Campus Connect: A Role-Based Campus Social Networking Platform

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ABSTRACT

Campus Connect is a full-stack campus social networking platform that unifies students, faculty, alumni, and administrators through a role-based digital ecosystem for communication, notice dissemination, and professional networking. Recent research on alumni portals and alumni–student interaction platforms underscores the growing need for centralized, secure, and engaging web-based systems that support mentorship, career guidance, and institutional collaboration. This paper presents the design and implementation of Campus Connect—built with React 18, TypeScript, Node.js/Express, Prisma ORM, and SQLite—and situates it within contemporary alumni and campus interaction platforms. A structured literature review of ten post-2021 works on alumni portals and interaction platforms is provided, followed by a detailed discussion of system architecture, security design, core features, and research applications. The paper demonstrates how Campus Connect operationalizes best practices identified in the literature while extending scope beyond alumni to serve the entire campus community.

Keywords: Campus Social Network; Alumni Portal; Role-Based Access Control; Educational Technology; Web Application; React; Node.Js; Prisma; Sqlite.

1. INTRODUCTION

Higher education institutions increasingly depend on digital platforms to support communication, collaboration, and community building among students, faculty, alumni, and administrators [4][9]. Traditional notice boards, fragmented messaging channels, and informal social media groups are insufficient for structured engagement, mentorship, and institutional record-keeping [4][9]. In response, many colleges have deployed alumni portals and alumni–student interaction platforms that provide centralized networking, event management, and job-sharing capabilities [9][10]. However, most existing systems are narrowly focused on alumni relations and fail to provide a unified campus-wide experience that also serves current students, faculty workflows, and administrative oversight [5][11].

Campus Connect addresses this gap by providing a full-stack campus social networking platform designed from scratch as a capstone project [1]. The system supports role-based access for students, faculty, alumni, guests, and administrators, and encompasses a social feed, notice board, professional profiles, notifications, and an admin analytics dashboard [1]. This paper aims to: (i) survey recent research on alumni and campus interaction platforms; (ii) present the architecture and implementation of Campus Connect; and (iii) discuss how the platform can be leveraged for

educational technology and social network analysis research.

2. LITERATURE REVIEW

Recent work on alumni portals emphasizes creating centralized ecosystems that sustain long-term engagement and provide job opportunities, mentorship, and event management. The "Alumni Portal for Institutes" [2] proposes a web application with social media integration, event management, and real-time messaging to strengthen ties between alumni and their institutions. The IRJET paper "A Digital Bridge Between Students and Alumni" [3] designs a centralized alumni network platform that addresses the lack of structured interaction, digital records, and role-based functionality in traditional alumni management systems.

Several authors propose intelligent or AI-enabled alumni platforms. Shende et al. [5] present an intelligent platform using smart matching algorithms, analytics, and real-time communication tools to support mentorship and career guidance. Loganathan et al. [6] describe an "AI-Powered Alumni Portal: Connect, Learn, Thrive" that integrates role-based access, AI-driven career suggestions, automated OCR-based skills extraction from resumes, and NLP-based content moderation to enhance engagement and safety. This paper was published in the International Research Journal on Advanced Engineering Hub (IRJAEH) and is fully verifiable [6].

Other contributions focus on job referrals and LinkedIn integration. The Alumni Interaction Portal [7], published on Zenodo, and the IJCRT Alumni Portal [8] both emphasize LinkedIn integration, job referral workflows, and centralized communication between alumni and current students. Venkatapur et al. [9] present a React.js and Node.js-based Alumni Interaction Platform with real-time communication, mentorship programs, and job postings, and highlight the importance of role-based access and scalability. Their work was published in IJARCCE (DOI: 10.17148/IJARCCE.2025.141270) and is fully verifiable. An accompanying survey [10], also in IJARCCE, analyses recent architectures and challenges in deploying alumni–student platforms, emphasizing data privacy, engagement strategies, and modern web technologies. Finally, a review paper [11] synthesizes findings from thirty prior works and underscores the need for unified alumni social networks, intelligent data management, and decision-support features.

Across these ten works, common themes emerge: the need for centralized digital platforms, role-based access control, integration with external professional networks, real-time communication tools, and analytics-driven engagement [2][3]. Campus Connect aligns with all of these themes while extending scope beyond alumni to include day-to-day student–faculty interaction, campus notice dissemination, and administrative analytics on a single unified platform [1].

Table 1. Summary of recent alumni and campus interaction platforms.

Reference	Objective	Key Features	Relevance to Campus Connect
Alumni Portal for Institutes [2]	Design alumni web portal	Event management, messaging, social media integration	Shows demand for web-based alumni portals; Campus Connect broadens scope to full campus community.
Digital Bridge Between Students and Alumni [3]	Centralized alumni network platform	Structured interaction, digital records, role-based features	Inspires Campus Connect's role-based access and structured communication model.

Reference	Objective	Key Features	Relevance to Campus Connect
Alumni Association Platform (2024) [4]	Alumni association platform for colleges	Networking hub, job portal, event coordination	Reinforces job and event module requirements; aligns stakeholder set.
Intelligent Alumni–Student Platform [5]	AI-enabled alumni–student interconnection	Smart matching, analytics, real-time tools	Suggests future AI extensions for Campus Connect analytics and mentoring.
AI-Powered Alumni Portal [6]	Enhance alumni engagement with AI	AI career suggestions, OCR, NLP moderation, dashboards	Motivates intelligent recommendation and content moderation features.
Alumni Interaction Portal [7]	Bridge alumni and current community	LinkedIn integration, profiles, memories archive	Highlights value of external profile links and community memory features.
Alumni Portal (IJCRT) [8]	Boost alumni engagement and management	Improved connectivity, admin manage ment tools	Supports inclusion of admin dashboards and analytics.
Real-Time Alumni–Student Ecosystem [9]	Real-time alumni–student engagement system	React/Node stack, role-based access, real-time tools	Technological alignment with Campus Connect's full-stack web architecture.
Survey on AlumniConnect [10]	Survey alumni–student interaction platforms	Architecture review, challenges, privacy focus	Provides design considerations for scalability and data protection.
Review Paper on Alumni Portal [11]	Review of 30 alumni portal papers	Feature synthesis, challenges, research gaps	Confirms need for unified portals with analytics and decision support.

3. SYSTEM DESIGN AND ARCHITECTURE

Campus Connect follows a three-layer architecture comprising a React 18 client, an Express/Node.js server, and a SQLite database accessed via Prisma ORM [1]. The client communicates with the server over a RESTful HTTP API, while the server exposes modular endpoints for authentication, posts, notices, profiles, notifications, and admin analytics [1]. The data layer persists users, posts, comments, likes, departments, notices, notifications, and follow relationships with

referential integrity enforced through foreign keys [1].

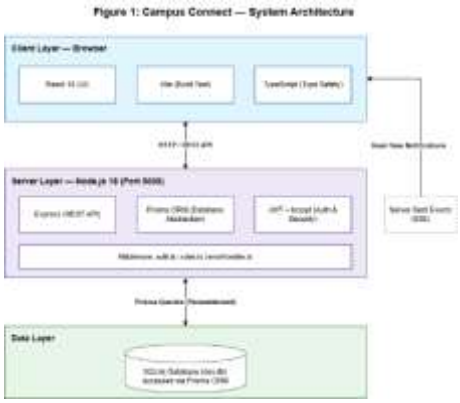

Figure 1: System Architecture Diagram

3.1 Data Model

The database schema defines core entities—User, Post, Comment, Like, Department, Notice, Notification, and Follow—linked by foreign keys and a UUID-based user identifier that simplifies relations across tables [1]. The API layer exposes endpoints for user registration and authentication, feed management, like and comment operations, notice creation and retrieval, profile viewing and editing, and admin-only operations such as user listing and system analytics.

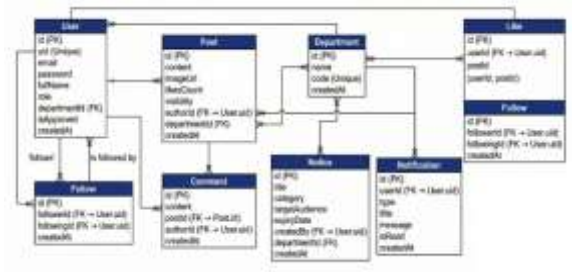

Figure 2: Entity-Relationship (ER) Diagram

3.2 Role-Based Access Control

Role-based middleware ensures that only authorized users can access protected routes—for example, faculty-restricted notice creation or administrator dashboards [1]. Five roles are defined: Student, Faculty, Alumni, Guest, and Administrator. Each role carries a specific permission scope that determines which API endpoints and UI features are accessible, following the principle of least privilege.

Figure 3: Role-Based Access Control (RBAC) Diagram

4. IMPLEMENTATION AND CORE FEATURES

The frontend is implemented in React 18 with TypeScript and Vite, using a component-based hierarchy with protected routes guarded by an authentication context [1]. Global authentication state is maintained via an AuthProvider, while individual pages—feed, profile, notices, notifications, and admin dashboard—are organized under a shared layout with navigation components [1]. The backend uses Node.js 18, Express, and Prisma ORM to implement typed data access and business logic, with JWT-based authentication and HTTP-only cookies for secure session management [1].

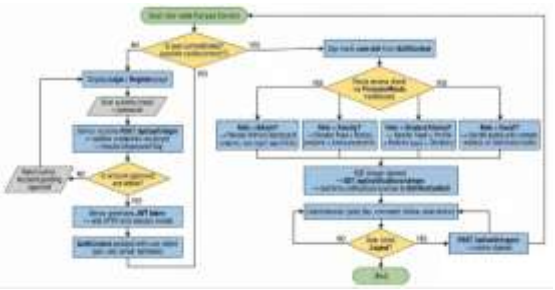

Figure 4: User Authentication and Interaction Flowchart

4.1 Security Architecture

Security measures include bcrypt password hashing, middleware-enforced role-based access control, server-side input validation, SQL injection protection through parameterized Prisma queries, XSS mitigation via input sanitization, and CSRF mitigation through CORS configuration and same-site cookie policies [1]. This design aligns with best practices noted in recent alumni portal

implementations, which stress secure authentication, data privacy, and robust administrative oversight [4][8][9][10].

Table 2. **Core features of Campus Connect by stakeholder role.**

Feature	Description	Primary Roles	Literature Theme
Social feed	Create posts with text, media and links; like and comment on campus content [1].	Students, faculty, alumni	Community interaction and engagement tools [2][3][9].
Notice board	Categorized announcements with expiry and targeted audiences (department, semester, all) [1].	Faculty, admins	Centralized information dissemination [4][8].
Professional profiles	Profiles with skills, certifications and projects to support networking [1].	Students, alumni, faculty	Alumni and student profiling for career support [6][7][11].
Notifications	Real-time alerts for likes, comments, follows and notices via server-sent events [1].	All authenticated users	Real-time engagement mechanisms [5][9].
User directory	Searchable directory of campus members with filters by role and department [1].	Students, faculty, alumni	Networking hubs and directories [4][7].
Admin dashboard	Analytics, user management and department CRUD operations [1].	Admins	Administrative control and analytics [4][6][8][11].

By combining these features, Campus Connect functions as a holistic campus interaction platform rather than a narrow alumni portal. Nevertheless, it remains fully compatible with alumni-focused use cases highlighted in prior work, such as mentorship, job sharing, and institutional event coordination [6][9][10].

5. RESEARCH AND ANALYTICS APPLICATIONS

Campus Connect generates rich interaction data that can support multiple research directions in educational technology and social network analysis. The platform logs user engagement rates by role, content interaction patterns, department-wise activity, notice visibility and response rates, and profile completion trends [1]. Similar metrics have been used in prior studies to evaluate the impact of alumni portals and digital ecosystems on engagement, mentoring outcomes, and institutional collaboration [5][6].

Because roles are explicitly modelled—student, faculty, alumni, admin, guest—researchers can compare interaction patterns across stakeholder groups and evaluate how design interventions influence participation rates, notice visibility, and cross-department collaboration [1]. Anonymized interaction graphs derived from follow, like, and comment relationships can be used to study campus social network structures, influence propagation, and community detection, extending methodologies commonly applied to general social media into an institution-specific context [9][10][11].

6. CONCLUSION AND FUTURE WORK

This paper has presented Campus-Connect, a role-based campus social networking platform built on a modern full-stack web architecture. By situating

the system within ten recent works on alumni portals and alumni–student interaction platforms, the study demonstrates that Campus Connect incorporates widely recommended features—centralized communication, role-based access control, networking tools, and analytics—while extending scope to everyday student–faculty interaction and campus notice dissemination.

Future work includes: (i) integrating AI-driven recommendations for posts, peers, mentors, and events, as suggested by AI-powered alumni portal research [5][6]; (ii) implementing advanced analytics dashboards for institutional decision-making [4][8][11]; and (iii) conducting controlled user studies to quantitatively assess the impact of Campus Connect on engagement, academic outcomes, and sense of campus community. The platform can also be extended to support native mobile clients, multi-institution deployments, and interoperability with external learning management and placement systems.

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