Project Report: ExamPro - An Online Proctoring System

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1. Project Overview

ExamPro is a secure, web-based platform designed to create, manage, and conduct online examinations. It provides distinct interfaces for **administrators** and **students**. The system's core feature is its AI-driven proctoring, which uses eye-tracking technology to monitor students during exams, ensuring academic integrity.

Administrators can create exams, view analytics on student performance, and review proctoring data. Students can take exams, view their scores, and manage their profiles. The platform is built with a modern technology stack, ensuring a robust and scalable solution for online assessments.

2. Technology Stack

The project leverages a combination of modern web technologies for its frontend, backend, and database components.

Frontend:

- **HTML5 & CSS3:** Used for structuring and styling.
- **JavaScript (Vanilla):** Powers client-side interactivity and API communication.
- **Chart.js:** JavaScript library for analytical charts on the admin dashboard.
- **WebGazer.js:** Core library for AI proctoring, providing real-time eye-tracking.

Backend:

- **Node.js:** JavaScript runtime environment for server-side application.
- **Express.js:** Node.js web application framework for building the REST API.

Database:

- **MongoDB:** NoSQL database for all application data, including user profiles, exam content, submissions, and proctoring metadata.

Key Libraries & Tools:

- **bcrypt:** Securely hashes user passwords.
- **Multer:** Node.js middleware for file uploads.
- **Nodemon (Implied):** Utility for automatic server restarts during development.

3. Core Features & Functionality

The application is divided into two main roles: Admin and Student.

Admin Portal

Secure Login

Admins have a dedicated login portal. Default admin email is admin@exam.pro.

Analytics Dashboard

Visualizes key metrics: Average Score Per Exam (bar chart) and Overall Pass/Fail Rate (pie chart).

Exam Management

Full control over exams: create new exams with title, time limit, and questions (Multiple Choice, True/False); view & delete exams.

Review Submissions

Review proctoring snapshots, highlighting gaze deviation for potential cheating.

View All Data

Comprehensive view of all system data in sortable tables: registered users, created exams, proctoring snapshots with metadata.

Student Portal

User Authentication

Students can create an account with full name, email, and password. All passwords are encrypted.

Student Dashboard

Personalized landing page with available exams and recent results summary.

Profile Management

Update full name, change password, upload/view/remove profile picture, view personal statistics, delete account.

My Results Page

Detailed history of completed exams: title, date taken, score, and final percentage in tabular format.

Exam Results Screen

Displays score and percentage immediately after exam submission.

4. AI Proctoring System Explained

The AI proctoring system is a key feature of ExamPro, designed to ensure a fair testing environment.

Camera Calibration

Mandatory process before exam: student looks at and clicks dots to calibrate WebGazer.js for accurate eye-tracking.

Gaze Tracking

System tracks student's gaze in real-time via webcam. Gaze outside screen bounds for sustained period is flagged as deviation.

Warning System

Red-bordered warning "PLEASE LOOK AT THE SCREEN" appears over proctoring feed when gaze deviation is detected, prompting refocus.

Automated Snapshotting

Snapshots taken every few seconds, saved to server. If gaze deviation flagged during snapshot, event recorded in database, linking image to potential integrity violation for admin review.

5. How to Set Up and Use the Application

Follow these steps to get the ExamPro system running on a local machine.

Prerequisites

- **Node.js:** Ensure Node.js is installed.
- **MongoDB:** Make sure a MongoDB instance is running and accessible.

Installation & Setup

1. **Install Dependencies:** Run `npm install` in the project's root directory.
2. **Database Configuration:** Ensure MongoDB is accessible at `mongodb://localhost:27017` or update `server.js` and `migrate_passwords.js`.
3. **Run Password Migration (Important):** Run `node migrate_passwords.js` before starting the server.
4. **Start the Server:** Launch with `node server.js`.

How to Use ExamPro

1. **Access the Application:** Navigate to `http://localhost:3000` in your browser.
2. **Admin Usage:**
   - Click "Admin Login".
   - Sign up with `admin@exam.pro` and a secure password.
   - From dashboard, Create Exams, Review Submissions, or view All Data.
3. **Student Usage:**
   - Click "Student Login" then "Sign up for free" to create account.
   - Dashboard displays available exams.
   - "Start Exam" initiates camera calibration, then exam begins.
   - View exam history on "My Results" and manage info on "Profile".

6. Future Enhancements & Challenges

Future Enhancements

LMS Integration

Seamless integration with popular Learning Management Systems (LMS) for streamlined exam delivery.

Advanced AI Modules

Implement facial recognition, voice pattern analysis, and multi-screen monitoring for enhanced security.

Expanded Question Types

Support for essay, coding, and diagram-based questions to cater to diverse academic needs.

Performance Optimization

Enhance scalability and load balancing to support a larger concurrent user base and high exam volumes.

Key Challenges

Data Privacy & Security

Continuously address concerns regarding student data protection and compliance with evolving regulations.

AI Proctoring Accuracy

Minimising false flags while ensuring robust detection of suspicious behaviour to maintain academic integrity.

User Onboarding

Streamlining the setup process and providing comprehensive technical support to new and existing users.

System Reliability

Ensuring uninterrupted service and stability during peak examination periods with high traffic loads.

ExamPro: Project Conclusion

ExamPro delivers a comprehensive and reliable online proctoring system, meticulously designed to ensure fair and secure examination environments. With its robust architecture, intuitive interfaces, and cutting-edge AI capabilities, ExamPro is poised to revolutionise digital assessments.

Empowering Secure Education

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