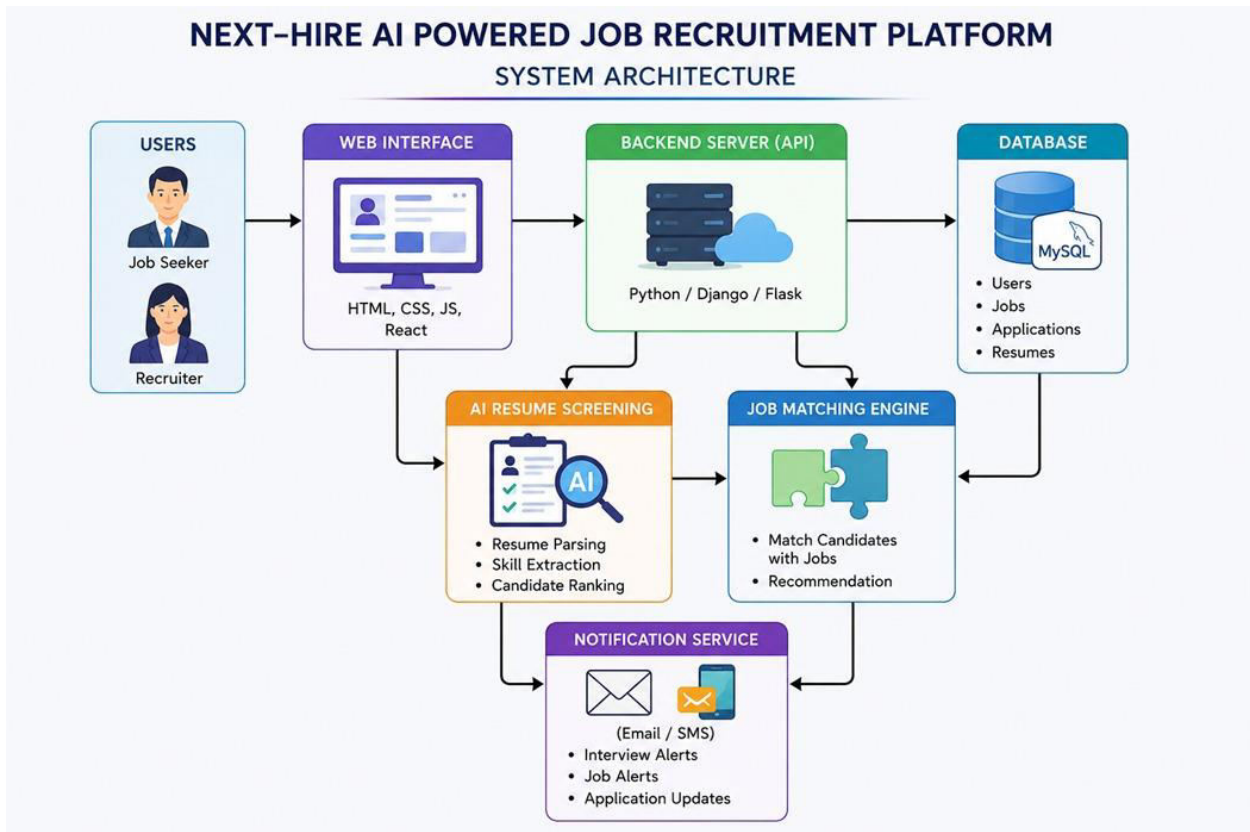
NEXT-HIRE is a Flask-based web application backed by a MySQL database with a Bootstrap-powered responsive frontend. It supports four user roles: Virtual HR Admin, Recruiters, Candidates, and the HR Avatar Bot. The overall recruitment pipeline flows as follows:

Candidate Registration → Resume Upload → SBERT Shortlisting → Aptitude Test (GBC) → Coding Test (Code2Vec) → AI Avatar Interview (T5 + MFCC + BiLSTM + Facial Analysis) → Score Aggregation → Hiring Decision

Table 1 summarises the seven core AI/ML modules integrated within NEXT-HIRE.

Table 1. NEXT-HIRE AI/ML Modules

Module	AI/ML Model	Function
Resume Screening	Sentence-BERT (SBERT)	Semantic cosine similarity matching
Aptitude Test	Gradient Boosting Classifier	Cognitive skill prediction
Coding Evaluation	Code2Vec	AST-based code quality analysis
Interview Questions	Fine-tuned T5 Transformer	Personalized question generation
Voice Analysis	MFCC + BiLSTM	Speech clarity & confidence scoring
Facial Analysis	Spatiotemporal Attention Net	Engagement & emotion detection
Final Decision	Weighted Aggregation Model	Candidate ranking & hiring advice





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## IV. SYSTEM SCREENSHOTS

The following figures illustrate the key interfaces of the NEXT-HIRE platform.

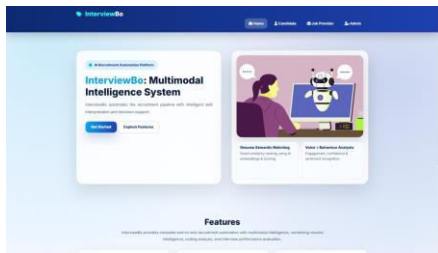


Fig. 1. Platform Home Page

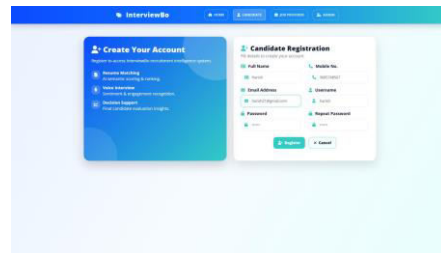


Fig. 2. Candidate Registration

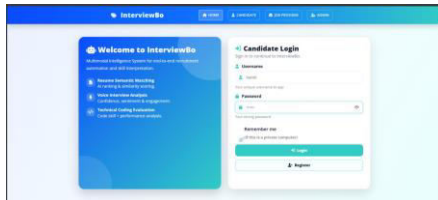


Fig. 3. Candidate Login Page

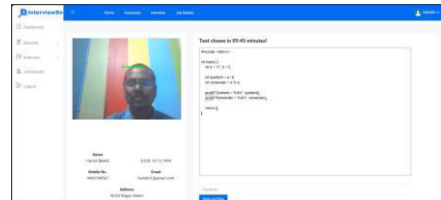


Fig. 4. Programming Skill Test

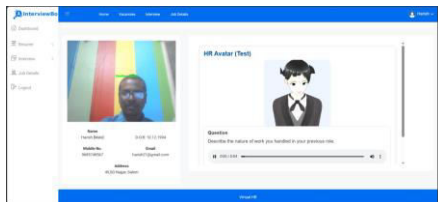


Fig. 5. AI HR Avatar Interview (Q1)

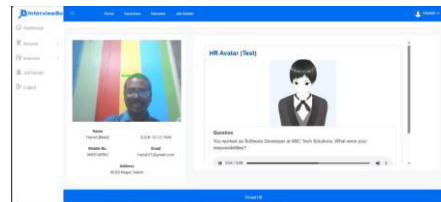


Fig. 6. AI HR Avatar Interview (Q2)

The home page (Fig. 1) presents the platform's features and entry points for all user roles. Candidate registration (Fig. 2) collects basic profile information before resume upload. After login (Fig. 3), shortlisted candidates proceed to timed assessments. Fig. 4 shows the programming competency module where candidates submit code under facial monitoring, with real-time emotion detection annotated on the webcam feed. Figures 5 and 6 illustrate the AI avatar interview, where the VRM-rendered HR Avatar presents resume-driven questions via synthesized speech while the candidate's facial engagement is continuously tracked.

## V. RESULTS AND TESTING

NEXT-HIRE underwent unit, integration, system, and user acceptance testing. Table 2 summarises the key test cases and their outcomes. All test cases passed successfully.

Table 2. Test Case Summary

TC ID	Description	Result	Status
TC001	Resume upload & SBERT matching	Candidate shortlisted correctly	Pass
TC002	Aptitude test (GBC scoring)	Performance score generated	Pass
TC003	Coding assessment (Code2Vec)	Coding score computed from AST	Pass



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TC004	AI avatar interview	Questions delivered; audio stored	Pass
TC005	Voice analysis (MFCC+BiLSTM)	Voice proficiency score produced	Pass
TC006	Facial behavior analysis	Engagement metrics computed	Pass
TC007	Score aggregation & ranking	Final performance index generated	Pass
TC008	Unauthorized access attempt	Access denied; error shown	Pass

Performance testing with JMeter confirmed that the system handles 50 concurrent sessions with average API response times below 1.2 s. Security testing verified role-based access control, AES-256 encryption of stored resumes and recordings, and resilience against common injection attacks. Two minor bugs were found and resolved: occasional facial analysis misclassification under low-light conditions (fixed via contrast normalisation preprocessing), and audio capture failure under high network latency (fixed via buffered streaming).

### VI. CONCLUSION

NEXT-HIRE demonstrates that the full recruitment lifecycle—from resume screening to final hiring decision—can be effectively automated using a combination of semantic NLP, ensemble ML, code representation learning, and multimodal deep learning. The platform eliminates the principal sources of bias and inefficiency in traditional hiring: manual screening, keyword filters, subjective interviews, and non-standardised coding evaluation. All critical test cases pass, and the system operates within practical performance bounds for deployment. Future work will focus on multilingual support, VR interview environments, cloud-scale deployment, and predictive post-hire analytics.

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