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Alumni Connect: Enhancing Alumni Networking And Support With Ai Assistance Using Langgraph And Pinecone

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Abstract- — In order to build solid relationships between colleges, their alumni, and present students, alumni en- gagement is essential. A specialized platform called ALUMNI CONNECT: BRIDGING THE GENERATION was created to strengthen these connections by offering a controlled, engaging envi- ronment for networking, career development, and mentoring. Key elements of the platform include job advertising, mentorship programs, discussion boards, guidance requests, regional alumni filters, alumni contributions, including donations, lab installations, and event planning. Furthermore, it maintains a trustworthy community by removing phony accounts and verifying profiles to guarantee authentic- ity. The initiative's main driving forces are the underutilization of alumni networks and the dearth of easily accessible, individualized student counseling. By tackling these issues, the platform encour- ages deep connections, allowing alumni to commemorate successes and offer insightful career guidance and university-specific recommendations. Students can close the gap between academic accomplish- ment and career success by gaining access to industry connections and mentorship possibilities through increased engagement. In order to improve professional development and institutional linkages,this project seeks to establish a smooth and effective alumni-student engagement paradigm. ALUMNI CONNECT hopes to create a thriving self-sustaining ecosystem that benefits both students and alumni by utilizing technology to promote involvement.

Keywords:-Career development, University Participation, Professional Advancement, Student advice, Mentorship, Fund raising and Alumni Network, AI Chatbot, Langgraph.

I. INTRODUCTION

1. Background

Alumni networks, which provide chances for networking, mentoring, fundraising, and institutional development, are an essential part of an educational institution's identity. These networks have historically been run through unofficial social media communities or simple alumni directories, which frequently lack the organized elements required for ongoing participation. Students need more than just academic knowledge in today's cutthroat economy; they also need access to industry connections, professional advice, and individualized mentoring. At the same time, alumni frequently look for more significant methods to support their old mater than sporadic gifts or reunions.

2. Problem Statement

Alumni networks have promise, however most schools don't fully exploit it for the following reasons:

Insufficient Centralized Engagement: Current portals frequently function as static contact lists instead as hubs for active engagement.

Problems with Trust and Verification: When there are phony or unconfirmed profiles on the net- work, its dependability is diminished.

Restricted Customization: Students have little access to mentorship or career guidance unique to their school.

Communication Channels That Are Fragmented: Job advertisements, mentoring programs, fundrais- ing, and event preparation frequently take place on different platforms.

3. Objectives

Establishing a robust and encouraging alumni-student environment that encourages ongoing partic- ipation and cooperation is the main goal of Alumni Connect: Bridging the Generation. Through interactive discussion boards, structured mentorship programs, and direct messaging, the platform seeks to: Improve Communication: Encourage smooth conversation.

Offer Academic and Career Guidance: Make internships, employment, and professional coun- seling from seasoned graduates easier to acquire.

Encourage Alumni Contributions: Give alumni the opportunity to organize events, set up labs, and make financial contributions.

Establish a strong profile verification mechanism: to get rid of phony accounts and preserve network reputation in order to ensure trust and authenticity.

Encourage Networking and Knowledge Sharing: To improve institutional relationships, es- tablish lively platforms for professional and scholarly debates.

Pay attention to accessibility and usability: Create an interface that is simple to use and intuitive to guarantee active involvement and quick access.

Include all contributions and fundraising: efforts in one system, including gifts, lab installa- tions, and event sponsoring.

4. Scope and Contibution

The suggested platform offers a number of features that aren't found in many alumni systems now in use, including AI chatbot and LangGraph integration for intelligent inquiry answering and tailored alumni-student matching.

Verification of profiles and elimination of phony accounts to preserve network legitimacy.

Unified Engagement Hub is a system that integrates fundraising, event planning, job postings, career counseling, and mentoring.

individualized counseling that bridges the gap between academic learning and career preparedness with recommendations tailored to the school.

II. LITERATURE SURVEY

Alumni management systems play a critical role in maintaining long-term relationships among insti- tutions, current students, and graduates. These platforms typically provide networking opportunities, professional development tools, mentorship programs, and fundraising mechanisms. Over time, vari- ous digital solutions have emerged to enhance engagement and streamline alumni relations.

1. Existing Alumni Management Systems

- Nigerian University Alumni Portal System: Designed to facilitate alumni registration, net- working, and fundraising, while offering career guidance and event coordination [1]. Limitations include low participation rates and challenges in the manage- ment of alumni data.
- An Effective Method for Linking Alumni: A multi-functional platform with job postings, career coun- seling, discussion boards, and mentorship programs [2, 6]. Effectiveness depends heavily on sustained user interaction.
- System for Managing Alumni at Aleksander Moisiu University: Focused on career man- agement and data management, providing updates to employers and administrators [3]. However, scalability and authentication remain concerns.
- Graduway Alumni Platform: A globally recognized solution integrating mentorship, job re- ferrals, and fundraising [4][8]. Although feature rich, high subscription costs limit accessibility for some in- stitutions.
- Alumni Web Portal for Career Development: Android-based system providing centralized access to jobs, scholarships, and networking [5]. Its mobile-only approach excludes users who prefer web platforms.
- University-Wide Alumni Tracking System: Tracks career growth for accreditation and aca- demic im- provement [6]. Reliance on self-reported data introduces inconsistencies.
- Social Media-Integrated Alumni System: Lever- ages platforms like LinkedIn and Facebook for informal networking [7] [16]. Privacy concerns and dependence on third-party services limit adoption.
- Smart Alumni Information System: Uses AI and analytics for career recommendations and trend analysis [8]. High computational requirements pose a challenge.
- Alumni Engagement and Fundraising System: Supports sponsorships, donations, and crowd- funding campaigns [9] [13]. Requires active alumni participation to remain financially viable.
- Intelligent Alumni Decision-Making Support System: Employs data mining to suggest mentors and professional programs [10]. Ethical and privacy concerns remain unresolved.

2. Key Theories and Findings

- Role of Digitization in Alumni Networks: Transitioning from manual to digital systems im- proves accessibility, efficiency, and overall engagement
- Impact of Alumni Engagement on Student Careers: Mentorship and networking significantly improve job

prospects through industry insights, referrals, and guidance [19]
- Security and Data Privacy Challenges: Verification mechanisms are essential to maintain trust and eliminate fake accounts [20]
- Fundraising and Institutional Development: Strong alumni relations contribute to higher donations and better institutional development outcomes [4][15][1].

3. Research Gap

Even while these systems have useful features, most have fragmentation, weak verification, and no career counseling customization. High-end solutions are frequently expensive, and AI-based systems require a lot of processing power without resolving trust concerns. By combining safe authentication, regional alumni filters, mentoring matching, dynamic fundraising modules, institution-specific coun- seling, and an AI-Chatbot for data access, Alumni Connect:Bridging the Generation stands out for being an easy to use platform.

III. METHODOLOGY

1. Development Approach - Scrum Model

Iterative progress, flexibility, and ongoing input are all supported by the Scrum Model, a popular agile methodology used in the creation of Alumni Connect: Bridging the Generation. This methodology guarantees that the platform adapts to user requirements while preserving a high level of development efficiency.

2. The Key benefits of adopting Scrum include

- Iterative Development – Each sprint delivers a fully functional module, enabling progressive system growth.
- Continuous Feedback – Inputs from stakeholders guide refinement and improvements.
- Flexibility – The system can easily adapt to changing requirements during development.
- Enhanced Collaboration – Regular communication and teamwork ensure alignment across all contrib- utors.

Table 1: Tools and Technologies Used

Category	Category Used
Frontend	React JS (Vite)
Backend	Node.js, Express.js,Mongoose
Database	MongoDB
Authentication	Cookie-based Authentication with JWT
Project Management	Scrum Workflow
Version Control	Github
Testing	Postman(API Testing)
Deployment	Vercel,Render,MongoDB Cluster

3. System Architecture

The architecture follows a three-tier design:

- Frontend (Client Layer): React.js with Vite for optimized user interface and communication with backend via secure REST APIs.
- Backend (Application Layer):Node.js Ex- press.js with Prisma ORM for database interaction; uses JWT-based session authentication.
- Database (Data Layer): MongoDB stores all user, event, donation and mentorship data.

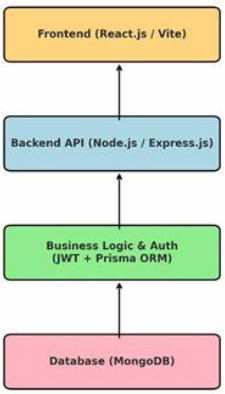
4. Authentication Flow

The authentication flow ensures secure access to the system by validating user credentials through a protected login form. Upon successful authentication, a JWT (JSON Web Token) is generated and stored in cookies to maintain session integrity. Middleware components subsequently validate these tokens for every request to protected resources, thereby enforcing authorization, safeguarding sensitive data, and ensuring a seamless yet secure user experience.

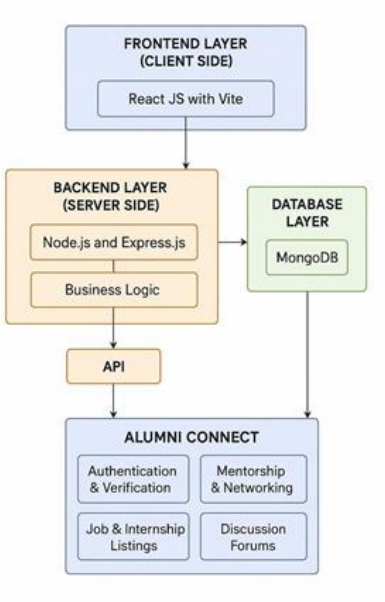
IV. SYSTEM DESIGN AND ARCHITECTURE

1. Architectural Overview

Reiterates three tiers (Frontend, Backend, Database) with focus on scalability and maintainability.



(a) System Architecture



(b) Data Flow Diagram

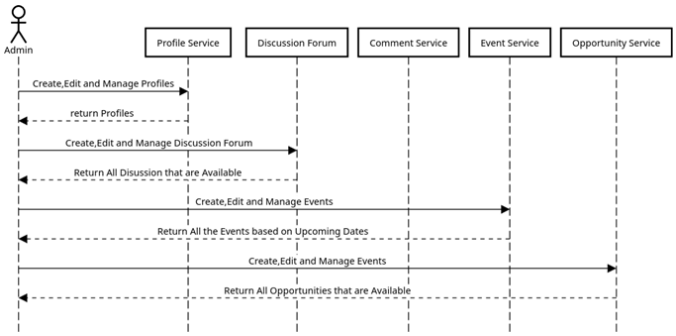


Figure 2: Admin Sequence Diagram

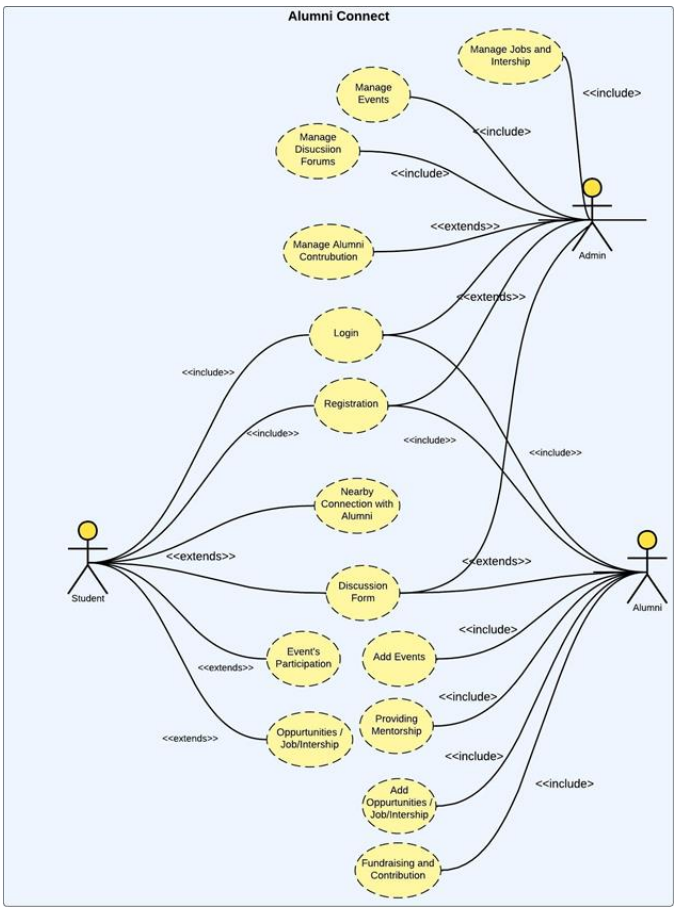


Figure 3: Use Case Diagram

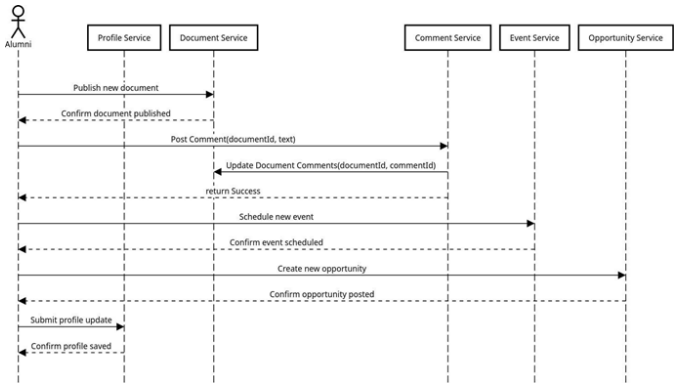


Figure 4: Alumni Sequence Diagram

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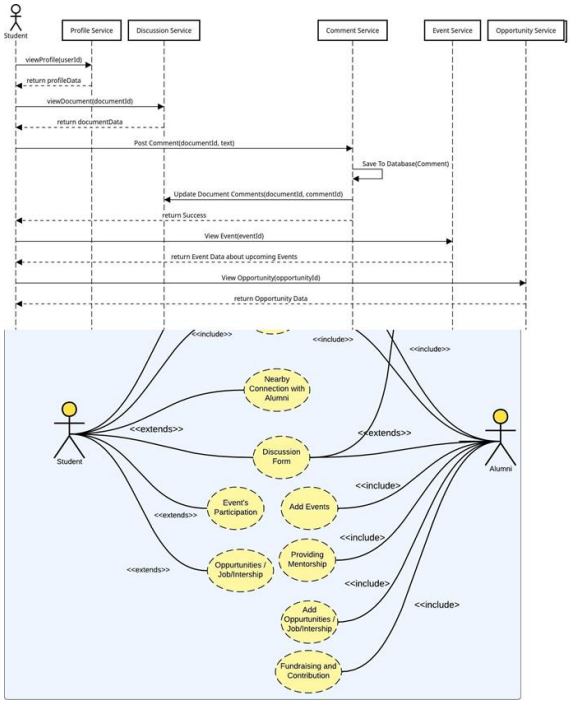

Figure 5: Student Sequence Diagram

2. Key Modules

- User Authentication & Verification: Cookie-based JWT with alumni verification to block fake profiles.
- Mentorship & Networking: Alumni mentor students with career guidance.
- Job & Internship Listings: Alumni and recruiters post opportunities.
- Discussion Forums: Topic-based discussions and peer learning.
- Alumni Contributions: Fundraising, donations, event organization.
- Event Management: Hosting and managing institutional events.

3. Data Flow

- User registration/login through backend API.
- Server-side business logic interacts with database.
- JSON responses sent to frontend.
- Real-time notifications via WebSockets or polling.

5. Implementation

Follows Scrum methodology with integrated modules.

1. Module-Wise Implementation

- User Authentication: Secure JWT login, password hashing with bcrypt.
- Profile Management: Alumni update career, education, skills.
- Mentorship Program: Alumni opt-in mentors; students request sessions.
- Discussion Forum: Post queries, reply, like, comment.
- Job Posting: Alumni share job/internship offers.
- Fundraising & Donation: Support scholarships, labs, campus improvements.
- Admin Dashboard: Manage events, donations, engagement metrics.
- AI Chatbot: An AI-driven chatbot facilitates quick navigation and efficient data retrieval through natural language queries, enabling users to access information, resources, and services without relying on complex menus or manual searches.

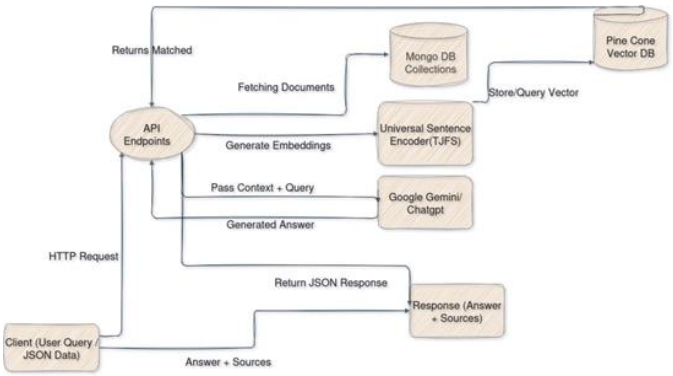

Figure 6: AI Chatbot WorkFlow

2. Implementation of AI Chat bot

This system integrates MongoDB (structured storage), Pinecone (vector database), Ten- sorFlow's Universal Sentence Encoder (embedding model), and Google's Generative AI (LLM) into a unified pipeline. The goal is to synchronize unstructured data from MongoDB and JSON sources into Pinecone, make it searchable through semantic embeddings, and finally use LLMs to answer user queries in natural language.

This architecture allows an intelligent assistant to retrieve context-aware answers from organiza- tional data sources (profiles, discussions, events, opportunities, etc.), making it suitable for academic or alumni platforms.

3. Chat-Bot Setup

- Pinecone Client - Used For Semantic Search and Vector Storage

- LangChain's Google Generative AI Library to call Gemini API for natural language re- sponses.
- TensorFlow.js with Universal Sentence Encoder (USE) to convert text into numerical vectors (embeddings).
- Mongoose Models that are used as Unstructured Data

4. Pinecone Setup

const pc = new Pinecone({ API-KEY }); const indexName = "mongodb-chatbot-index";

Here, Pinecone is initialized. The chosen index (mongodb-chatbot-index) acts like a semantic mem- ory bank. Before usage, the code ensures that the index exists (creating one if not) and that it matches the embedding dimension (512 for USE(Universal Sentence Encoder).
Pinecone automatically manages index sharding, replication, and vector similarity compu- tations (cosine/dot-product) at scale. This ensures that even with millions of embeddings, the system can retrieve the most relevant context in milliseconds, forming the backbone of the Retrieval Augmented Generation (RAG) pipeline.

5. Universal Sentence Encode(USE)

EmbedModel = await use.load();

The embedding model is loaded only once.

- Universal Sentence Encoder maps text to 512-dimensional vector.
- It detects semantic similarity, so queries such as "upcoming hackathon" and "new coding event" will refer to the same memory region.

Batching is supported (generateEmbeddings) to handle large datasets efficiently, processing 32 texts at a time. This shows awareness of computational efficiency and memory management

6. Google Generative AI Setup

const llm = new ChatGoogleGenerativeAI({ model: "Google or ChatGPT LLM Model", apiKey: process.env.GOOGLE API KEY, temperature: 0.3,
});

Here, Model is usually configured as the reasoning engine.

- The temperature(0.3) ensures factual, low-variance answers and prioritizing reliability over creativ- ity
- Together with Pine-cone search results, this creates an RAG pipeline(Retrieval Augmented Generation).

1: BEGIN SYSTEM
2: **1. INITIALIZE ENVIRONMENT**
3: - Load environment variables (API keys, configs)
4: - Import required libraries (Pinecone, USE, LLM, MongoDB models, dotenv, etc.)
5: **2. SETUP PINECONE**
6: FUNCTION Ensure Index To Pincone():
7: - Check if index exists
8: - IF not exist: create index (512 dimensions), wait until ready
9: - RETURN index reference
10: **3. SETUP UNIVERSAL SENTENCE ENCODER**
11: FUNCTION Initialize EmbedModel:
12: - IF not loaded: load USE
13: - RETURN model
14: FUNCTION Generating Single Embedding(text):
15: - Ensure model is loaded
16: - Convert text into 512-dim embedding
17: - RETURN embedding
18: FUNCTION Generating Multiple Embeddings(list of texts):
19: - Ensure model is loaded
20: - Split texts into batches (32 each)
21: - For each batch: generate embeddings, store vectors
22: - RETURN embeddings
23: **4. METADATA CLEANING**
24: FUNCTION Sanitize Meta data(object):
25: - Remove private fields (id, functions)
26: - Convert values to safe formats
27: - RETURN cleaned metadata
28: **5. SYNCING DATA WITH PINECONE**
29: FUNCTION Syncing With Pinecone(documents):
30: - For each document: extract ID, text, metadata
31: - Generate embedding, create vector {id, embedding, metadata}
32: - Upsert vectors into Pinecone in batches of 100
33: - RETURN summary
34: **6. API ENDPOINTS**
35: 6.1. FUNCTION SyncFromMongo(request):
36: - Fetch data (Profiles, Users, Discussions, Events, Opportunities)
37: - Convert fields to text, build document list
38: - IF empty: RETURN error
39: - ELSE: syncWithPinecone(documents), RETURN success
40: 6.2. FUNCTION QueryChatbot(request):

41: - Get query + topK
42: - IF empty: RETURN error 43: - Generate query embedding 44: - Search Pinecone (topK)
45: - IF no results: RETURN fallback
46: - ELSE: build context, prompt LLM, RETURN answer + sources
47: END SYSTEM

V. RESULTS AND DISCUSSION

The Alumni Connect : Bridging the Generation platform was successfully developed and tested across its core modules. The system provides a structured, secure, and interactive environment where students and alumni can engage meaningfully.

1. System Outputs

User Authentication & Verification: Login and registration with cookie-based JWT authenti- cation ensure secure access. Ensure that till the user profile is not completed they are not allowed.

Profile Management: Both students and alumni can update their personal, educational, and professional details. Ensure that till the user profile is not completed they are not allowed.

Mentorship Program: Alumni can register as mentors, while students can request career guid- ance. This feature bridges the knowledge gap between industry and academia

Discussion Forum: Users actively participate in discussions, post questions, and share insights. This fosters collaborative learning and knowledge sharing.

Job Posting and Opportunities: Alumni can contribute towards scholarships, campus events, lab installations, and development activities. This creates a sustainable model for institutional growth.

Fundraising & Donations: Alumni and recruiters can post jobs or internships, and students can search/filter opportunities. This improves employability prospects for students.

Admin Dashboard: Admins manage events, contributions, discussion forums, and overall alumni/student engagement, ensuring smooth functioning of the ecosystem.

AI- Chat Bot: Manage all the requirement knowledge for the student about the Institution details.

2. Comparative Advantages

Compared to existing alumni management systems, the proposed platform offers :

- Robust profile verification to reduce fake accounts.
- Integrated fundraising features for institutional support.
- A multi-role structure (Student, Alumni, Admin) for diverse functionalities.
- User-friendly, accessible web design with React JS and MongoDB backend.

3. Evaluation and Feedback

Initial usability testing with a small group of students and alumni showed:

- Found the interface intuitive and easy to use.
- Students believed the mentorship program could improve career readiness.
- Alumni feedback highlighted the usefulness of event participation and contribution options.

4. System Testing and Evaluation

Functional Testing Table :-

Module	Test Performed	Excepted Result	Actual Result	Status
Login or Authenti-cation	Users enters correct credentials	Redirected to Dashboard	Same	Pass
Profile Manage-ment	Alumni updated job details	Profile updated Successfully	Same	Pass
Mentorship	Student sends men-torship request	Alumni received notification	Same	Pass
Discussion Forum	User posts a query	Query visible in discussion	Same	Pass

Opportunities	Alumni Share Jobs	Access to all Students	Same	Pass
Fundraising	Alumni donates to scholarship fund	Record Stored in Database	Same	Pass
AI Chat-bot	Asked some Institutional Question	Share the Information	Same	Pass

Table 2: Testing Result

VI. CONCLUSION AND FUTURE SCOPE

1.Conclusion

The project "Alumni Connect: Bridging the Generation" successfully demonstrates a compre- hensive and user-friendly platform designed to enhance alumni-student engagement. By integrating features such as mentorship programs, discussion forums, job postings, fundraising, and profile verification, the system effectively bridges the gap between academic learning and profes- sional development.

The results show that the platform not only strengthens alumni-student relationships but also con- tributes to institutional growth through donations and collaborative activities. With its robust au- thentication mechanisms and modular architecture, the system ensures security, reliability, and scalability, making it suitable for deployment across universities and institutions.

Overall, this platform addresses the under utilization of alumni networks and provides a sustainable ecosystem for knowledge sharing, career guidance, and institutional support.

2. Future Scope

Although the platform meets its core objectives, there is scope for further improvement and expansion:

- Mobile Application Development - Create Android/iOS apps for increased
- AI-Powered Recommendation System - Use machine learning to suggest mentors, jobs, and events tailored to users' interests accessibility.
- Integration with Social Media APIs - Enable seamless alumni connections through LinkedIn or similar platforms
- Blockchain for Secure Donations - Implement blockchain to ensure transparency and trust in fundraising activities.

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