Alumni Connect: A Secure Web-Based Platform Using Facial Recognition And NLP For Student-Alumni Engagement

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Abstract- *The Alumni Connect platform is a modern, web-enabled system built to strengthen bonds between former and current students, raising the likelihood of meaningful employment connections while encouraging alumni participation within their academic communities. Conventional alumni systems rely heavily on manual processes, lack robust security, and offer no intelligent talent-matching capabilities. The Alumni Connect application addresses these gaps through a user-friendly interface featuring biometric login using the Grassmann-based facial recognition algorithm, a centralized admin module for managing records and events, and an NLP-driven job recommendation engine that aligns student skills with available opportunities. Alumni can maintain professional profiles, post job vacancies, and participate in mentorship programs, while students can explore alumni networks, upload their resumes, and receive personalized career guidance. The platform builds a structured, secure, and intelligent bridge between alumni and students, significantly improving networking, career placement, and institutional engagement.*

Keywords: Alumni Management, Facial Recognition, Grassmann Algorithm, Natural Language Processing, NLP, Web Application

I. INTRODUCTION

The Alumni Connect system is a web-based application designed to build meaningful relationships among educational institutions, alumni, and current students using an intelligent and secure digital platform. Existing alumni systems have long depended on manual workflows, spreadsheets, and basic web portals that are inadequate in terms of security, data management, and career support.

This project introduces a fundamentally upgraded approach: biometric authentication via facial recognition, automated data management, and artificial intelligence (AI)-powered job matching.Three key stakeholders interact with the system: Admin, Alumni, and Students. The Admin oversees all user records, including personal details and facial data, while Alumni and Students gain access through the Grassmann Algorithm, which authenticates identities by comparing live facial features with stored templates.

Upon logging in, alumni can update their professional profiles with their current employer, role, and academic background, providing students with visibility into diverse career paths. They can also post job openings directly from their profiles. Students can search alumni profiles, explore career opportunities, and submit their resumes. The system then uses Natural Language Processing (NLP) to match each student's skills and experience against available job postings, delivering tailored recommendations that meaningfully narrow the gap between student readiness and employer expectations.

II. LITERATURE SURVEY

2.1 Existing System

Alumni and student data have traditionally been managed through manual records or low-capability online tools, with username-and-password combinations as the only access control mechanism. These approaches are vulnerable to misuse and lack the intelligence to provide effective career support. Communication between alumni and students occurs informally across various unconnected channels, making mentorship tracking and event coordination cumbersome. Job vacancies circulate through notice boards or social media with no tailored matching based on individual profiles. The absence of a unified, intelligent platform has left students without timely and relevant guidance and has created fragmented and inefficient alumni engagement.

2.2 Disadvantages of Existing Systems

- Traditional username-password login offers weak security and is prone to unauthorized access.

- Manual data management for alumni and student records leads to frequent errors and delays.
- No intelligent job recommendation engine exists to match students with opportunities based on their skills.
- Job postings are shared via unstructured channels, resulting in missed or irrelevant opportunities.
- Mentorship and alumni-student interactions remain sporadic and uncoordinated.

III. SYSTEM ANALYSIS

3.1 Proposed System

Alumni Connect is an advanced, intelligent platform that replaces traditional methods with secure, streamlined digital experiences. The Grassmann-based facial recognition algorithm serves as the primary authentication mechanism, eliminating the need for passwords. A centralized administrative module enables the efficient management of user records, upcoming events, and mentorship programs. Alumni can maintain profiles and advertise job openings, whereas students can upload resumes and receive NLP-generated job recommendations tailored to their backgrounds.

The system promotes structured communication, enhances career guidance, and improves placement outcomes through smart automation. It offers a scalable, modern solution for alumni engagement and student career development that can be adopted by any educational institution.

3.2 Advantages

- Password-free biometric authentication significantly improves security and user experience.
- Automated data management reduces manual effort and minimizes errors.
- NLP-based job recommendations provide accurate and personalized career guidance.
- Direct alumni-student interactions foster structured mentorship and career networking.
- Centralized event and mentorship management improves coordination and participation.
- Intelligent job matching accelerates student placement and career readiness.

3.3 System Architecture

The proposed architecture follows a three-tier model comprising the Presentation Layer (front-end web interface), Application Layer (Python-Flask back-end logic), and Data Layer (MySQL database). Facial recognition runs as a middleware service using the Grassmann algorithm, intervening between login requests and database verification. NLP processing is triggered when a student uploads a resume, extracting term frequencies, and comparing them against stored job descriptions.

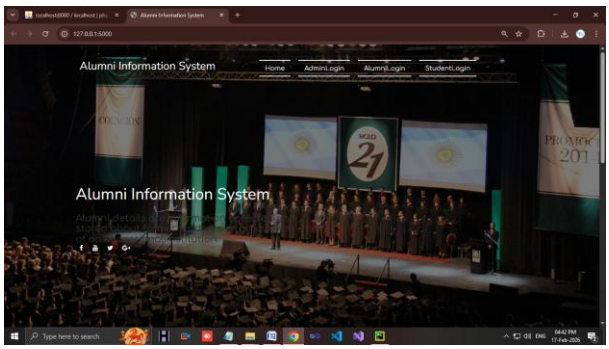

Fig. 1: System Architecture Overview

IV. SYSTEM REQUIREMENTS

4.1 Hardware Specifications

- Processor: Dual Core, 2.60 GHz
- RAM: 4 GB
- Hard Disk: 320 GB
- Monitor: 15-inch Colour Display
- Standard Keyboard and Mouse

4.2 Software Specifications

- Operating System: Windows OS
- Front End: HTML, CSS, JavaScript
- Back End: Python (Flask Framework)
- Database: MySQL Server
- IDE: Python 3.7 IDLE

4.3 Technology Overview

The front end uses HTML5 to structure content, CSS3 (including Flexbox and Grid) for responsive design, and JavaScript for dynamic interactivity and real-time DOM manipulation. Modern JavaScript frameworks, such as React and Vue.js, were considered for future scalability. On the back end, Python provides the core logic, which is interpreted, dynamically typed, and highly extensible. Python's readability and rich ecosystem of libraries (Flask, NLTK, OpenCV) made it a natural choice for this project. MySQL serves as a relational database, offering multi-user support, robust querying, and seamless integration with Python via the mysql-connector library. The combination of these technologies

delivers a performant, maintainable, and production-ready full-stack application.

V. SYSTEM IMPLEMENTATION

5.1 Use Case Diagram

The use case diagram illustrates how each actor (Admin, Alumni, and Student) interacts with the core system functions. The Admin manages users, events, and mentorship slots; Alumni authenticate via face recognition, manage profiles, and post jobs; and Students log in biometrically, explore alumni profiles, upload resumes, and view job recommendations.

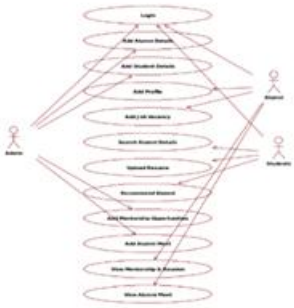

Fig. 2: Use Case Diagram

5.2 Class Diagram

The class diagram models the object-oriented structure of Alumni Connect, capturing entities such as User, Admin, Alumni, Student, Job, MentorshipProgram, and AlumniMeet, along with their attributes and relationships. It serves as a blueprint for database schema design and back-end module development.

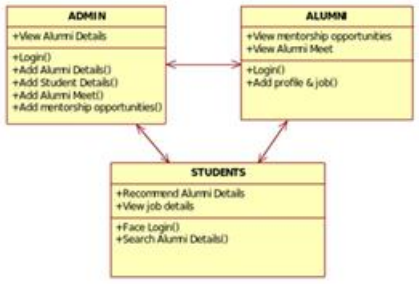

Fig. 3: Class Diagram

5.3 Sequence Diagram

The sequence diagram traces the chronological flow of messages between objects during key scenarios, most notably the facial recognition login flow and resume-based job recommendation process. It highlights the timing and dependencies of system interactions, making it easier to identify performance bottlenecks and security check points.

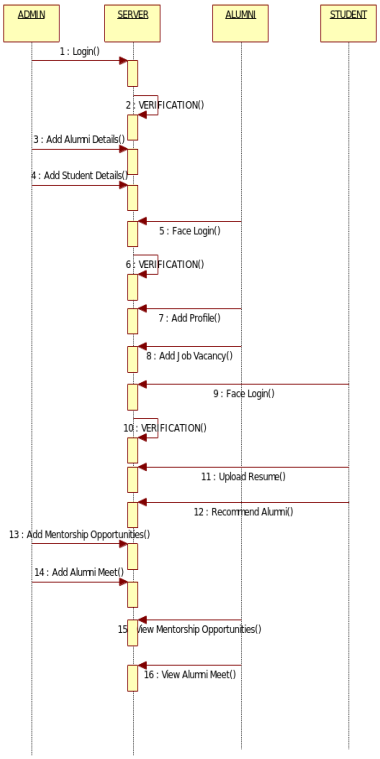

Fig. 4: Sequence Diagram

5.4 Activity Diagram

The activity diagram captures the step-by-step workflows within the system, from user registration and biometric login to profile updates, job postings, and resume uploads. It uses decision nodes to represent conditional logic and parallel bars to show concurrent processes, providing a clear operational map of the application process.

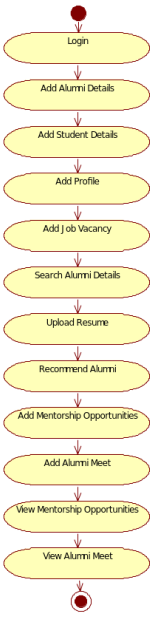

Fig. 5: Activity Diagram

5.5 Data Flow Diagram

The Data Flow Diagram (DFD) models how data moves through the Alumni Connect system. The Level 0 (Context) diagram treats the entire system as a single process and shows its interaction with external entities: Admin, Alumni, and Students. The Level 1 diagram breaks this into the system's main functions: user management, authentication, profile handling, job management, and recommendation. Level 2 diagrams provide further granularity for complex modules, such as the NLP recommendation engine.

VI. MODULE DESCRIPTION

6.1 Admin Module

The Admin module is the control center of the platform. Administrators log in with standard credentials and gain full access to the student and alumni records. Key sub-functions include adding and managing alumni and student details (including facial data), scheduling alumni meet events, and posting mentorship opportunities. **This *module*** ensures data accuracy, access control, and event coordination throughout the platform.

6.2 Alumni Module

Alumni are authenticated exclusively through facial recognition using the Grassmann algorithm. Once inside, they can build and update their professional profiles, including their current employer, role, and higher education history. Alumni can also post job vacancies with full details, such as job title, required skills, and number of openings. Additionally, they can browse mentorship opportunities and view scheduled alumni meet events, thereby staying actively connected with their academic community.

6.3 Student Module

Students use the same biometric login mechanism as alumni, ensuring consistent security across all the user types. After logging in, students can search alumni profiles by department, company, or skill set to explore their career paths. They can upload their resumes in PDF or DOCX format, which the NLP engine processes to extract key terms. These terms are matched against job postings in the database, and personalized recommendations are surfaced for the student, automating what would otherwise be a time-consuming manual job search.

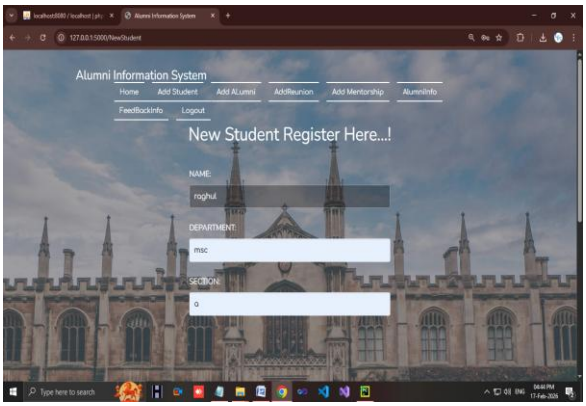

Fig. 6: Student Dashboard

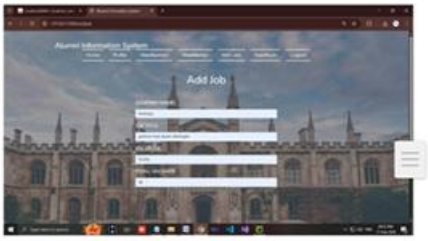

Fig. 7: Alumni Job Posting Interface

VII. VERIFICATION AND VALIDATION

7.1 Verification

During registration, all user-provided data, including name, email, institution ID, and face image, undergo format checks and database validation to ensure completeness and uniqueness. The facial recognition system captures each user's face during registration and stores it securely. On subsequent logins, the live feed is compared with this stored template using the Grassmann algorithm. An administrator reviews and approves new accounts, job posts, and mentorship programs to prevent fraudulent entries. Resume uploads and job postings are checked for formatting completeness before being processed or published.

7.2 Validation

Every input field in the system is validated against format rules, required length, and data type before acceptance. Email addresses were unique to prevent duplicate accounts. Login credentials are cross-verified with biometric data to ensure that only authorized users gain access. Profile fields for both alumni and students were checked for completeness and proper formatting. Resume files were validated for type (PDF or DOCX) and size. Job postings must include a title, description, and eligibility criteria before they go live. Event scheduling validates the date and time against the system constraints. Together, these validation layers ensure data integrity, system reliability, and a seamless user experience.

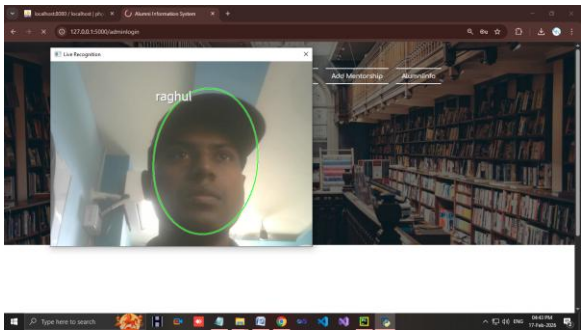

Fig. 8: Face Recognition Login Screen

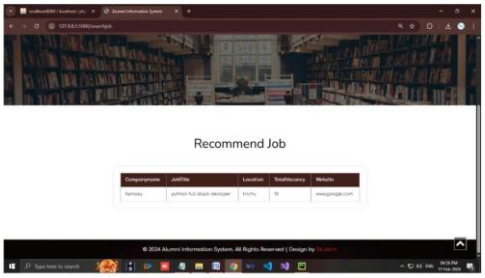

Fig. 9: NLP-Based Job Recommendation Output

VIII. CONCLUSION AND FUTURE ENHANCEMENTS

8.1 Conclusion

The Alumni Connect system delivers a comprehensive, secure, and intelligent solution to bridge the gap between educational institutions, alumni, and current students. By combining biometric authentication via the Grassmann facial recognition algorithm with NLP-driven job matching, the platform goes beyond what traditional alumni systems offer. Alumni can actively manage their profiles, post vacancies, and participate in mentorship programs, while students benefit from structured networking, career exploration, and automated job recommendations. The platform not only reduces administrative overhead but also increases student placement opportunities and alumni engagement. This represents a meaningful step forward in how academic communities stay connected and support one another across generations.

8.2 Future Enhancements

Several enhancements are planned to further improve the platform. Advanced AI algorithms will enable more nuanced and preference-aware career recommendations based on real-time industry trends. Push notifications will keep alumni and students informed about upcoming events, job openings and mentorship slots. Video-based mentoring sessions and live webinars expand learning opportunities. A mobile application will make the platform accessible on the go, and multilingual support will open it up to a broader international audience.

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