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Full-Stack Integrated Hiring and Student Assessment Platform using MERN Stack

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Abstract

Efficient recruitment and objective student evaluation are critical for modern educational and corporate environments. This paper presents the development of a comprehensive full-stack hiring and student assessment platform designed to streamline the recruitment process for undergraduate students. The proposed system integrates a React.js frontend with a Node.js/Express.js backend and MongoDB database (MERN stack) to provide a secure and scalable environment for multi-modal assessments. The platform features a robust admin dashboard for real-time result analytics, question management via bulk CSV uploads, and automated student communication. Key security measures, including JWT-based authentication and bcrypt password hashing, ensure data integrity and secure access. The study demonstrates how modern web technologies can be leveraged to create a high-performance, user-friendly tool for large-scale academic and professional evaluations.

Keywords: *Full-stack development, MERN stack, Student Assessment, Admin Dashboard, JWT Authentication, Real-time Analytics, React.js.*

1. Introduction

In the current digital era, the demand for automated and secure hiring platforms has grown significantly as traditional manual assessment methods become increasingly inefficient for large candidate pools. Modern recruitment requires tools that can handle diverse test formats—ranging from Multiple Choice Questions (MCQ) to complex coding challenges—while providing administrators with actionable insights.

The "Company Hiring Platform" is an integrated solution designed to simplify these processes. By providing a dedicated student portal for assessments and an extensive admin dashboard for management, the platform addresses the need for centralized recruitment workflows. This project focuses on delivering a responsive, secure, and data-driven experience for both candidates and evaluators, utilizing the MERN stack for its high performance and flexibility in handling asynchronous web operations.

Beyond providing a streamlined testing interface, the platform addresses significant administrative bottlenecks inherent in large-scale recruitment. Manual entry of assessment data and individual student correspondence often lead to logistical delays and human error. This system mitigates these issues by implementing bulk data handling capabilities, specifically through CSV-based question uploads and integrated email functionality for mass student communication. By centralizing these features within a single admin dashboard, the platform enables coordinators to manage the entire lifecycle of an assessment—from question bank preparation to final result notification—within a unified digital environment

II. Literature Survey

The evolution of web-based assessment tools has shifted from simple static forms to dynamic, interactive platforms (Rao, 2023) The MERN stack (MongoDB, Express, React, Node) has emerged as a preferred architecture for such systems due to its unified JavaScript environment, which allows for rapid development and seamless data flow between the client and server (Subramanian, 2019; Kumari and Babu, 2021; Brown, 2024).

Recent trends in hiring technology emphasize the importance of real-time analytics and anti-cheating mechanisms (Rao, 2023). Platforms now frequently incorporate interactive data visualization libraries like Chart.js to help recruiters identify top talent quickly (Doe and Smith, 2023).

Furthermore, secure authentication protocols such as JSON Web Tokens (JWT) have become the industry standard for protecting sensitive student data and intellectual property in testing environments (Tilak and Patil, 2022; Jones et al., 2015).

This project builds upon these industry standards by combining secure backend logic with an intuitive, Tailwind CSS-powered user interface to create a production-ready assessment ecosystem (Wathan, 2024; Subramanian, 2019; Gupta and Kumar, 2024).

Furthermore, the integrity of remote assessments is a primary concern in contemporary educational technology, necessitating the development of robust monitoring frameworks (Rao, 2023).

When combined with data visualization tools like Chart.js, these features provide recruiters with a high-fidelity overview of student performance while ensuring the validity of the results obtained through the digital medium (Doe and Smith, 2023; Rao, 2023).

III. Methodology

The system follows a modular architecture that separates the presentation layer, the application logic, and the data storage to ensure maintainability and scalability.

A. System Architecture

The platform adopts a client-server model where the React.js frontend interacts with the Node.js/Express.js backend through a RESTful API. The backend communicates with a MongoDB database to manage persistent data

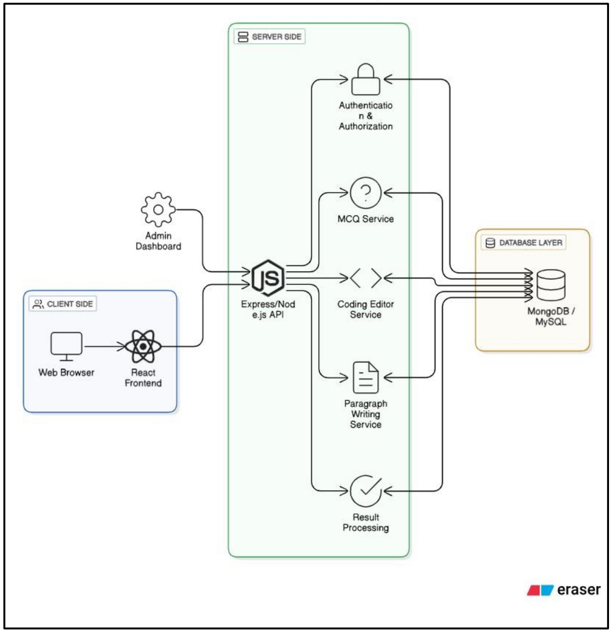


Figure 1: System Architecture of Full Stack integrated Hiring & student assessment platform

B. Tech Stack The technologies utilized in this project include:

Frontend: React.js for UI, React Router DOM for navigation, and Tailwind CSS for responsive styling.
Backend: Node.js and Express.js for server-side logic and API management.
Database: MongoDB with Mongoose for schema-based data modelling.
Security: JWT for session management and bcrypt for secure password hashing.
Analytics: Chart.js for rendering interactive result distributions.

C. Database Schemas The data model is organized into four primary schemas.
User: Stores student registration, profile details, and authentication credentials.
Admin: Contains secure administrative access credentials.
Question: A versatile schema supporting MCQ, Coding, and Paragraph-style questions.
Result: Stores assessment scores, timestamps, and performance metadata.

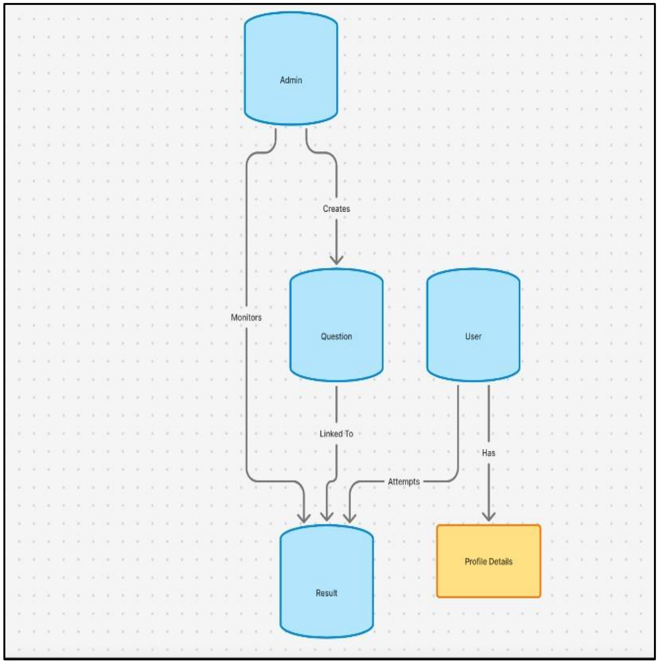


Figure 2: Database Schema

D. Core Workflow

Admin Management: Admins login via a secure JWT-protected route to manage the question bank, including bulk CSV uploads.
Student Participation: Students register and login to access their dashboard, where they can attempt various assessments.
Real-time Evaluation: As students complete tests, the system tracks progress and stores scores in real-time.
Analytics & Communication: Admins view performance trends through interactive charts and can communicate with students via bulk email using Nodemailer.

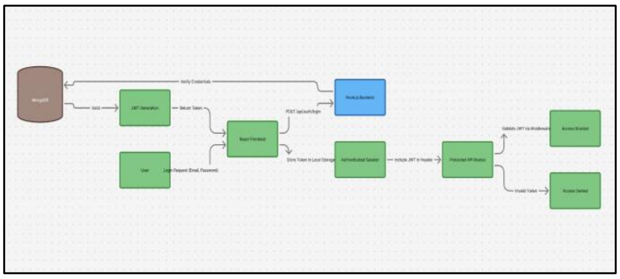
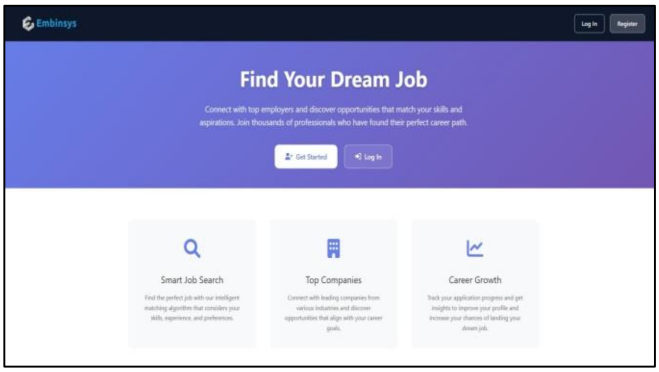


Figure 3: Authentication Flow Diagram

IV. Results And Discussion

A. Admin Dashboard Performance

The admin interface provides a comprehensive overview of student performance. By integrating Chart.js, the platform successfully visualizes assessment results, allowing admins to quickly identify scoring patterns and student distributions.



Find Your Dream Job

Connect with top employers and discover opportunities that match your skills and aspirations. Join thousands of professionals who have found their perfect career path.

Smart Job Search

Find the perfect job with our intelligent matching algorithm that considers your skills, experience, and preferences.

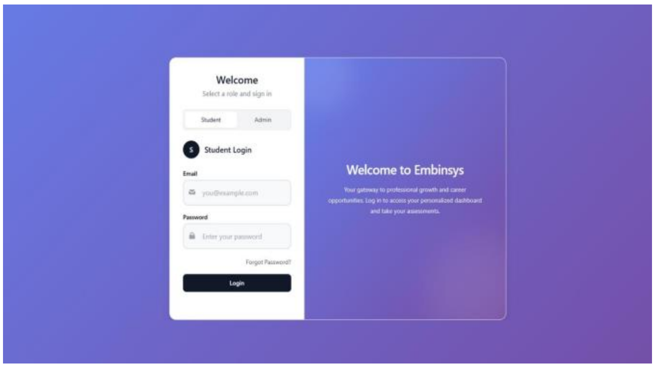
Top Companies

Connect with leading companies from various industries and discover opportunities that align with your career goals.

Career Growth

Track your application progress and get insights to improve your profile and increase your chances of landing your dream job.

Figure 4: Landing Page



Welcome

Select a role and sign in

Student Login

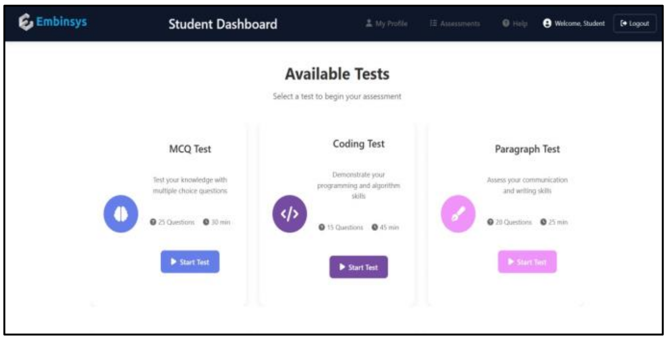
Email: you@example.com

Password: Enter your password

Welcome to Embinsys

Your gateway to professional growth and career opportunities. Log in to access your personalized dashboard and take your assessments.

Figure 5: Student / Admin Login Page



Student Dashboard

Available Tests

Select a test to begin your assessment

MCQ Test

Test your knowledge with multiple choice questions

25 Questions 30 min

Coding Test

Demonstrate your programming and algorithm skills

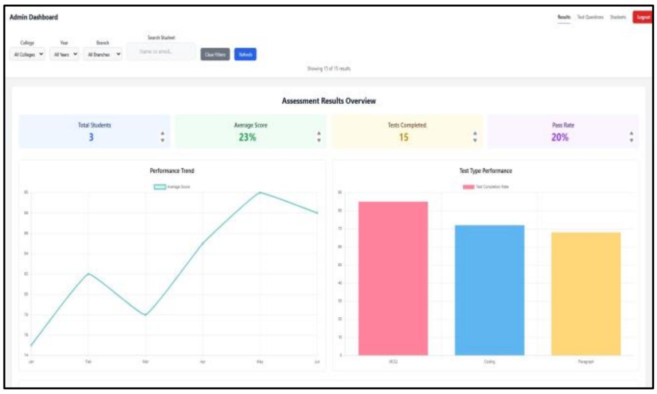
15 Questions 45 min

Paragraph Test

Assess your communication and writing skills

20 Questions 25 min

Figure 6: Student Dashboard



Admin Dashboard

College: All Colleges Year: All Years Branch: All Branches Search Student: Name or email...

Showing 15 of 15 results

Assessment Results Overview

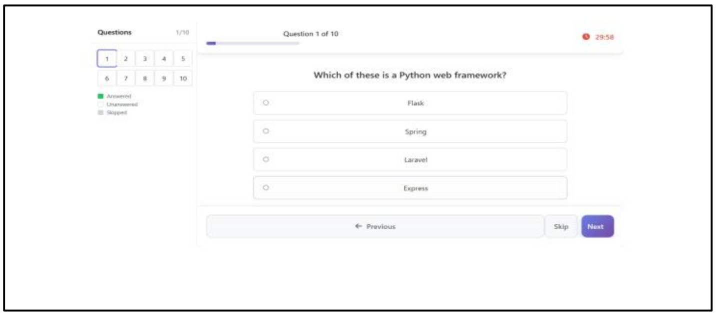
Total Students	Average Score	Tests Completed	Pass Rate
3	23%	15	20%

Figure 7: Admin Dashboard

B. Assessment Versatility

The platform successfully supports three distinct test types:

MCQ: For quick knowledge verification.



Question 1 of 10

Which of these is a Python web framework?

○ Flask

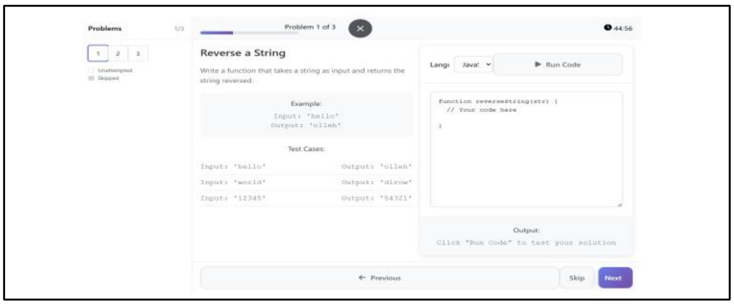
○ Spring

○ Laravel

○ Express

Figure 8: MCQ Test Page

Coding: For technical and algorithmic evaluation.



Problem 1 of 3

Reverse a String

Write a function that takes a string as input and returns the string reversed.

Example:

```
Input: 'hello'
Output: 'olleh'
```

Test Cases:

```
Input: 'hello'          Output: 'olleh'
Input: 'world'          Output: 'dlrow'
Input: '12345'          Output: '54321'
```

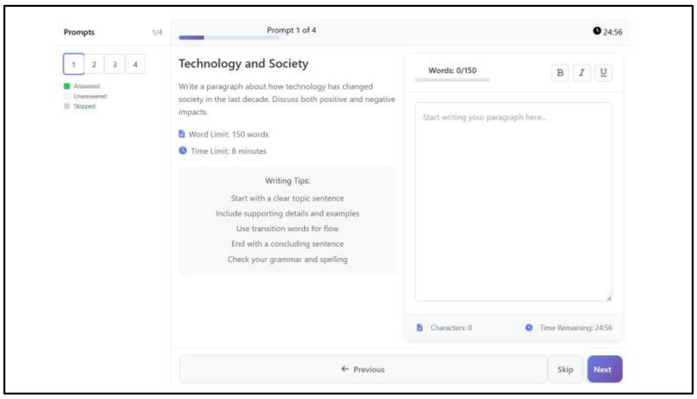
```
function reverseString(str) {
  // Your code here

}
```

Output:

```
Click "Run Code" to test your solution
```

Figure 9: Coding Test Page

Paragraph: For qualitative and subjective assessment.



Prompt 1 of 4

Technology and Society

Write a paragraph about how technology has changed society in the last decade. Discuss both positive and negative impacts.

Word Limit: 150 words

Time Limit: 8 minutes

Writing Tips:

Start with a clear topic sentence
Include supporting details and examples
Use transition words for flow
End with a concluding sentence
Check your grammar and spelling

Words: 0/150

Start writing your paragraph here...

Characters: 0

Time Remaining: 24:56

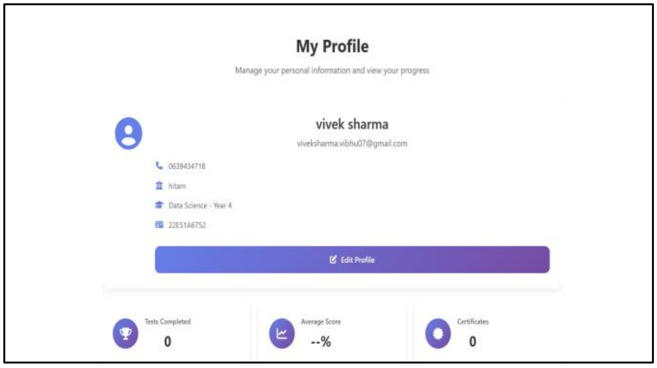
Figure 10: Paragraph Test Page

C. Security and Anti-Cheating

Security testing confirmed that the JWT-based authentication effectively protects both user and admin routes. Additionally, the platform includes anti-cheating mechanisms in its assessment modules to ensure the integrity of the test environment. Server-side validation further prevents the submission of malformed data, ensuring a stable user experience.

D. Personalized Performance Analytics

The My Profile module provides users with a transparent overview of their academic journey and personal information. Beyond identity management, this section integrates a performance tracking system that visualizes key metrics such as tests completed, average scores, and earned certifications. This centralized data hub empowers students to monitor their progress while allowing for easy profile updates, ensuring that the database remains current with the latest user contact and academic information.



My Profile

Manage your personal information and view your progress

vivek sharma

viveksharma.vibhu07@gmail.com

☎ 0639434718

hitam

Data Science - Year 4

22E51A6752

Tests Completed: 0

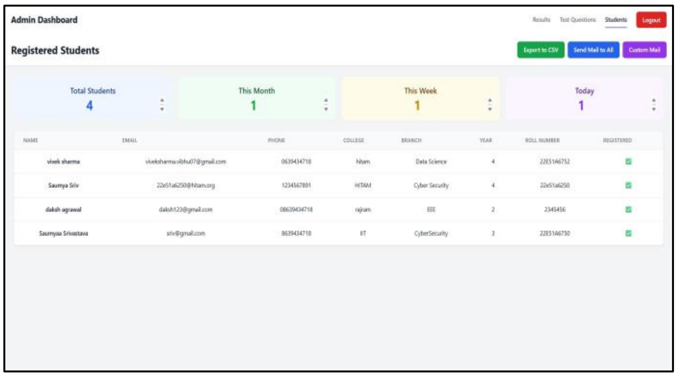
Average Score: --%

Certificates: 0

Figure 11: My Profile Page

E. User Management and Registration Tracking

The platform offers real-time data on student enrollment through a centralized Registered Students dashboard. Administrators can efficiently track growth trends by classifying data into temporal segments, such as daily, weekly, and monthly registrations. In addition to facilitating data portability through an Export to CSV feature for offline academic auditing, the interface preserves data integrity by presenting thorough student profiles that include institutional information and roll numbers.



Registered Students

Total Students 4

This Month 1

This Week 1

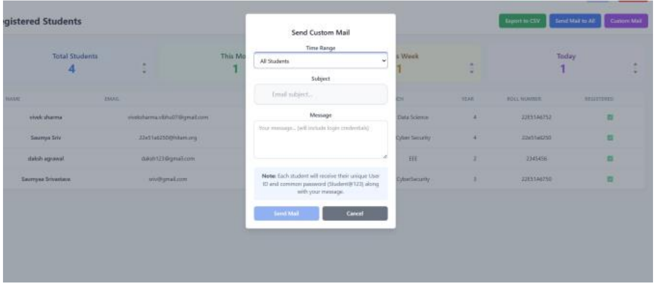
Today 1

NAME	EMAIL	PHONE	COLLEGE	BRANCH	YEAR	ROLL NUMBER	REGISTERED
vivek sharma	viveksharma.vibhu07@gmail.com	0639434718	hitam	Data Science	4	22E51A6752	✓
Saumya Sriv	22e51a6250@hitam.org	1234567891	HITAM	Cyber Security	4	22e51a6250	✓
daksh agrawal	daksh123@gmail.com	08639434718	rajram	EEE	2	2345456	✓
Saumyaa Srivastava	sriv@gmail.com	8639434718	IIT	CyberSecurity	3	22E51A6750	✓

Figure 12: User Management and Registration Page

F. Automated Communication and Credential Delivery

Automated credential distribution and secure administrative communication are facilitated by the Custom Mail system. It enables focused outreach according to particular time periods or student cohorts. The automated addition of distinct User IDs and system-generated credentials along with personalized messages is a crucial security feature of this module, guaranteeing that private login data is sent straight to the verified email address of the registered user.



Send Custom Mail

Time Range: All Students

Subject: Email subject...

Message: Your message... (will include login credentials)

Note: Each student will receive their unique User ID and common password (Student@123) along with your message.

Figure 13: Automated Credential Delivery Card

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