

NextGen: An AI-Powered Placement Preparation Platform with Integrated Proctoring, Adaptive Interviews, and ATS Resume Scoring

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Abstract—The dynamic demands of contemporary technical interviews and traditional placement preparation techniques have drastically diverged due to the quick evolution of recruitment tactics. This article presents NextGen, a comprehensive AI-powered placement preparation platform that offers engineering students a single, adaptable learning environment, eliminating the need for fragmented tooling. The system consists of six main components: an AI-driven mock interview simulator powered by the Gemini and OpenAI APIs; a guided resume builder with industry-aligned templates; an Applicant Tracking System (ATS); an automated coding and aptitude evaluation engine with instant feedback; a performance analytics dashboard offering personalised progress visualisation; and computer vision-based ethical proctoring using YOLOv5 and OpenCV for real-time anomaly detection. Independent validator nodes sign their observations, carry out real-time anomaly checks, and provide scored payloads to the backend aggregator. For tamper-proof audit trails, the hub aggregator gathers complete session data and anchors summary metrics including uptime, accuracy scores, and SHA-256 report hashes. React.js, Node.js/Flask, and MongoDB Atlas are used in the platform's scalable microservices design, which is implemented on cloud infrastructure. Experimental evaluation and a comparative feature analysis show that the platform offers significantly better customisation, ethical oversight, and SLA verifiability than centralised alternatives.

Index Terms—Placement preparation, computer vision, YOLOv5, natural language processing, resume scoring, mock interviews, ATS, performance analytics, React.js, Flask, MongoDB, adaptive assessment, proctoring, Gemini API.

I. INTRODUCTION

Finding a job becomes crucial as engineering programs come to a close. Businesses rely on placement criteria, and colleges guarantee near-complete placement rates—often reporting numbers around 90%—meaning that less than 10 out of every hundred graduates are unplaced. Although a dedication to thorough preparation reduces that disparity, the resources accessible to pupils are nonetheless general and compartmentalised. Students

will have to piece together several different services without a common feedback loop until there is a single, intelligent, integrated platform [1].

There is a big trust difference. Before a student gets to an interview, a single coding platform cannot explain to them why their resume was rejected. The student's performance on the previous aptitude test is unknown to a stand-alone mock interview instrument. The interview responses that revealed a communication flaw are forgotten by a resume scanner. The student must manually synthesise all signals since each tool operates independently [2].

A strong alternative is offered by recent developments in computer vision, artificial intelligence, and large language models. Examination integrity can be enforced in real time by object-detection networks like YOLOv5 [3]. Adaptive mock interviews can be carried out at scale by conversational AI models like Gemini and GPT-4 [4]. Resumes may be scored against job descriptions with nearly human accuracy using transformer-based NLP pipelines [6]. These technologies work together to create a cohesive, intelligent preparation ecosystem where all modules share context.

II. BACKGROUND AND RELATED WORK

A. AI-Based Online Proctoring Systems

Companies use their own infrastructure to conduct automated inspections on exam sessions from isolated server networks. Notable examples include Proctorio, Honorlock, and Respondus. Due to the vendor's exclusive control over session records and the lack of a cryptographic method for users to verify that reported results correspond with actual observations, reliance is totally dependent on one party. A framework using YOLOv5 and OpenCV was presented by Malik and Kumar [3] for the real-time detection of infractions such as multiple faces, mobile devices, and candidate absence. Their technology proved that automated proctoring can maintain exam integrity without human interaction. Nevertheless,

neither post-test performance analysis nor the creation of customised feedback are included in the study.

B. AI-Driven Virtual Interview Systems

AI as a substitute for human interviewers has been investigated in earlier research. A virtual interview system that uses sentiment analysis and NLP to create domain-specific questions and assess candidate responses for technical accuracy and communication quality was presented by Chauhan et al. [4]. However, the technology does not offer real-time scoring feedback throughout the session and does not have adaptive questioning logic.

C. Automated Resume Analysis

In business hiring, keyword-driven applicant tracking systems are now commonplace. According to Lee and Park [5], candidates are often eliminated prior to human assessment because of keyword mismatches rather than actual ability gaps. Li et al. [6] showed that transformer-based NLP models produce Pearson correlations more than 0.85 in semantic resume–job-description matching, indicating that smarter scoring is both possible and required for equitable candidate evaluation.

D. Identified Gaps

A critical analysis of the literature identifies three enduring gaps: (i) the lack of integrated platforms that combine proctoring, evaluation, and career readiness tools in a single system; (ii) the absence of data-driven, personalized performance feedback that spans multiple preparation modalities; and (iii) the inadequate real-time adaptability of AI-driven assessment tools. All three deficiencies are intended to be filled by NextGen inside a single, unified platform.

III. SYSTEM ARCHITECTURE AND DESIGN

A. Architectural Overview

To optimise each module's scalability, fault tolerance, and autonomous deployability, NextGen is based on a microservices architecture. TailwindCSS and React.js 18 are used to implement the frontend. The backend manages authentication, test orchestration, AI integration, and analytics computation while exposing RESTful APIs via Node.js (Express) and Flask. MongoDB Atlas is a fully managed NoSQL cloud database that handles data durability. JWT-based stateless authentication is used for communication via HTTPS. WebRTC technologies are used to encrypt webcam broadcasts for proctoring end-to-end. The system is set up using Docker-containerized services on AWS, Render, and Vercel.

B. Core Module Design

The platform comprises six primary functional modules:

- **AI Proctoring Engine:** detects multiple faces, unapproved gadgets, and prolonged absence by processing camera footage in real time with YOLOv5.
- **Coding & Aptitude Evaluator:** provides immediate analytical feedback after evaluating contributions in many languages against test scenarios.
- **Mock Interview Simulator:** adaptive, contextual interviews with real-time confidence and accuracy scoring are conducted using Gemini 1.5.
- **Performance Analytics Dashboard:** aggregates all session data into personalised visualisations and targeted recommendations.
- **Resume Builder:** combines session data to create tailored suggestions and visualisations.
- **ATS Resume Scorer:** generates a composite employability score with category breakdown by analysing resumes using spaCy and TensorFlow.

C. Database Schema

Users, Tests, Submissions, Interviews, Resumes, and Analytics are among the MongoDB Atlas collections. At the institutional level, compound indexing on timestamps and user identities guarantees effective query performance.

IV. IMPLEMENTATION

A. Frontend Development

The frontend was created with TailwindCSS and React.js 18. The student dashboard, test interface with camera proctoring overlay, resume editor, mock interview console, and ATS score report page are important views. Custom hooks and the React Context API are used in state management. Every component is tested and responsive on Windows, macOS, and Linux using Chrome and Firefox.

B. AI Proctoring Module

For real-time frame analysis at 30 frames per second, the proctoring module combines OpenCV and YOLOv5 (PyTorch). A specially annotated dataset of acceptable and unacceptable exam behaviours was used to refine the model. The admin portal receives notifications of detected infractions, which are timestamped and recorded in MongoDB. On the validation set, the system's mean average precision (mAP) is 91.3%.

C. AI Interview Module

Gemini 1.5 is used for conversational orchestration in the mock interview module. Deterministic scoring rubrics, contextual follow-up, and domain-specific question production are all guaranteed by an organised prompt-engineering approach. Technical accuracy, communication clarity,

and response confidence (derived from lexical diversity and sentence-complexity metrics) are the three criteria used to evaluate responses. Transcripts of sessions are kept for long-term progress monitoring.

D. ATS Resume Scorer

The ATS module combines a TensorFlow classifier trained on a labelled corpus of accepted and rejected resumes with a spaCy NLP pipeline for named entity identification and keyword extraction. A composite employability score (0–100) with a breakdown of skills alignment, experience relevance, formatting compliance, and keyword density is produced by the scorer.

E. Security Implementation

Authentication uses JWT tokens and bcrypt password hashing (cost factor 12). All data transmissions are TLS-encrypted. Webcam streams are processed in isolated server-side containers. Role-based access control (RBAC) defines three roles: Student, Faculty, and Placement Officer.

V. SYSTEM REQUIREMENTS

A. Hardware Requirements

Minimum end-user requirements are an Intel Core i5 8th-generation processor or AMD equivalent, 8 GB RAM (16 GB recommended), a 720p HD webcam at ≥ 30 frames per second, and a reliable broadband connection at ≥ 10 Mbps upload/download.

B. Software Stack

TABLE I: Technology Stack of NextGen Platform

Layer	Technology
Frontend	React.js 18, TailwindCSS
Backend	Node.js (Express), Flask (Python 3.11)
Database	MongoDB Atlas (NoSQL)
AI / ML	Gemini 1.5 API, OpenAI API, YOLOv5, spaCy, TensorFlow 2.x, OpenCV
Deployment	AWS, Render, Vercel (Docker)
Dev Tools	VS Code, Git/GitHub, Postman, Figma

VI. PROJECT WORK PLAN

Over the course of six months, development was conducted using a six-phase agile methodology. Stakeholder interviews were used in Phase 1 requirements analysis, which produced the SRS. Phase 2 resulted in the finished stack, Figma wireframes, and system architecture. The YOLOv5/OpenCV pipeline and all RESTful APIs were implemented in Phase 3.

The finished React.js frontend with backend APIs was delivered in Phase 4. Phase 5 included complete integration testing, an ATS scorer, and an AI interview module. Phase 6 finished documentation, user input gathering, and cloud deployment.

VII. RESULTS AND DISCUSSION

Fifty engineering students participated in the evaluation throughout the course of two test cycles. When compared to manual supervision, the examiner burden was reduced by about 78% thanks to the AI proctoring module's 91.3% mAP. On 100 test resumes, the ATS scorer showed a Pearson correlation of $r = 0.87$ with human recruiter rankings. Students' self-assessed interview readiness (five-point Likert scale) improved by 34% after doing three or more mock interviews. Strong acceptance was shown by the analytics dashboard's SUS score of 82.4. Institutional-scale scalability was confirmed by the system's 99.2% uptime during the test period, API latencies of 240 ms, and AI inference of less than 1.5 s.

TABLE II: Summary of Evaluation Results

Metric	Value
Proctoring detection mAP	91.3%
Examiner workload reduction	~78%
ATS scorer Pearson correlation	0.87
Interview readiness improvement	34% (Likert)
Platform SUS usability score	82.4 / 100
System uptime (evaluation)	99.2%
Avg. API response time	240 ms
AI inference endpoint latency	<1.5 s

VIII. CONCLUSION

NextGen, an all-inclusive AI-powered placement preparation platform, has been introduced in this paper. It combines resume creation, ATS scoring, automated assessment, ethical proctoring, adaptive mock interviews, and performance analytics into a single scalable solution. The platform directly addresses the fundamental shortcomings seen in current technologies, such as the lack of integrated analytics, ethical monitoring, and tailored feedback.

NextGen provides an adaptable, data-driven, and user-centric experience that bridges the gap between

academic preparation and industrial expectations by integrating YOLOv5, Gemini API, spaCy, and TensorFlow in a resilient microservices architecture. Future research will concentrate on LLM-based adaptive learning pathways, multilingual interview simulation, and real-time employer feedback loops for ongoing development.

REFERENCES

- [1] S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach*, 4th ed. Hoboken, NJ: Pearson, 2020.
- [2] D. Garg, S. Goel, and P. Pandey, "A review of AI-based tools for placement and career readiness in engineering education," *Int. J. Educ. Technol. High. Educ.*, vol. 19, no. 1, pp. 1–21, 2022.
- [3] S. Malik and A. Kumar, "Online exam proctoring system based on artificial intelligence," in *Proc. IEEE Int. Conf. Adv. Comput. Commun. Syst. (ICACCS)*, Coimbatore, India, 2023, pp. 145–151.
- [4] R. P. S. Chauhan, M. A. Khan, A. Patel, and S. Sharma, "AI-based virtual interview system using NLP and sentiment analysis," *Int. J. Res. Appl. Sci. Eng. Technol. (IJRASET)*, vol. 12, no. 3, pp. 214–220, 2024.
- [5] K. Lee and H. Park, "Keyword-driven applicant tracking systems: Impact on hiring outcomes and candidate experience," *J. Hum. Resour. Manag. Res.*, vol. 15, no. 2, pp. 88–104, 2023.
- [6] Y. Li, Z. Wang, and J. Chen, "Semantic resume–job description matching using transformer-based NLP models," in *Proc. ACL Workshop NLP Hum. Resour.*, 2023, pp. 67–75.
- [7] Proctorio Inc., "Proctorio automated remote proctoring," 2023. [Online]. Available: <https://proctorio.com>
- [8] J. Redmon and A. Farhadi, "YOLOv3: An incremental improvement," *arXiv preprint arXiv:1804.02767*, 2018.
- [9] A. Vaswani et al., "Attention is all you need," in *Proc. Adv. Neural Inf. Process. Syst. (NeurIPS)*, 2017, pp. 5998–6008.
- [10] Google DeepMind, "Gemini: A family of highly capable multimodal models," *Technical Report*, Google, 2024.