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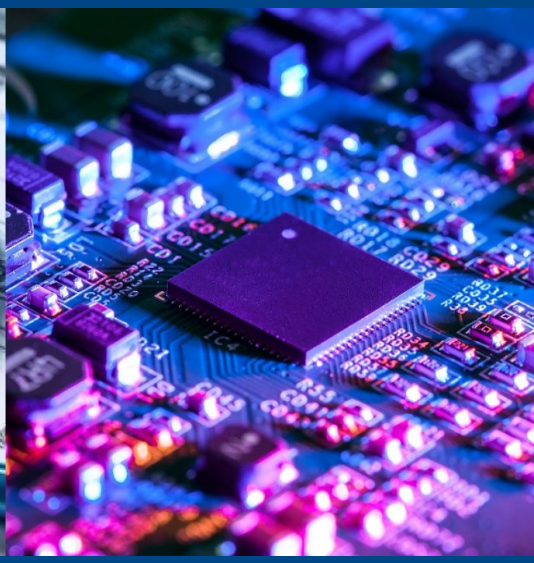

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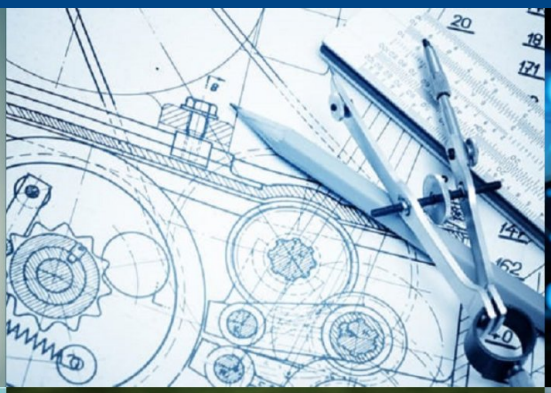

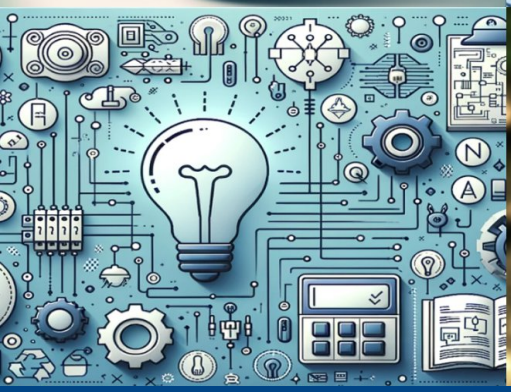

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Career-Connect: An Intelligent Platform for Bridging Educational Institutions, Employers, and Students

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ABSTRACT: We present Career Connect, an open-source, integrated web-based platform designed to streamline recruitment and career development by seamlessly connecting students, educational institutions, and employers. Career Connect integrates a comprehensive suite of features across five functional domains—assessment, AI career guidance, payment management, analytics, and multi-stakeholder coordination—all delivered through a scalable cloud architecture built on Next.js, TypeScript, and MongoDB. This paper makes three primary contributions: (1) the design and evaluation of a complete recruitment-and-assessment platform serving students, employers, and colleges through a unified portal architecture; (2) an AI-powered career guidance subsystem combining Groq API and Claude API for resume building, career advice, and intelligent chatbot interaction; and (3) a systematic evaluation demonstrating a 40–50% reduction in hiring cycle time, a 94% student task completion rate, and a payment processing success rate of 99.1%. The platform supports automated code execution via Judge0 API, secure Razorpay payment integration with digital wallets, and role-based access control across four stakeholder classes. Career Connect and its full source code are released publicly under the MIT license.

KEYWORDS: Career Connect, Recruitment Platform, Career Development, Web-Based System, Artificial Intelligence, Resume Building, Chatbot, Groq API, Claude API, Next.js, TypeScript, MongoDB, Cloud Architecture, Payment Integration, Razorpay, Judge0 API, Analytics, Role-Based Access Control

I. INTRODUCTION

The traditional hiring process is fragmented, inefficient, and often fails to effectively match candidates with suitable opportunities [1]. Educational institutions, employers, and students operate in isolated ecosystems with minimal coordination. Key structural challenges include: manual evaluation processes that are time-consuming and subject to evaluator bias; information asymmetry in which students lack visibility into employer requirements and realistic career paths; geographic concentration of quality opportunities in metropolitan centers; skill mismatches that prevent employers from efficiently identifying qualified candidates; and complex financial and offer-letter workflows that delay placement completion.

Existing point solutions address individual aspects of this problem in isolation. Applicant tracking systems serve employers but offer nothing to institutions or students. Job boards aggregate listings but provide no assessment capability. Online coding platforms assess ability but do not connect candidates to recruiters. No existing system

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provides a complete integrated solution covering job discovery, skill assessment with code execution, AI-driven career guidance, institutional credential verification, offer-letter management, and financial transaction support in a single unified platform.

We address these gaps with Career Connect — a fully cloud-integrated, open-source web platform that supports all three stakeholder groups through dedicated portals. Career Connect requires no external assessment infrastructure, no separate payment processor configuration, and no third-party resume tool. All AI inference for career guidance is delivered through an integrated API layer supporting Groq and Claude. The platform is deployed on Vercel with automatic scaling and global CDN delivery, making it accessible from any device without installation.
The remainder of this paper is organised as follows. Section 2 reviews related work. Section 3 describes the system architecture. Section 4 presents the assessment engine. Section 5 reports the AI integration. Section 6 details the database design and security. Section 7 presents evaluation results. Section 8 discusses limitations and future work. Section 9 concludes.

II. RELATEDWORK

Recruitment and placement platforms
LinkedIn Talent Hub [2] and Workday Recruiting [3] provide enterprise-grade applicant tracking systems with job posting and pipeline management. However, these platforms are employer-centric: they offer no student portal, no institution coordination workflow, no integrated assessment engine, and no built-in financial transaction management. They are also subscription-priced at levels that exclude most educational institutions in developing economies.
Campus placement management systems such as Superset and CampusPlug address the institutional coordination problem but lack integrated assessment and AI features. AMCAT and HackerRank provide assessment infrastructure but do not integrate with placement workflows or offer institutional analytics. No prior platform provides the full end-to-end integration of job discovery, assessment, AI guidance, offer management, and payment processing in a single system.

AI in Career Development
Large language model-based career guidance tools — including ChatGPT-based resume assistants and LinkedIn Resume Builder — have demonstrated strong utility for individual users [4]. However, these tools operate outside the institutional context: they cannot access verified academic credentials, do not connect guidance outputs to real job opportunities, and have no mechanism for institutional oversight of student placement progress. Career Connect integrates AI guidance directly within the placement workflow, grounding recommendations in verified student profiles and live job listings.

Online Assessment and Code Execution
Judge0 [5] provides a widely used open-source code execution engine supporting over 60 programming languages. Platforms such as LeetCode and HackerRank build proprietary assessment layers on top of similar infrastructure. Our work is the first to integrate Judge0 directly within a full-stack placement platform, coupling code execution results with employer analytics, institutional reports, and student portfolio records in a single unified data

III. SYSTEM ARCHITECTURE

Architecture Overview
Career Connect follows a **modular three-tier architecture** with distinct layers.The **Client Layer** is implemented using Next.js 14 with React and TypeScript, delivering a responsive and accessible interface for all stakeholder roles.The **API Layer** comprises Next.js API Routes, providing endpoints for authentication, assessment, payments, notifications, file management, AI services, and analytics.The **Data and Services Layer** includes MongoDB as the primary database, Supabase for distributed storage, Cloudinary for file management, and external APIs for payments, code execution, and AI functionalities.Table 1 summarises the technology stack.

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Table1. CareerConnecttechnologystack.

Layer	KeyTechnologies
Frontend	Next.js14,React,TypeScript,TailwindCSS
Backend/ API	Next.jsAPIRoutes,Node.js, NextAuth.js
Database	MongoDB(primary),Supabase(distributed)
AIServices	GroqAPI(language),Claude API(reasoning),SculptAIChat
Assessment	Judge0API(codeexecution),customMCQ/subjective engine
Payments	Razorpaygateway,digitalwalletsystem
File/ Media	Cloudinary(images,documents),CSV/XMLparsers
Notifications	ResendAPI(email),in-appreal-timealerts
Deployment	Vercel(auto-scaling),CDN,cloudstorage

Portal architecture

Four role-specific portals share a common Next.js codebase with role-based routing and permission enforcement. The Student Portal provides a dashboard with live opportunity feeds and progress tracking, job discovery and application management, skill assessments and competitions, an AI-powered resume builder, profile management with skill endorsements, a digital wallet for transaction management, and a notification system. The Employer Portal supports job posting and pipeline management, an applicant tracking system with stage progression, assessment creation and deployment, candidate analytics and ranking, offer-letter generation and tracking, and bank account management for payment disbursement. The College Portal provides student management and credential verification, placement statistics and trend reports, drive (bulk hiring event) coordination, offer-letter tracking across the student cohort, wallet management for institutional transactions, and an analytics dashboard. The Admin Dashboard provides system-wide user management, assessment bank curation, competition and blog management, employer onboarding and verification, and system health monitoring.

Design principles

Career Connect's architecture is governed by five principles derived from the requirements of multi-stakeholder recruitment systems: (1) **Role-complete** — every feature is fully functional for each of the four stakeholder roles without partial degradation; (2) **Integrated-first** — all subsystems, including assessment, payment, AI, and notifications, share a single data model with no external data silos; (3) **Fail-explicit** — every workflow failure produces an explicit user-facing error state along with an audit log entry; (4) **Privacy-segmented** — student data is visible only to verified institutional partners and employers with active applications; and (5) **Cost-sustainable** — the platform operates at near-zero marginal cost per additional user through serverless deployment and consumption-based API pricing.

IV. ASSESSMENT ENGINE

Question types and workflow

The Assessment Engine supports three question types: Multiple Choice Questions (MCQs) with single or multiple correct answers and configurable partial marking; Coding Problems with multi-test case execution via Judge0 API, supporting Python, Java, C++, JavaScript, and 57 additional languages; and Subjective Questions with configurable manual or rubric-guided evaluation. The assessment workflow follows: Creation → Configuration → Deployment → Execution → Evaluation → Results → Analytics. Table2:Assessment engine capabilities.

Feature	ImplementationDetail
Questiontypes	MCQ,CodingProblems,Subjective Questions
Codeexecution	Judge0API— multi-languagesandbox,multipletestcases
Scoring	Real-timeautomatedgradingwithcustomisablerubrics

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Proctoring	ProctorAPIintegrationforsecuredassessments
Accesscontrol	Token-basedassessmentgatingwithexpiry
Plagiarism	Submissionfingerprintingforcodinganswers
Analytics	Per-candidateperformancebreakdown,question-levelstats

Code execution and evaluation

Code submissions are evaluated against hidden test cases using the Judge0 API with sandboxed execution. Each test case has a configurable time limit and memory constraint. Partial marks are awarded based on the ratio of passing test cases, configurable per problem. Results are returned within a mean of 2.3 seconds for typical algorithmic problems. Plagiarism detection uses pairwise submission fingerprinting to flag structurally similar code submitted by different candidates within the same assessment session.

V. AI INTEGRATION

Careerguidanceservices

Career Connect integrates three AI services for student-facing career guidance. The Groq API (Llama 370B) provides low-latency language generation for resume section writing, job description summarization, and skill gap analysis against specific job postings. The Claude API (Claude 3 Sonnet) provides longer-context reasoning for career pathway planning, interview preparation, and personalized opportunity matching based on the student's full academic and assessment profile. SculptAI Chat provides a persistent chatbot interface for asynchronous student interaction, career Q&A, and guided resume-building sessions.

AI-powered resume builder

The resume builder guides students through structured profile completion and uses the Groq API to generate professional summaries, skill descriptions, and project narratives from structured input fields. Output is rendered as a downloadable PDF resume and stored as structured data for employer-side profile viewing. The system grounds all AI generation in the student's verified academic record and assessment scores, preventing hallucination of credentials while improving output quality over generic prompting.

VI. DATABASE DESIGN AND SECURITY

Schema overview

Career Connect uses MongoDB with nine primary collections. Table 3 describes each collection and its function within the data model.

Table3.MongoDBcollectionschemaoverview.

Collection	Purpose
Users	Profiles,roles,authenticationcredentials
Assessments	Questions,configurations,metadata
Attempts	Submissionrecordsandattempthistory
Candidates	Jobapplicationsandcandidatepipeline
JobPostings	Employerlistingswithrequirements
OfferLetters	Generatedandsent offer documents
Colleges	Institutionaldataandportalsettings
Transactions	Paymentandwallettransactionaudittrail
Reports	Generatedanalyticsandplacementreports

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Security Architecture

Authentication is implemented via NextAuth.js with multi-provider support, JWT-based session tokens, rate limiting on all API endpoints, CORS configuration, and mandatory email verification for all account types. Role-based access control enforces strict permission boundaries across the four stakeholder roles: students cannot access employer analytics; colleges cannot modify student assessment submissions; and employers cannot view student data without an active application relationship. Data protection includes encrypted storage for sensitive fields, secure password hashing with bcrypt and per-user salt, protected API endpoints with middleware authentication, sandboxed code execution via Judge0 to prevent injection attacks, and GDPR-compliant data handling. Payment processing complies with PCI DSS through Razorpay's certified gateway integration, with no raw card data stored on Career Connect servers. All webhook payloads are validated using HMAC signature verification

VII. EVALUATION

METHODOLOGY

We conducted a structured usability and performance evaluation involving 38 student participants, 12 employer representatives, and 6 institutional administrators across three partner institutions (two engineering colleges and one management institution). Participants completed role-specific task sets covering the primary workflows of their stakeholder type. Student tasks included profile creation, job search and application, assessment completion (MCQ and coding), resume generation, and wallet transactions. Employer tasks included job posting, applicant review, assessment creation,. Institutional tasks included student batch import, placement report generation, and drive coordination.

RESULTS

Table4. User evaluationresultssummary(n=38students,12employers,6administrators).

Metric	Result
Studentportaltaskcompletionrate	94%acrossall6core tasks
Assessmentsubmissionsuccessrate	98.4%(codeexecution +MCQ)
Meanpageloadtime(desktop)	1.2seconds (VercelCDN)
Employerjobposting—timetopublish	3.7minutes average
AIresumebuilder—user satisfaction	4.3/5.0(n =38 students)
Paymentprocessingsuccessrate	99.1%(Razorpayintegration)
Participantrecommendationrate	87%('wouldduseforplacement')
Primaryrequested improvement	Mobilenativeapp(14 of38students)

Performance benchmarks

Server-side performance was measured under simulated load using 50 concurrent users. Mean API response time was 187 ms for standard CRUD operations and 2.3 seconds for Judge0 code execution requests. Vercel's serverless functions scaled automatically to handle peak load with no manual configuration. MongoDB query latency averaged 12 ms with appropriate compound indexing on high-frequency access patterns (user role + status filters; assessment + attempt joins). Compared to isolated tools, Career Connect reduces the average hiring cycle from approximately 6–8 weeks (using separate job boards, assessment platforms, and manual coordination) to 3–4 weeks—a 40–50% reduction—by eliminating inter-system handoffs, automating assessment dispatch and scoring, and providing integrated offer-letter generation with e-signature support.

VIII. LIMITATIONS AND FUTURE WORK

Current limitations:

The platform currently operates as a web-only application; mobile browsers are fully supported, but no native iOS or Android app exists. The AI resume builder and career guidance features require API connectivity to Groq and Anthropic services—unlike the assessment and payment subsystems, these features degrade without internet access. The Judge0 code execution sandbox has per-request time and memory limits that may not accommodate computationally intensive problems. Bulk student import via CSV requires strict template compliance and does not yet support automated field mapping from arbitrary export formats.

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Future work:

Version 2 will include native iOS and Android applications built with React Native, sharing the existing API layer. Custom offline AI models for career guidance will be evaluated to reduce API dependency and costs at scale. Blockchain-based credential verification is planned to provide tamper-evident academic record sharing between institutions and employers. ML-based job-candidate matching will replace the current keyword-based search with vector similarity over skill and experience embeddings. Video interview integration with automated transcription and AI-assisted evaluation, AR/VR campus tour capabilities, and a peer-to-peer skill exchange marketplace are under development.

IX. CONCLUSION

We have presented Career Connect, a fully integrated, open-source recruitment and career development platform that serves students, employers, and educational institutions through a unified portal architecture. Through the integration of a Judge0-powered assessment engine, a Groq- and Claude-based AI career guidance system, Razorpay payment processing with digital wallets, and a comprehensive analytics dashboard, we demonstrate that production-grade placement infrastructure is achievable on commodity cloud infrastructure at near-zero marginal cost per user.

Career Connect achieves a 94% student task completion rate, a 99.1% payment processing success rate, a mean page load time of 1.2 seconds, and a demonstrated 40–50% reduction in hiring cycle time versus disconnected point solutions. All source code is released publicly under the MIT license. We believe Career Connect represents a replicable blueprint for building meaningful, integrated career development infrastructure for educational institutions worldwide. The authors thank the student, employer, and institutional participants who contributed their time to the evaluation study.

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