GROUP 1 REPORT.

UCU Innovation Hub Application Report

GROUP MEMBERS AND THEIR CONTRIBUTIONS.

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IYAMUMPAYE BRENDA M25B13/030 B33237FRONTEND

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GALIWANGO HUSSEIN M25B13/013 B33220 BACKEND

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Executive Summary

The UCU Innovation Hub is a full-stack web application designed to showcase and manage student innovations and research projects at Uganda Christian University. The platform serves as a centralized repository for student projects, enabling students to submit their work, supervisors to review submissions, and the public to browse approved innovations. The system implements role-based access control with three distinct user types: Students, Supervisors, and Administrators.

1. Project Overview

Purpose and Objectives

The UCU Innovation Hub addresses the need for a unified platform to:

- Showcase approved student projects to the public

- Manage project submissions and approval workflows
- Facilitate collaboration between students and supervisors
- Provide analytics and insights on innovation trends
- Promote UCU's research and innovation capabilities

Target Users

1. Students: Submit and manage their innovation projects

2. Supervisors: Review, approve, or reject project submissions

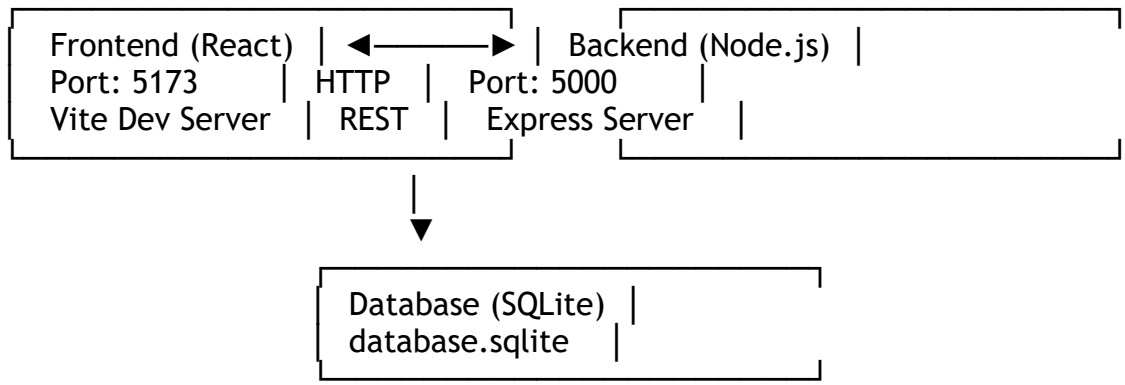
3. Administrators: Oversee the entire system, manage users, and view analytics

4. Public Visitors: Browse approved projects without authentication

2. System Architecture

Architecture Overview

The application follows a client-server architecture with clear separation of concerns:



Frontend Architecture

Technology Stack:

- Framework: React 19.2.0
- Build Tool: Vite 7.2.4
- Routing: React Router DOM 6.23.0

- Styling: Tailwind CSS 4.1.17 + Custom CSS (Forest Green Theme)
- HTTP Client: Axios 1.6.5
- Charts: Chart.js 4.4.1 with React-Chartjs-2 5.2.0
- UI Components: Bootstrap 5.3.8

Project Structure:

```
src/
├── components/          # Reusable UI components
│   ├── HeroSlideshow.jsx
│   ├── Navbar.jsx
│   ├── NotificationCenter.jsx
│   ├── ProjectCard.jsx
│   ├── ProtectedRoute.jsx
│   ├── SearchFilters.jsx
│   └── ThemeToggle.jsx
├── context/             # State management
│   ├── AuthContext.jsx
│   └── NotificationContext.jsx
├── pages/               # Route components
│   ├── AdminDashboard.jsx
│   ├── Login.jsx
│   ├── PublicGallery.jsx
│   ├── Register.jsx
│   ├── StudentDashboard.jsx
│   └── SupervisorDashboard.jsx
├── styles/              # Component-specific CSS
├── utils/               # Utilities
│   └── api.js           # API client
├── App.jsx              # Main app component
├── main.jsx             # Entry point
└── index.css            # Global styles
```

2.3 Backend Architecture

Technology Stack:

- Runtime: Node.js
- Framework: Express 4.18.2
- ORM: Sequelize 6.35.2
- Database: SQLite3 5.1.6
- Authentication: JWT (jsonwebtoken 9.0.2)

- Password Hashing: bcryptjs 2.4.3
- CORS: cors 2.8.5

Project Structure:

```
src/
├── config/            # Configuration
│   └── database.js
├── controllers/       # Business logic
│   ├── analyticsController.js
│   ├── authController.js
│   ├── commentController.js
│   ├── projectController.js
│   └── userController.js
├── middleware/        # Express middleware
│   └── auth.js
├── models/            # Database models
│   ├── Comment.js
│   ├── Project.js
│   ├── User.js
│   └── index.js
├── routes/            # API routes
│   ├── analytics.js
│   ├── auth.js
│   ├── comments.js
│   ├── projects.js
│   └── users.js
└── seeders/           # Database seeders
    └── demoData.js
```

3. Core Features

Public Gallery

- Hero Section: Dynamic slideshow showcasing featured projects
- Search & Filter: Advanced filtering by faculty, category, technology, and year
- Project Cards: Visual cards displaying project information
- Responsive Design: Mobile-first approach with smooth animations

Authentication System

- JWT-based Authentication: Secure token-based auth
- Role-Based Access Control: Three user roles (Student, Supervisor, Admin)
- Protected Routes: Route guards for authenticated pages
- Session Management: Token storage and automatic refresh

Demo Credentials:

- Student: student@ucu.ac.ug / password123
- Supervisor: supervisor@ucu.ac.ug / password123
- Admin: admin@ucu.ac.ug / password123

Student Dashboard

- Submit new projects
- View submitted projects
- Edit project details
- Track submission status (Pending/Approved/Rejected)

Supervisor Dashboard

- Review pending project submissions
- Approve or reject projects with comments
- View all projects under supervision
- Track approval statistics

Admin Dashboard

- Analytics: Visual charts showing:

  - Projects by faculty

  - Projects by category

  - Approval rates

  - Trending technologies

- User Management: View and manage all users
- System Overview: Total projects, users, and pending submissions

Notification System

- Real-time notifications for project status changes
- Notification center with dropdown
- Type-based notifications (success, error, warning, info)
- Clear all functionality

Theme Support

- Light/Dark mode toggle
- Forest Green color scheme
- Smooth theme transitions
- Persistent theme preference
- Smooth transitions (0.3s ease)
- Hover effects on interactive elements

7. Security Implementation

Authentication & Authorization

- JWT Tokens: Secure token-based authentication
- Password Hashing: bcryptjs with salt rounds
- Protected Routes: Middleware-based route protection
- Role Verification: authorize () middleware for role checks

Frontend Security

- Token Storage: localStorage with automatic cleanup
- Axios Interceptors: Automatic token injection
- 401 Handling: Automatic logout on unauthorized
- Input Validation: PropTypes for component props

Backend Security

- CORS: Configured for cross-origin requests
- Environment Variables: Sensitive data in .env
- SQL Injection Prevention: Sequelize ORM parameterization
- Error Handling: Centralized error middleware

Development Workflow

Running Locally

Backend:

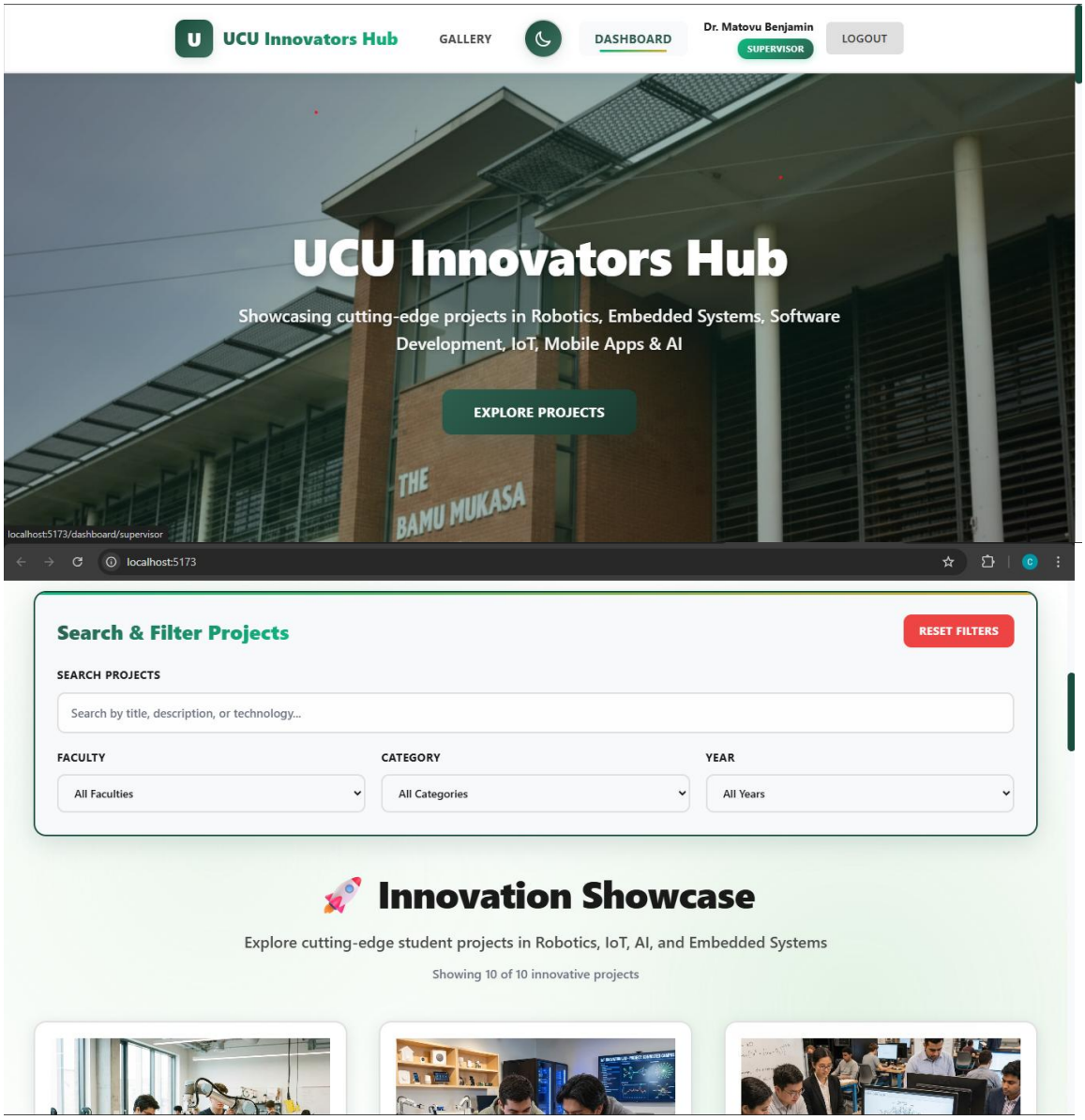
```
cd UCU-INNOVATION-HUB-BACKEND
npm install
npm start
# Server runs on http://localhost:5000
```

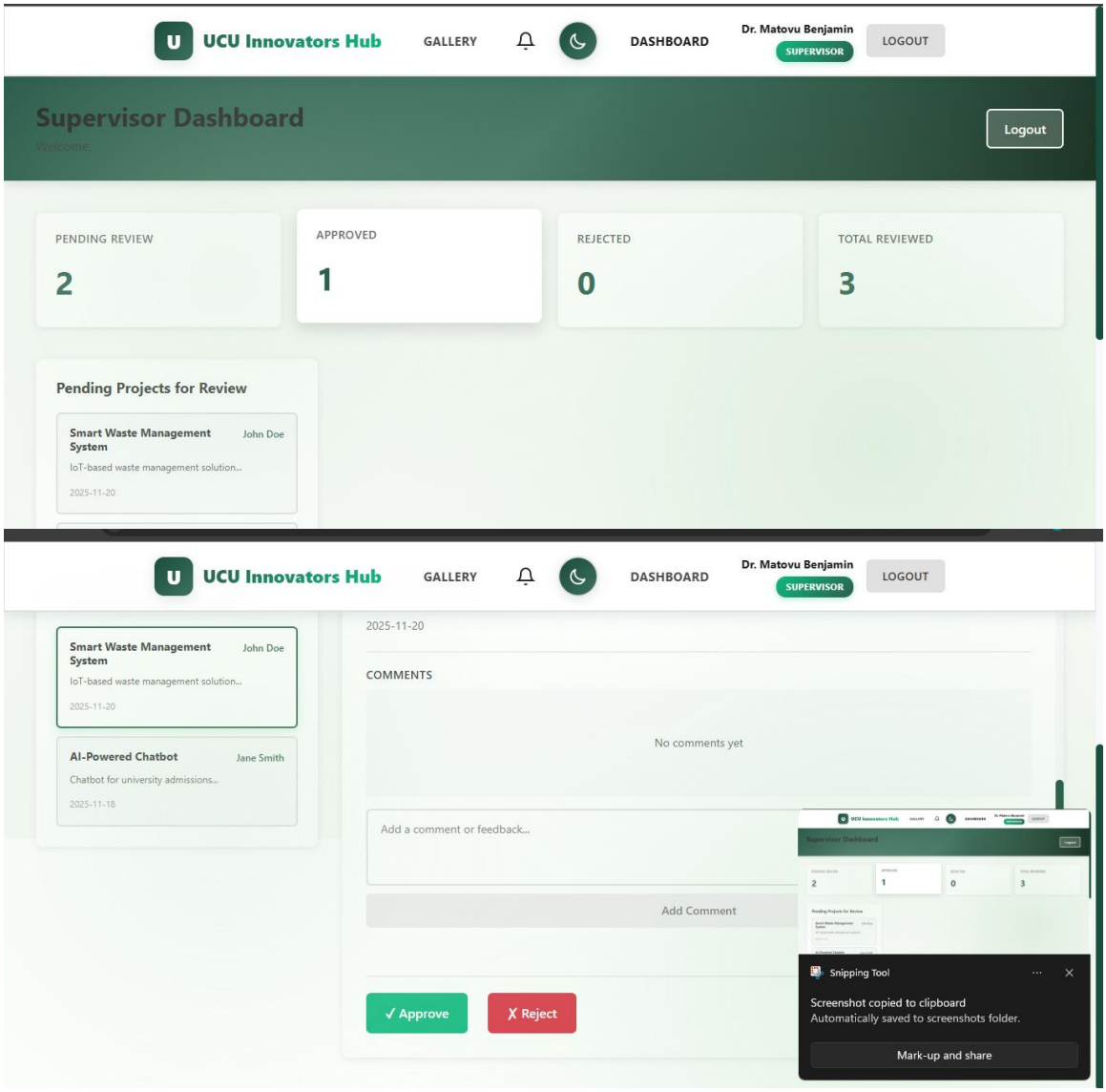
Frontend:

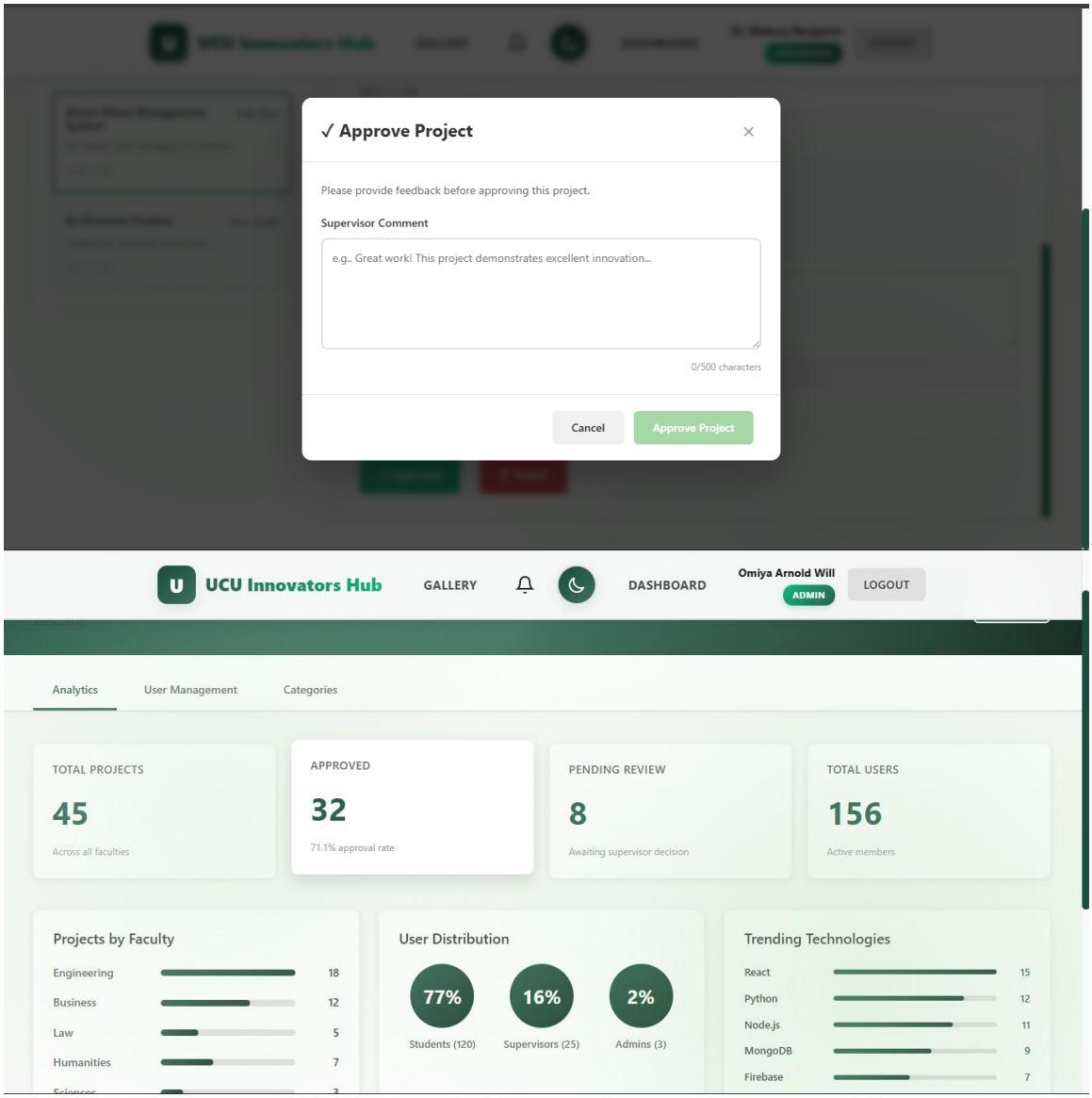
```
cd UCU-INNOVATION-HUB-FRONT/UCU-INNOVATION-HUB-FRONT
npm install
npm run dev
# App runs on http://localhost:5173
```

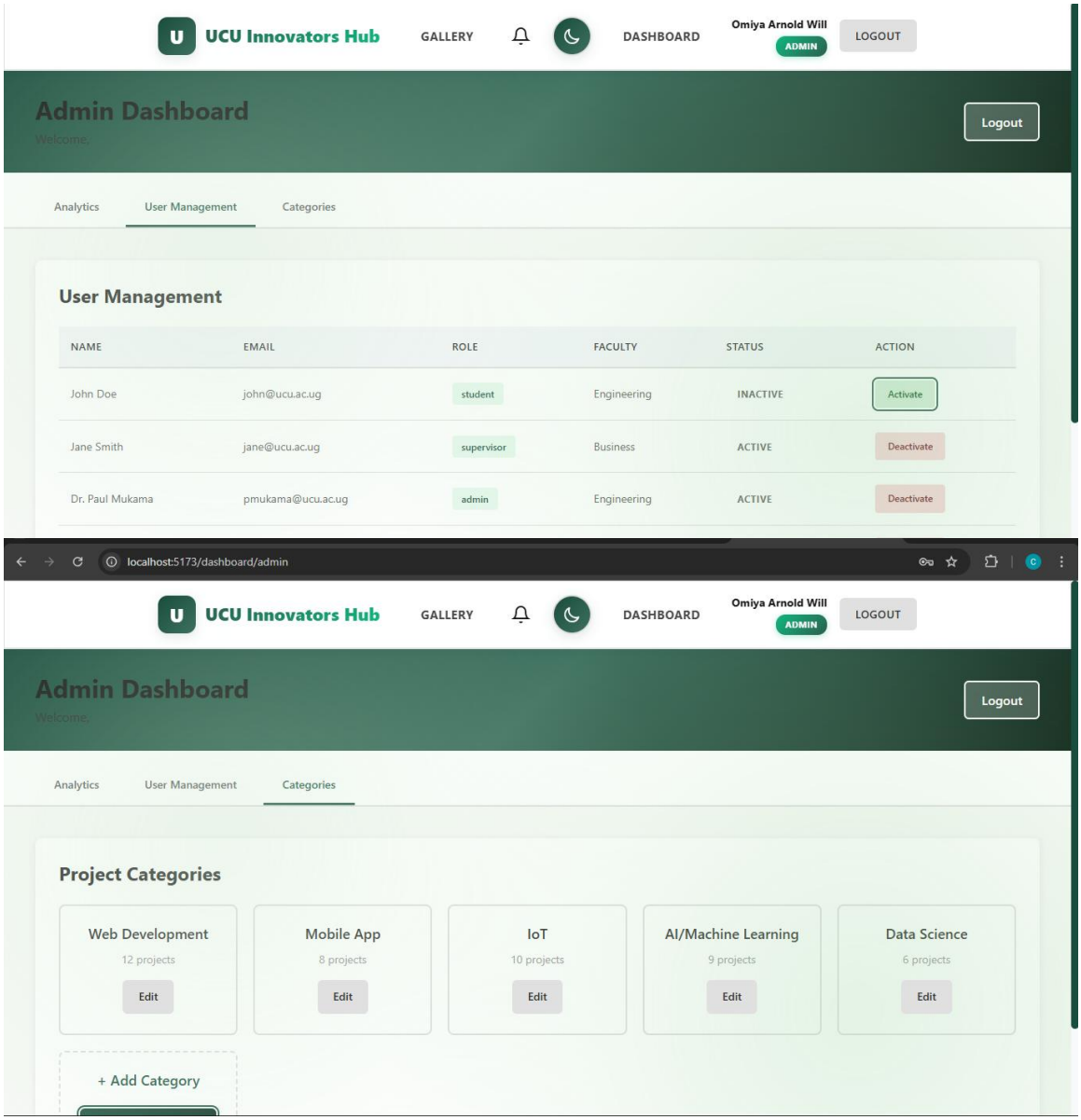
Repository links.
https://github.com/omara-chrispus-adrian/UCU-INNOVATION-HUB-FRONTEND
https://github.com/omara-chrispus-adrian/UCU-INNOVATION-HUB-BACKEND

SCREENSHOTS OF THE APPLICATION.

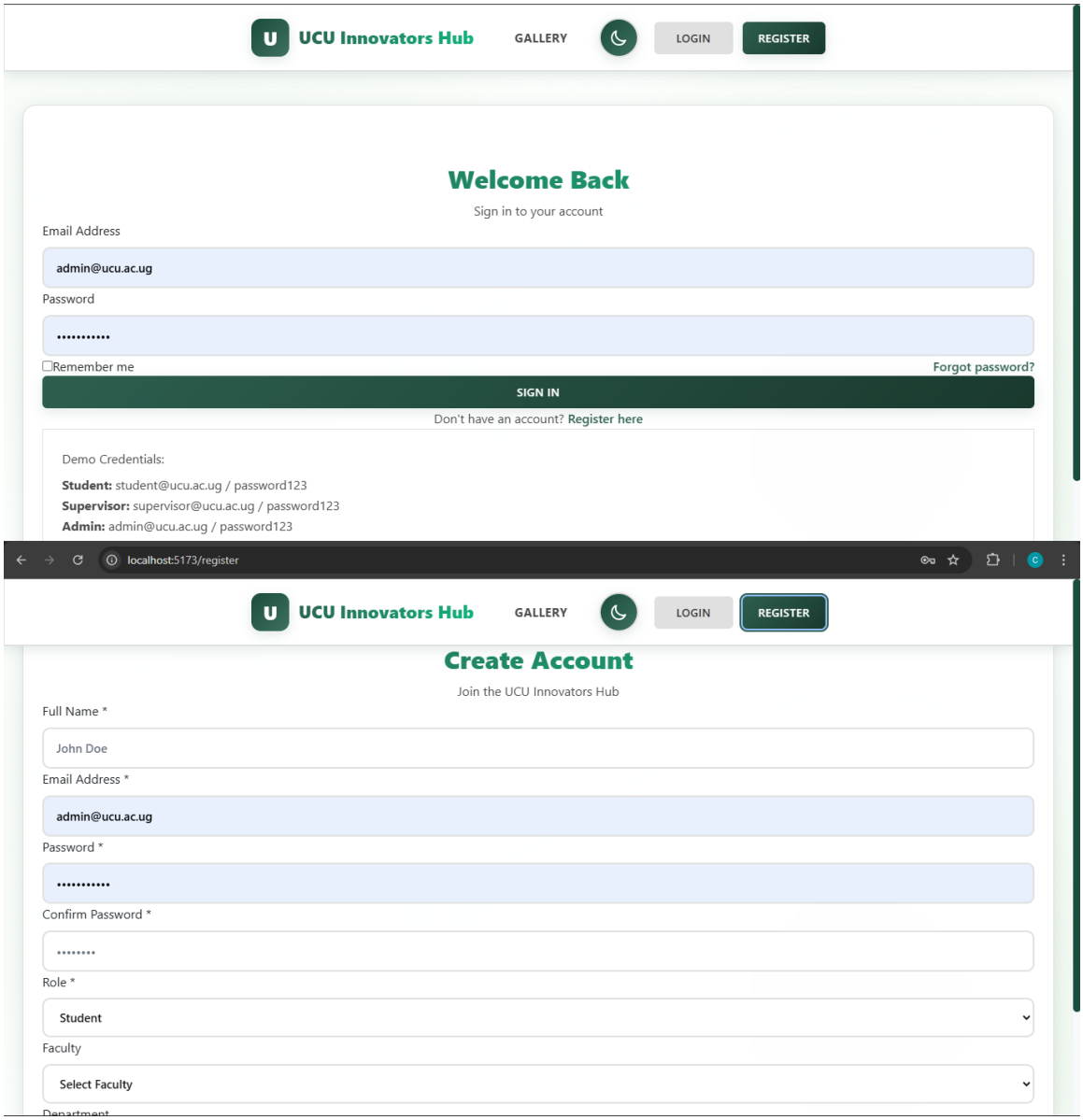

UCU Innovators Hub
GALLERY
DASHBOARD
Dr. Matovu Benjamin
SUPERVISOR
LOGOUT
UCU Innovators Hub
Showcasing cutting-edge projects in Robotics, Embedded Systems, Software Development, IoT, Mobile Apps & AI
EXPLORE PROJECTS
THE BAMU MUKASA
localhost:5173/dashboard/supervisor
localhost:5173
Search & Filter Projects
RESET FILTERS
SEARCH PROJECTS
Search by title, description, or technology...
FACULTY
All Faculties
CATEGORY
All Categories
YEAR
All Years
Innovation Showcase
Explore cutting-edge student projects in Robotics, IoT, AI, and Embedded Systems
Showing 10 of 10 innovative projects

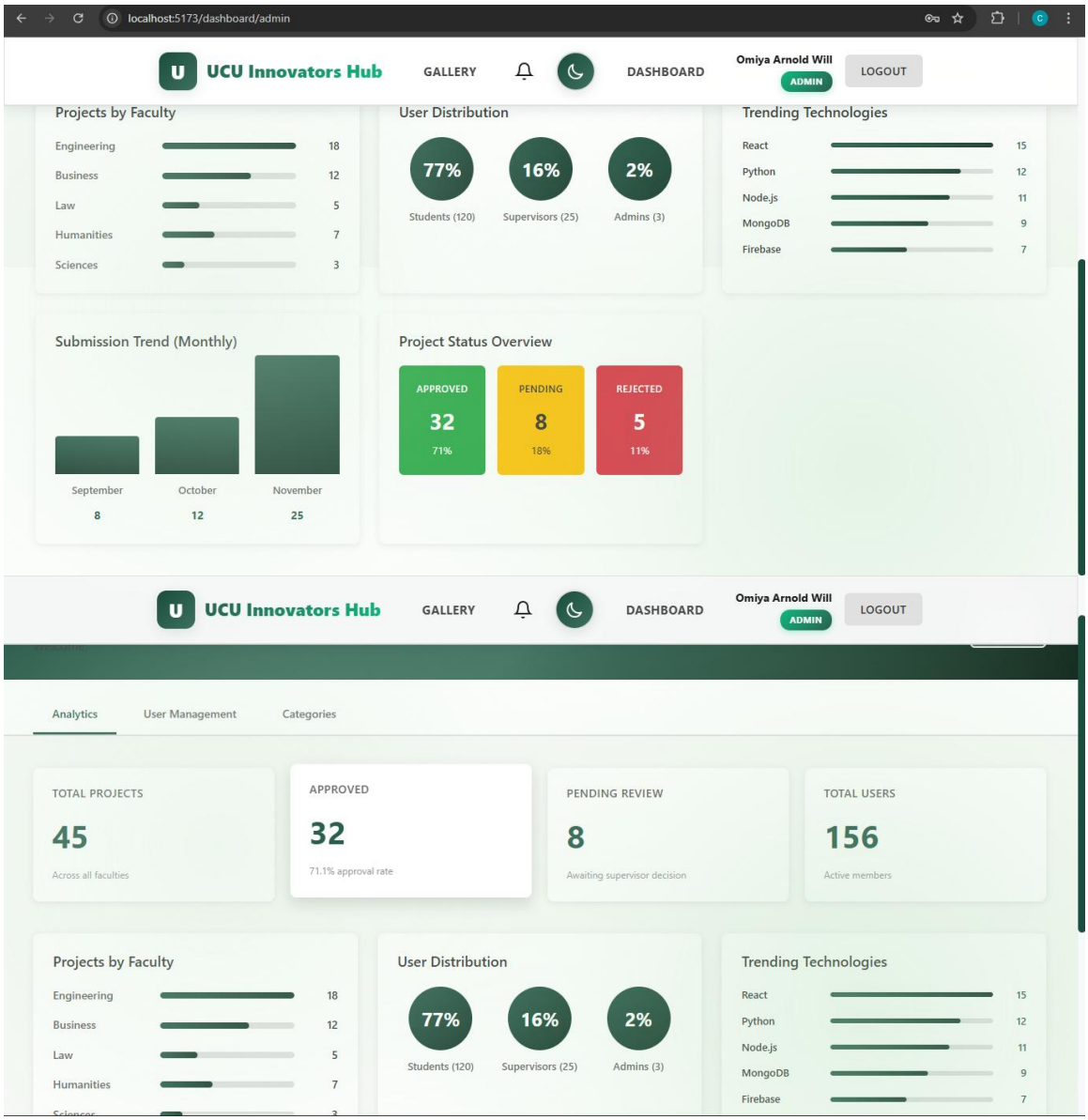

UCU Innovators Hub
GALLERY
DASHBOARD
Dr. Matovu Benjamin
SUPERVISOR
LOGOUT
Supervisor Dashboard
Welcome,
Logout
PENDING REVIEW
2
APPROVED
1
REJECTED
0
TOTAL REVIEWED
3
Pending Projects for Review
Smart Waste Management System
John Doe
IoT-based waste management solution...
2025-11-20
UCU Innovators Hub
GALLERY
DASHBOARD
Dr. Matovu Benjamin
SUPERVISOR
LOGOUT
Smart Waste Management System
John Doe
IoT-based waste management solution...
2025-11-20
AI-Powered Chatbot
Jane Smith
Chatbot for university admissions...
2025-11-18
2025-11-20
COMMENTS
No comments yet
Add a comment or feedback...
Add Comment
✓ Approve
X Reject
Snipping Tool
Screenshot copied to clipboard
Automatically saved to screenshots folder.
Mark-up and share


✓ Approve Project
Please provide feedback before approving this project.
Supervisor Comment
e.g., Great work! This project demonstrates excellent innovation...
0/500 characters
Cancel
Approve Project
UCU Innovators Hub
GALLERY
DASHBOARD
Omiya Arnold Will
ADMIN
LOGOUT
Analytics
User Management
Categories
TOTAL PROJECTS
45
Across all faculties
APPROVED
32
71.1% approval rate
PENDING REVIEW
8
Awaiting supervisor decision
TOTAL USERS
156
Active members
Projects by Faculty
Engineering 18
Business 12
Law 5
Humanities 7
User Distribution
77%
Students (120)
16%
Supervisors (25)
2%
Admins (3)
Trending Technologies
React 15
Python 12
Node.js 11
MongoDB 9
Firebase 7


UCU Innovators Hub
GALLERY
DASHBOARD
Omiya Arnold Will
ADMIN
LOGOUT
Admin Dashboard
Welcome,
Logout
Analytics
User Management
Categories
User Management
NAME
EMAIL
ROLE
FACULTY
STATUS
ACTION
John Doe
john@ucu.ac.ug
student
Engineering
INACTIVE
Activate
Jane Smith
jane@ucu.ac.ug
supervisor
Business
ACTIVE
Deactivate
Dr. Paul Mukama
pmukama@ucu.ac.ug
admin
Engineering
ACTIVE
Deactivate

localhost:5173/dashboard/admin
UCU Innovators Hub
GALLERY
DASHBOARD
Omiya Arnold Will
ADMIN
LOGOUT
Admin Dashboard
Welcome,
Logout
Analytics
User Management
Categories
Project Categories
Web Development
12 projects
Edit
Mobile App
8 projects
Edit
IoT
10 projects
Edit
AI/Machine Learning
9 projects
Edit
Data Science
6 projects
Edit
+ Add Category


UCU Innovators Hub
GALLERY
LOGIN
REGISTER
Welcome Back
Sign in to your account
Email Address
admin@ucu.ac.ug
Password
Remember me
Forgot password?
SIGN IN
Don't have an account? Register here
Demo Credentials:
Student: student@ucu.ac.ug / password123
Supervisor: supervisor@ucu.ac.ug / password123
Admin: admin@ucu.ac.ug / password123
localhost:5173/register
UCU Innovators Hub
GALLERY
LOGIN
REGISTER
Create Account
Join the UCU Innovators Hub
Full Name *
John Doe
Email Address *
admin@ucu.ac.ug
Password *
Confirm Password *
Role *
Student
Faculty
Select Faculty


localhost:5173/dashboard/admin
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LOGOUT
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Engineering 18
Business 12
Law 5
Humanities 7
Sciences 3
User Distribution
77%
Students (120)
16%
Supervisors (25)
2%
Admins (3)
Trending Technologies
React 15
Python 12
Node.js 11
MongoDB 9
Firebase 7
Submission Trend (Monthly)
September 8
October 12
November 25
Project Status Overview
APPROVED 32 71%
PENDING 8 18%
REJECTED 5 11%
UCU Innovators Hub
GALLERY
DASHBOARD
Omiya Arnold Will
ADMIN
LOGOUT
Analytics
User Management
Categories
TOTAL PROJECTS
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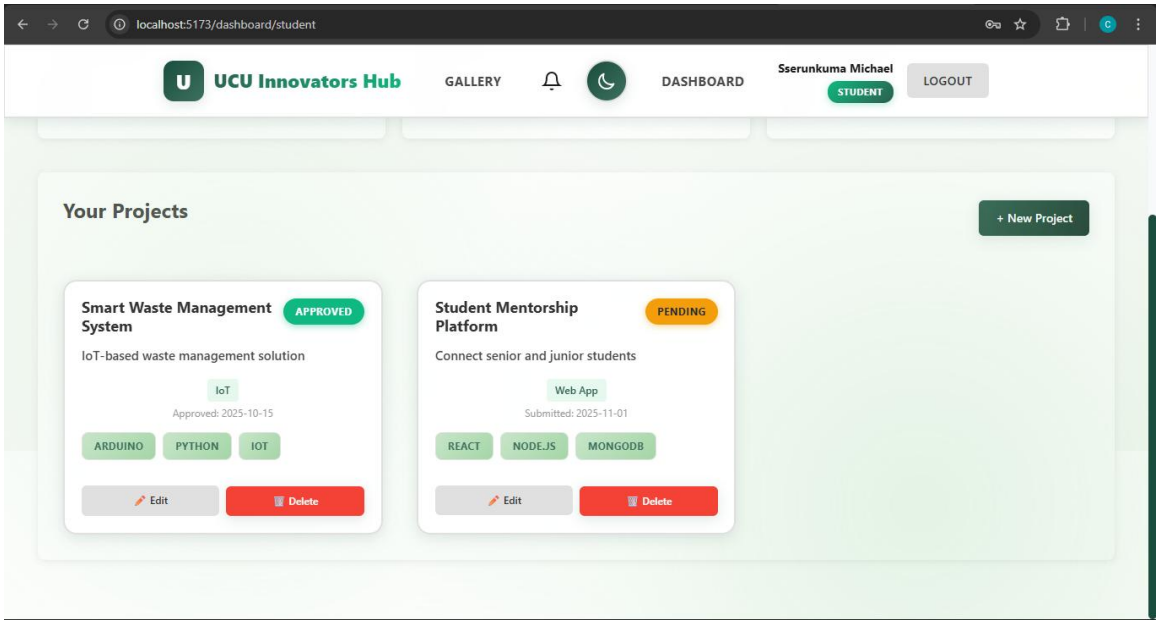

Conclusion.

The UCU Innovation Hub successfully provides a comprehensive platform for managing and showcasing student innovations at Uganda Christian University. The application demonstrates modern web development practices with:

- Robust Architecture: Clean separation of frontend and backend
- Security: JWT-based authentication with role-based access
- User Experience: Responsive design with smooth animations
- Scalability: Modular structure ready for future enhancements
- Maintainability: Well-organized codebase with clear documentation

The platform is production-ready and can serve as a foundation for UCU's innovation showcase while remaining flexible for future feature additions.