Dsu website~report

1. Introduction

The Student Portal System is a full-stack web-based application designed to automate student registration, authentication, data storage, and assistance using an AI-powered chatbot. The system consists of three main components: **Frontend, Backend, and an AI Chatbot module**. The platform aims to enhance user interaction by providing automated responses without human intervention, improving responsiveness and reducing manual workload.

The project primarily focuses on core development rather than infrastructure deployment. There is **no budget investment**, and all the development is done using open-source tools and cloud hosting platforms. The system is built to function efficiently for university-level usage, offering user registration, login-based data management, and intelligent chat-based support.

The major objectives of this system include:

- Creating a functional backend for database operations, user authentication, and secure API handling.
- Designing a minimal and responsive frontend UI for user form submission and chatbot interaction.
- Implementing an AI chatbot that can communicate seamlessly and handle student queries 24/7.

This report describes the entire architecture, libraries used, API implementation, model integration, UI behavior, system flow, and future scalability possibilities.

2. Frontend Overview

2.1 Frontend Purpose

The frontend is the user-facing component that interacts with students to collect input data and display content dynamically. It ensures responsiveness, form validation, API consumption, and chatbot UI integration.

2.2 Technologies Used

- **HTML, CSS, JavaScript** (core UI rendering)
- **React.js** for dynamic UI and component-based structure
- **Tailwind CSS** for fast styling and responsiveness
- **Vercel deployment** to host the UI

2.3 UI Components

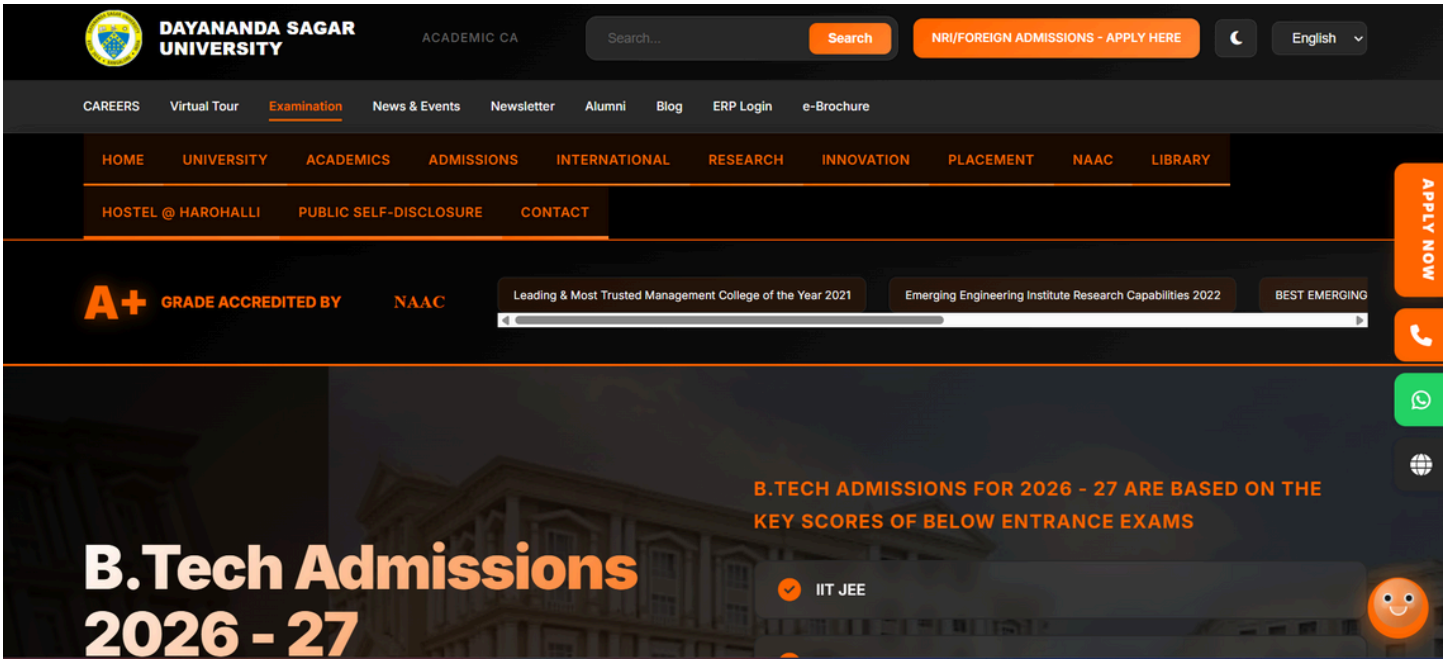
The system includes these core UI components:

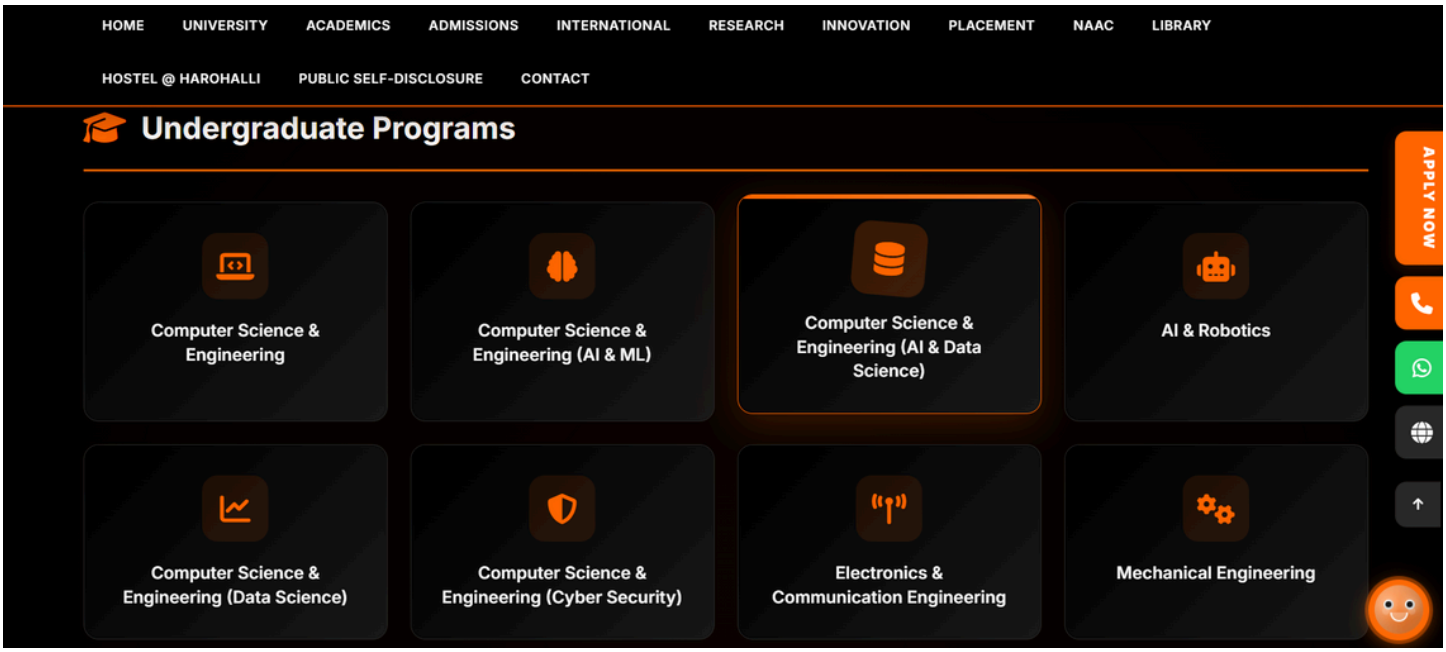
1. **Registration Form**
    - Fields: Name, Email, Phone Number, Password
    - Validations for email format and password length
    - On submit, it calls the backend API to store user data
2. **Login Interface**
    - Takes email and password
    - Verifies credentials via backend API
    - Once validated, user is allowed inside the system
3. **Chatbot User Interface**
    - Fixed chat window UI on website
    - Message input box and display bubbles
    - Connects to AI chatbot API
    - Responds instantly to student queries

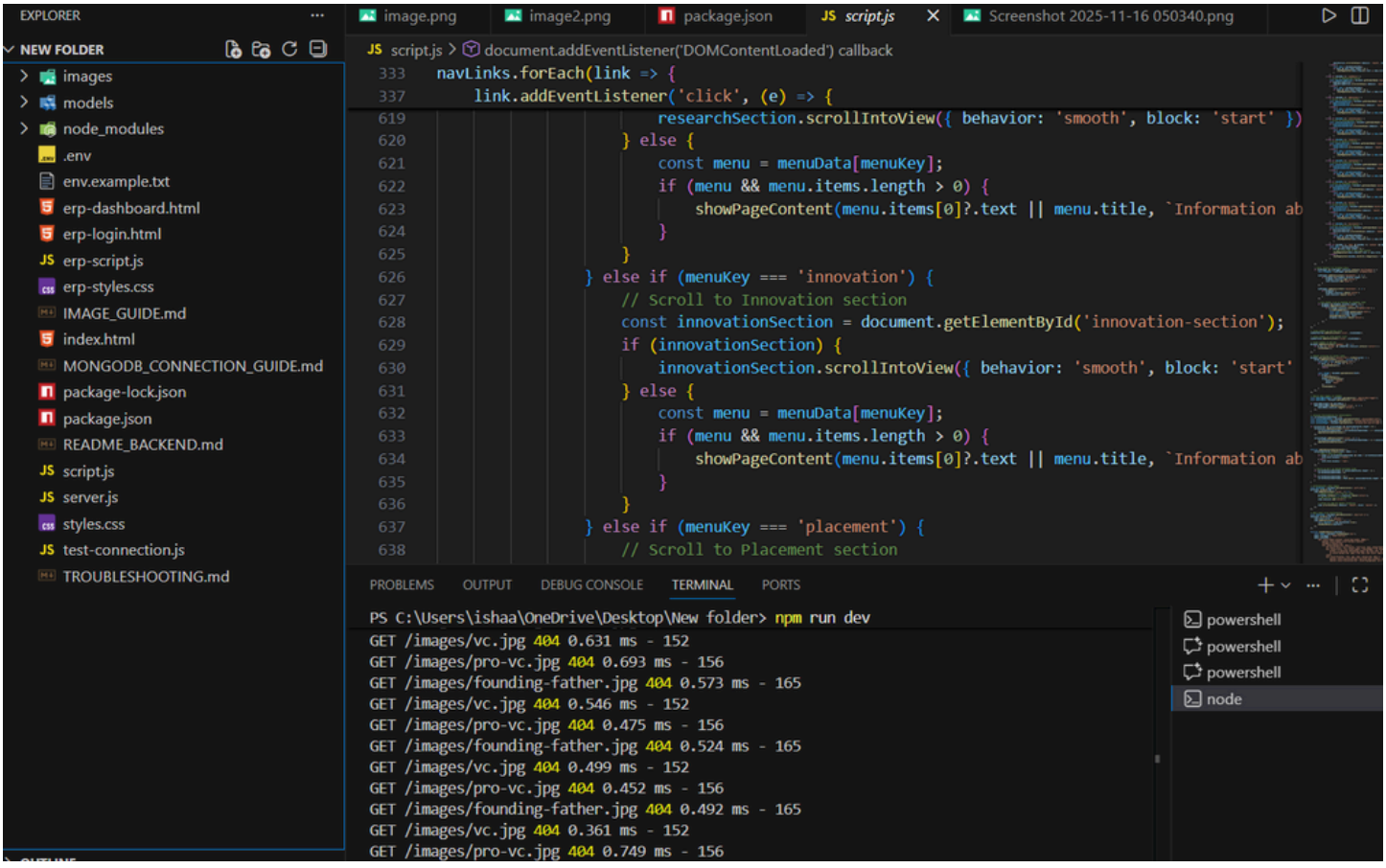
2.4 Frontend Working Flow

- User enters details in the form.
- Data is validated on the client side.
- Once validated, data is sent to backend API using fetch() or axios.
- Backend responds with a success/failure message.
- Chatbot UI renders messages and calls chatbot API to generate AI response.

The frontend does not directly deal with data storage; it only transmits data and displays received information from backend and chatbot module.







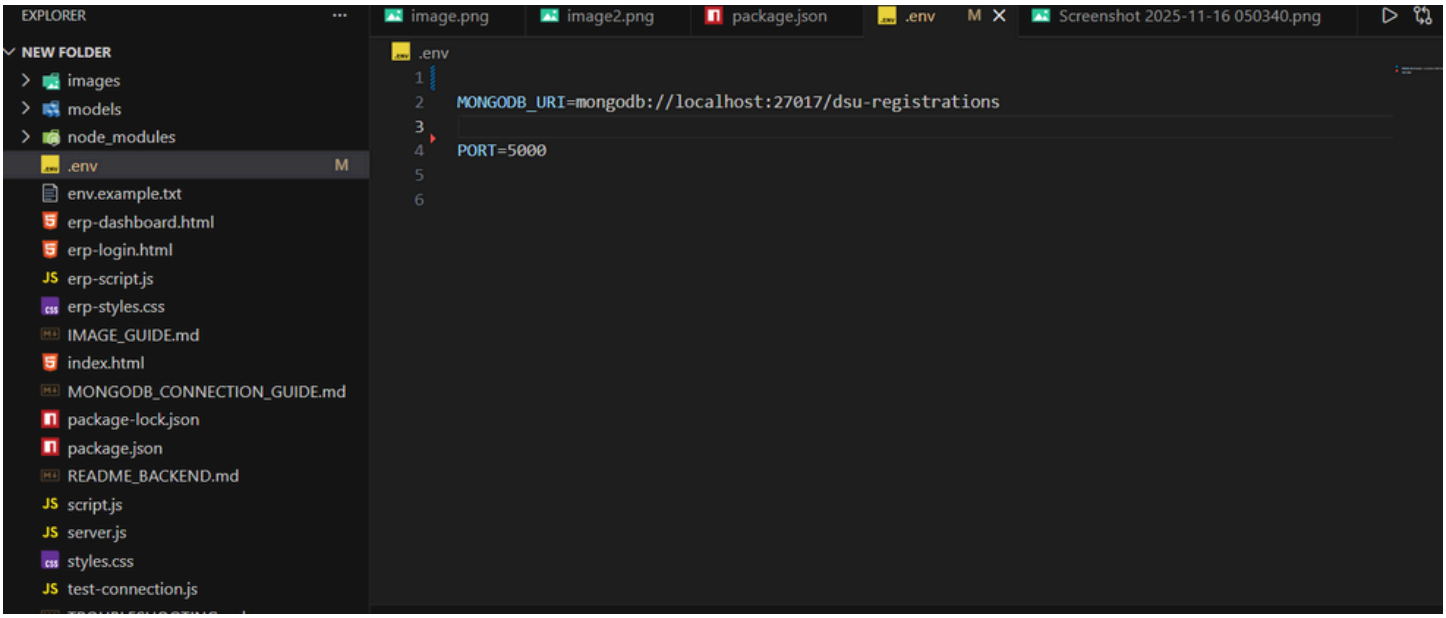
3. Backend Architecture

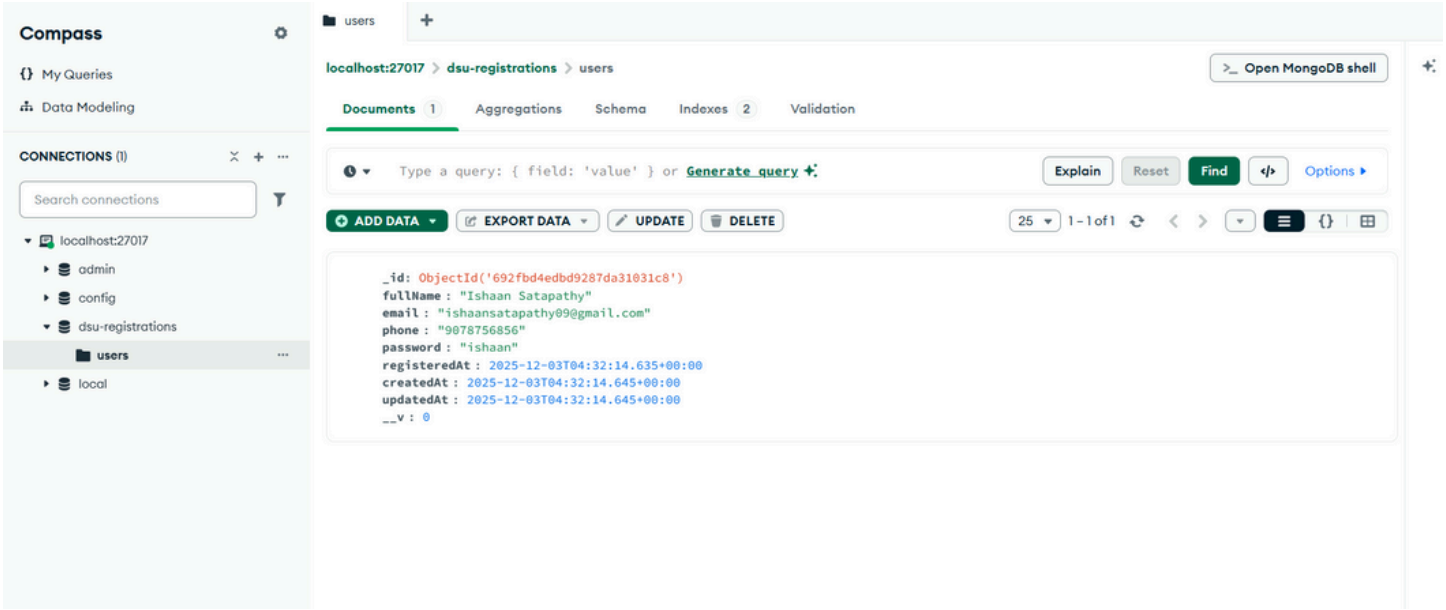
3.1 Backend Purpose

The backend manages student information, handles authentication, manages database queries, and exposes REST APIs for AI and frontend connection.

3.2 Technologies & Tools Used

- **Node.js** runtime environment
- **Express.js** to build REST APIs
- **MongoDB** as main database
- **Mongoose ORM** for schema and data modeling
- **bcrypt.js** for password hashing
- **JWT (JSON Web Token)** for authentication sessions
- **CORS, dotenv, body-parser** for API security and environment control
- **API hosted on Render / local server**





3.4 Authentication System

Two levels of authentication were implemented:

1. **Password hashing**
   - Before saving password, it is converted into hash using bcrypt

    - Makes raw password unreadable in DB
2. **Login session using JWT**
    - Once user logs in, backend creates a token
    - Token is sent back to frontend for future authorization
    - Token has expiry time for security

3.5 Core Backend API Routes

Route	Method	Purpose
/register	POST	Save new student in DB
/login	POST	Verify user and return JWT
/chat	POST	Receive message → send to AI model → return response

3.6 Backend Working Flow

- Registration request received in JSON
- Backend checks if email already exists
- Password is hashed using bcrypt
- Data is saved in MongoDB via Mongoose
- Login request validates credentials
- If correct, JWT token is created and sent back
- AI chatbot request is forwarded to model and reply is returned

3.7 Advantages of Backend Design

- Passwords are never stored as raw text
- API endpoints accept only validated JSON
- JWT ensures secure sessions without saving login state in DB
- MongoDB scalability supports future expansion

4. AI Chatbot Module

4.1 Purpose of AI Chatbot

The chatbot removes the need for manual query handling. It provides automated responses to:

- Admission process questions

- Course details
- Registration help
- General student queries

4.2 Integration Approach

- Frontend sends user message to backend /chat
- Backend forwards message to AI model using API call
- AI generates response instantly
- Backend returns AI response to frontend UI

4.3 Behavior Characteristics

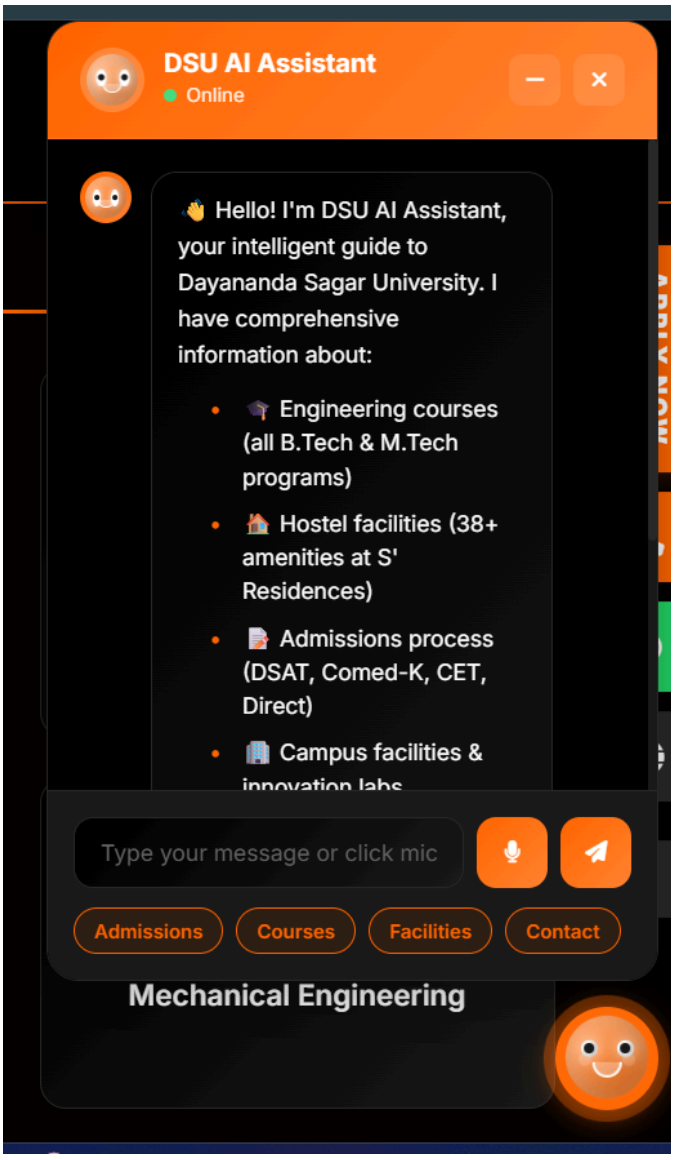
- Always conversational
- Gives short and accurate answers
- No memory retention across chats
- Avoids hallucinated data
- Politely declines unknown institution-specific facts
- Can greet, guide, and assist in form submission

4.4 AI Implementation Flow

1. Student types query in chat UI
2. Query goes to backend route
3. Backend calls AI model
4. Reply is received and returned
5. UI displays response bubble

4.5 Chatbot Limitations

- Does not fetch live data
- Not connected to external knowledge sources
- Cannot display student-specific stored DB details
- Answers only pre-known/general queries


DSU AI Assistant
Online
Hello! I'm DSU AI Assistant, your intelligent guide to Dayananda Sagar University. I have comprehensive information about:
Engineering courses (all B.Tech & M.Tech programs)
Hostel facilities (38+ amenities at S' Residences)
Admissions process (DSAT, Comed-K, CET, Direct)
Campus facilities &
Type your message or click mic
Admissions
Courses
Facilities
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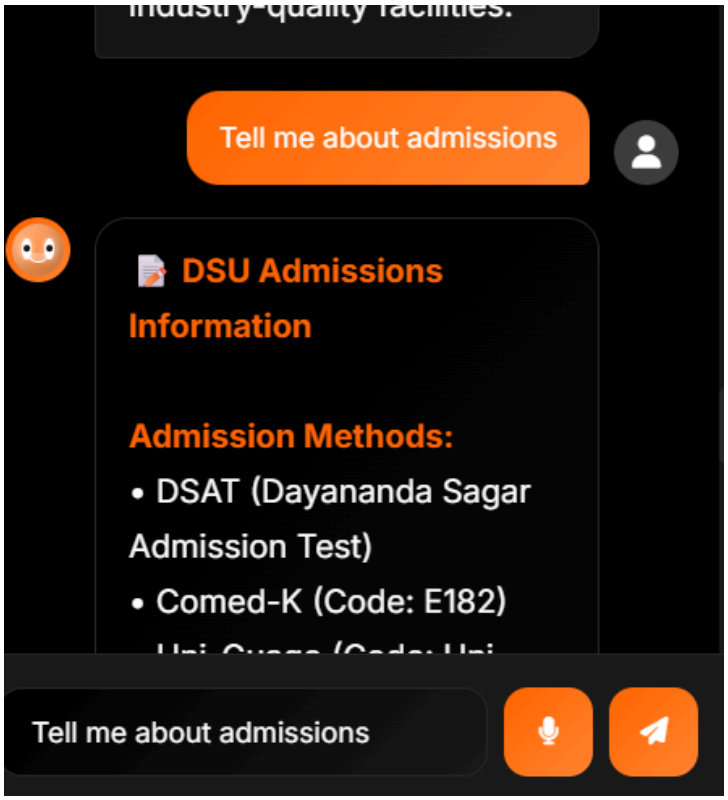
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DSU Admissions Information
Admission Methods:
• DSAT (Dayananda Sagar Admission Test)
• Comed-K (Code: E182)
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4.6 Benefits

✅ Instant 24×7 support
✅ Reduces manual assistance
✅ Improves student experience
✅ Can be extended later with live API linking

5. System Workflow Diagram (Page 7–8)

1. User opens student portal
2. Portal loads static/dynamic React frontend
3. User registers → backend API → DB storage
4. User logs in → backend auth → JWT token
5. User sends chatbot query → backend → AI → reply

Overall Data Flow:

User → Frontend UI → Backend API → (MongoDB OR AI Model) → Backend → Frontend UI → Display

6. Deployment Architecture (Page 8)

Component	Deployment
Frontend	Vercel
Backend API	Local/Render/Render-like hosting
Database	MongoDB Atlas or local MongoDB
AI Chatbot	API integrated through backend

Deployment ensures separation between modules while keeping costs zero.

7. Security Mechanisms (Page 9)

1. **Database Security**
   - Password hashing
   - Unique email constraint
   - No sensitive data leakage
2. **API Security**
   - CORS protection
   - dotenv variable protection

- No API keys in frontend
- All AI calls done server-side

3. **User Security**
   - JWT session token
   - Encrypted passwords

LINK: 🌐 Dayananda Sagar University | DSU - Bengaluru, India

GITHUB REPO: 🌐 GitHub - ishaansatapathy/dsuwebsite

Name	USN No	Contribution
Vishal Priyans	**ENG24CT0071**	**Backend API development, authentication logic (JWT & bcrypt), database schema modeling**
Ishaan Sachida Satapathy	**ENG24CT0042**	**Frontend development using React.js, UI structuring & API integration**
Ashrith Manoj	**ENG24CT0032**	**AI Chatbot integration and response handling pipeline**
Bhumika H Bhapri	**ENG24CT0002**	**UI/UX enhancements, testing and documentation**
Liya T cariappa	**ENG24CT0010**	**System flow planning, validation testing and report compilation**