InsurAI: Online Corporate Insurance using AI

FINAL PROJECT REPORT

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ABSTRACT

InsurAI is a smart and modern corporate insurance automation platform developed to eliminate the challenges of traditional manual insurance processing. In existing systems, customers face delays in policy requests, limited communication with agents, and dependency on physical workflows. To resolve these limitations, InsurAI integrates automation, artificial intelligence, and secure digital operations to simplify business processes and improve operational efficiency. The platform offers a seamless solution for policy creation, policy renewal, claim inquiry, and appointment booking, ensuring a faster and more responsive service experience.

A key innovation of InsurAI is the integration of AI-powered voice recognition, enabling customers to interact with the system through voice commands for quick query resolution. Real-time appointment scheduling enhances coordination between customers and agents by displaying live availability, thus improving service transparency and customer satisfaction. The system ensures secure and authorized access using authentication mechanisms with JSON Web Tokens (JWT), providing role-based dashboards for Admin, Agent, and User to manage respective workflows efficiently.

Technically, the solution follows enterprise-level Java architecture with layered design principles to ensure scalability, maintainability, and performance. The backend is developed using Spring Boot, REST APIs, and MySQL database, while modern UI technologies enable a friendly and interactive frontend experience. The report includes a detailed explanation of architecture, modules, database design, workflows, Data Flow Diagrams (DFD), and sequence diagrams that illustrate system behavior and internal communication among components.

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1. INTRODUCTION

InsurAI is an advanced corporate insurance automation platform designed to streamline, modernize, and digitalize traditional insurance workflows. In many organizations, insurance management still relies heavily on manual documentation, offline communication, and delayed service processing. These issues lead to operational inefficiency, error-prone data handling, and poor customer experience. InsurAI addresses these challenges by integrating automation, real-time communication, and AI-based assistance into a unified system.

The platform supports intelligent interaction through a Voice-Based Query System, enabling policyholders to speak and retrieve insurance details instantly without navigating complex interfaces. It further offers automated policy workflows that minimize manual tasks and reduce human dependency in day-to-day operations.

InsurAI also includes real-time appointment scheduling paired with Agent Availability Tracking, ensuring smooth coordination between customers and service agents. Role-based dashboards for Admin, Agent, and User provide personalized access, enabling secure viewing and management of insurance policies, appointments, and customer records.

Security is reinforced using JWT-based Authentication and Authorization, ensuring that only authorized users can access sensitive data. With seamless UI, responsive design, and optimized performance, InsurAI delivers a modern digital insurance experience.

Overall, InsurAI enhances business productivity, accelerates service delivery, and improves customer satisfaction. It serves as a scalable and futuristic solution for organizations aiming to transition from traditional policy handling to smart, automated corporate insurance management.

2. PROBLEM STATEMENT

Corporate insurance processes currently face multiple operational difficulties that impact both customers and insurance providers:

- **Manual policy handling** leads to delays, higher workload, and increased chances of human error.
- **Limited communication channels** between customers and agents often result in missed follow-ups and ineffective customer service.
- **No AI-driven support**, causing customers to wait longer for answers to policy or claim queries.
- **Lack of automation** in appointment booking and plan management creates scheduling conflicts and delays in service delivery.
- **Poor visibility of policy and agent availability** makes tracking status and renewals difficult.

Solution Highlights

InsurAI addresses the above challenges by introducing automation and intelligent assistance into the insurance workflow:

- **AI Voice Recognition**
  Provides instant answers to user queries regarding policies, claims, and renewals.
- **Automated Policy & Appointment Handling**
  Reduces manual effort by digitizing and streamlining workflow processes.
- **Real-time Agent Availability**
  Ensures customers can schedule appointments smoothly without conflicts.
- **Role-based Dashboards**
  Dedicated feature views for Customers, Agents, and Admins to track their actions, performance, and data efficiently.

3. OBJECTIVES

The primary objective of *InsurAI* is to transform traditional corporate insurance processes into a smart, automated, and user-friendly digital system. The platform focuses on eliminating manual delays, improving service accessibility, and enabling intelligent support through automation and AI technologies.

The key objectives of the system are:

- To automate the complete insurance policy lifecycle including creation, updating, renewal, and monitoring of policy details.
- To provide a real-time appointment scheduling system that allows customers to book, reschedule, or cancel meetings based on agent availability.
- To offer transparent policy status tracking for both customers and agents, ensuring improved communication and faster decision-making.
- To integrate AI-powered voice assistance that enables users to interact naturally with the system and access information quickly.
- To ensure strong security and controlled access through JWT-based authentication and role-based authorization.
- To deliver separate dashboards for Admin, Agent, and User, allowing role-specific features that enhance productivity and operational efficiency.
- To improve overall customer experience by providing a centralized and intelligent insurance service platform that is scalable, reliable, and easy to use.

4. TECHNOLOGY STACK

InsurAI is built using modern and scalable technologies that support secure, high-performance insurance automation and AI-driven interaction.

Backend Technologies

- Java 17
- Spring Boot Framework
- Spring MVC – Web Layer and REST API
- Spring Data JPA – ORM for database operations
- Spring Security + JWT – Authentication & Authorization
- MySQL – Relational Database Management

Frontend Technologies

- React (with Vite for optimized build & performance)
- Axios – API communication
- Tailwind CSS – Responsive UI design

AI / Voice System

- Gemini API (Google AI) – Intelligent query processing
- Speech-to-Text integration – Voice assistance support

Tools & Build System

- Maven – Dependency management & build automation
- Postman – API testing
- VS Code, Eclipse / IntelliJ IDEA – Development IDEs

5. SYSTEM ARCHITECTURE

The **InsurAI** platform is designed using a structured and scalable layered architecture to ensure security, performance, and easy maintainability. Each layer is responsible for a specific set of operations, enabling seamless flow of data and business logic throughout the system.

Layered Architecture Overview

1. **Client Layer (React Frontend UI)**
   - Provides interactive user interfaces for Customer, Agent, and Admin dashboards
   - Utilizes Axios for secure communication with backend APIs

2. **REST API Layer (Spring Boot Controller Layer)**
   - Exposes RESTful endpoints for all user operations
   - Handles incoming requests and responses

3. **Service Layer**
   - Contains core business logic
   - Processes validation, transformation, and decision rules

4. **Repository Layer (Spring Data JPA)**
   - Manages data persistence and database operations
   - Implements ORM for entity mapping

5. **Database Layer (MySQL)**
   - Stores all policy, user, appointment, and notification data
   - Ensures relational consistency and secure data access

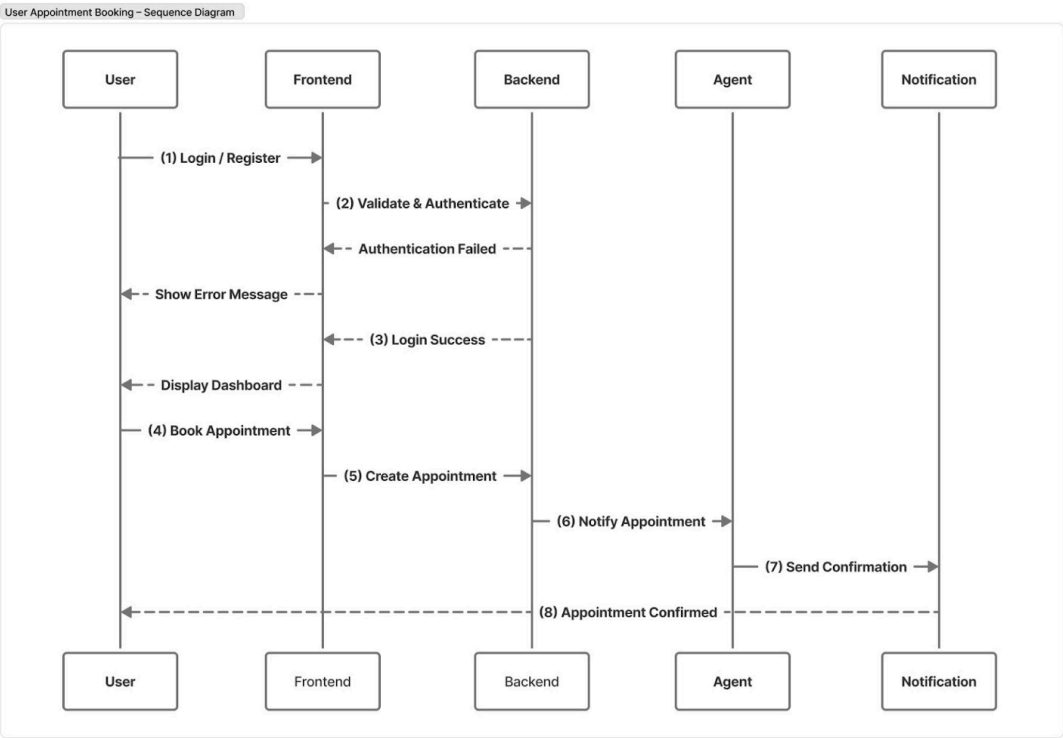
6. **AI Integration Layer (Gemini Voice System)**
   - Converts speech to text for intelligent query handling
   - Uses Gemini API to respond to user queries with relevant insurance details

6. UML DIAGRAMS

6.1 User Sequence Diagram

[]The User Sequence Diagram represents the step-by-step interaction between the user and the InsurAI system. It describes how a user performs operations such as authentication, viewing policy details, booking appointments, and accessing AI-based assistance. The sequence clearly shows the communication flow among the User Interface, Controller, Service Layer, and Database to complete each action smoothly.

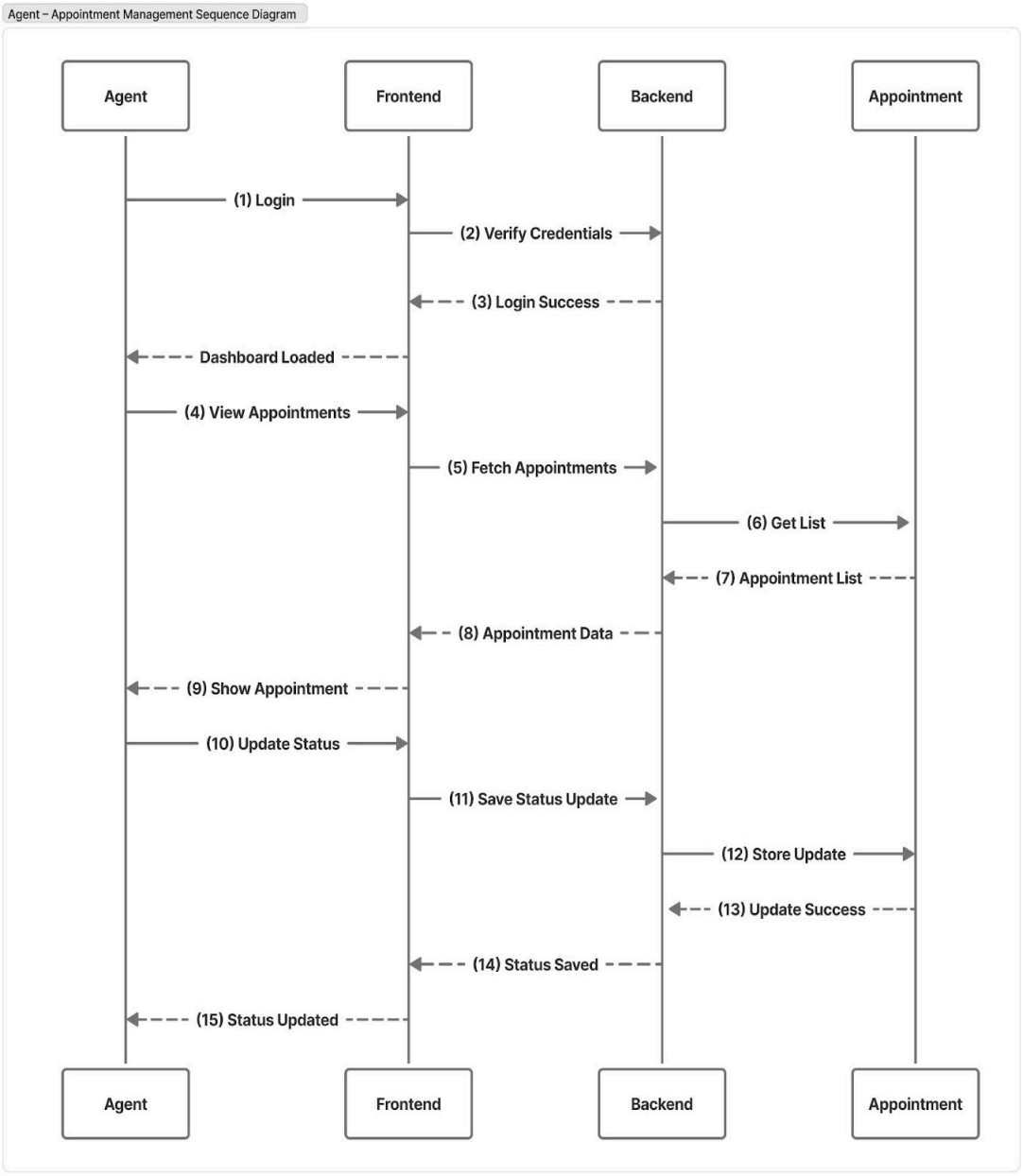
User Sequence Diagram – Login, Query AI, Book Appointment



6.2 Agent Sequence Diagram

The Agent Sequence Diagram illustrates the interactions between the agent and InsurAI during appointment and policy-related operations. It shows how agents manage appointment requests, update availability, and respond to customer actions through the system. The backend services and database layers work together to ensure accurate status updates and seamless communication with the users.

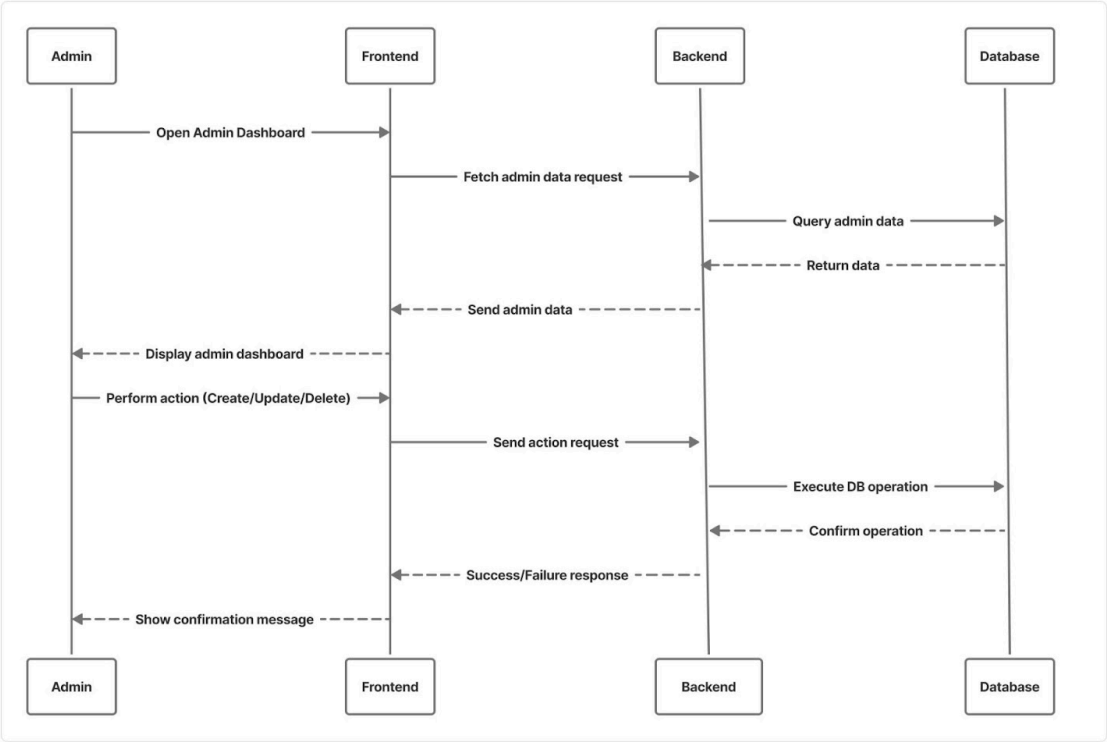
Agent Sequence Diagram – Manage Availability, Accept/Reject Appointment



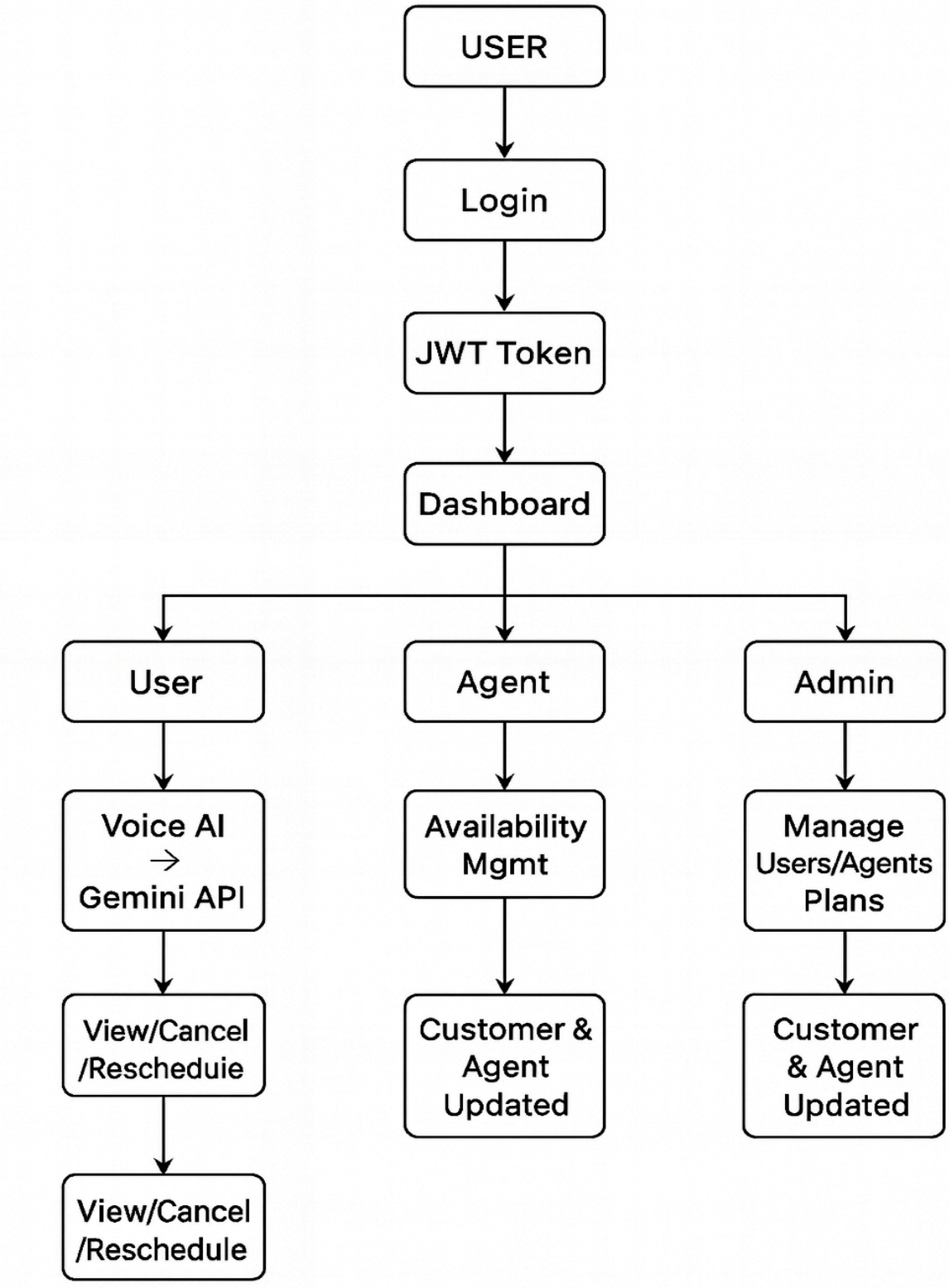
6.3 Admin Sequence Diagram

The Admin Sequence Diagram demonstrates how an admin interacts with InsurAI to handle system-wide operations. It includes managing users, agents, and policies through monitoring and control dashboards. The diagram clearly depicts how the admin triggers actions that pass through controllers and services to update the database securely and efficiently.

Admin Sequence Diagram – Manage Users, Agents, Policies

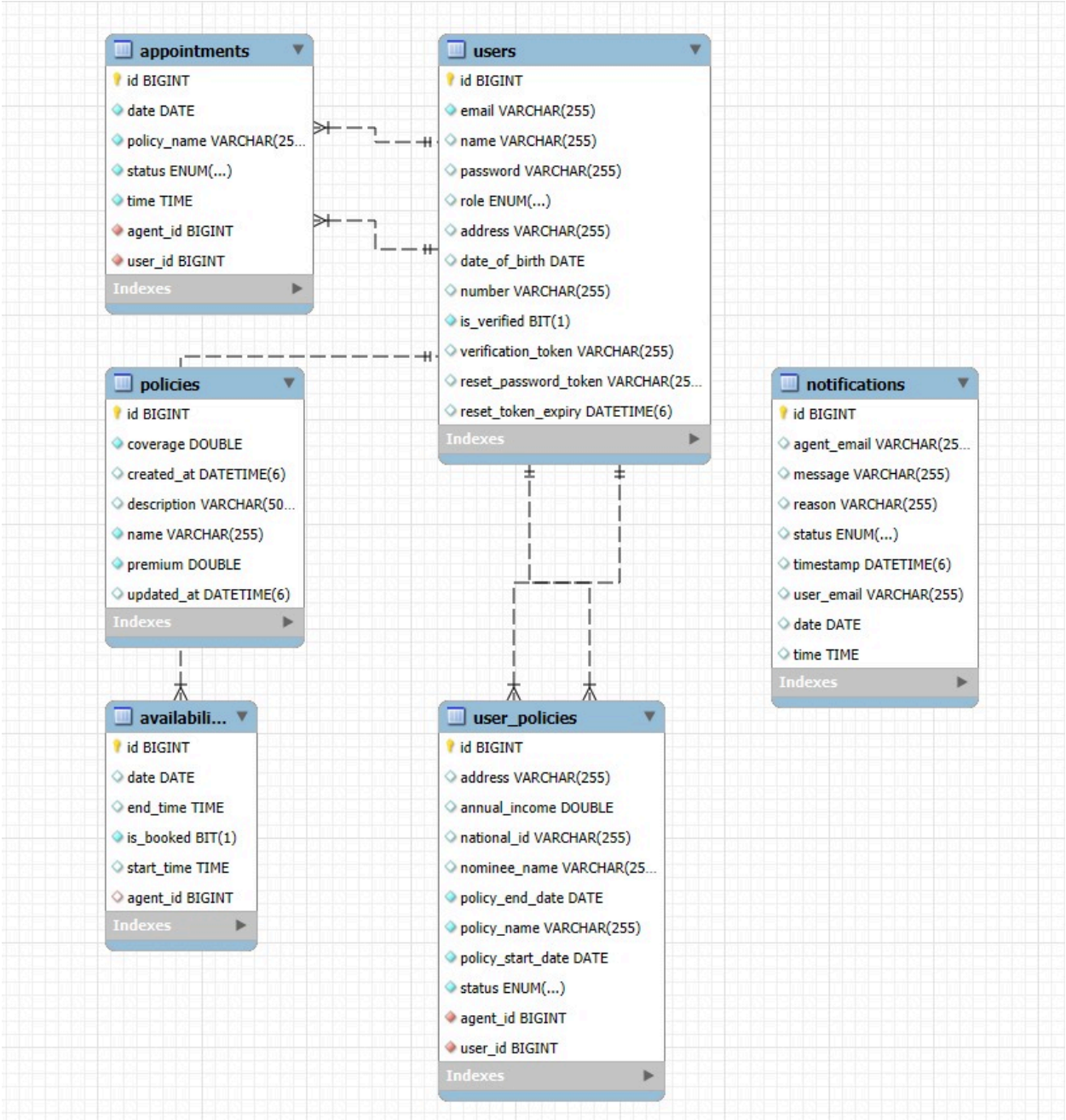


6.4 Data Flow Diagram



6.5 Class Diagram

[Diagram Placeholder – Entities: User, Agent, Appointment, PolicyPlan, Notification, Availability]



7. MODULE OVERVIEW

The InsurAI Corporate Policy Application consists of the following key modules:

1. User Authentication (JWT)
2. Voice Recognition (AI Query System)
3. Agent Availability Management
4. Appointment Scheduling Interface
5. Appointment Management
6. Plan Information Management (Purchased Policies)
7. Notification System
8. Admin Dashboard

8. IMPLEMENTATION

Module 1: User Authentication & Authorization (JWT)

- Handles user login, registration, and secure access using JSON Web Tokens.
- Includes workflow and UI screenshots demonstrating implementation.

Key Features:

- **User Registration** (role-based: User / Agent / Admin)
- **User Login** with JWT Token Generation
- **Refresh Token Mechanism** for session continuity
- **Role-Based Access Control (RBAC)**
- **Password Reset** functionality
- **Email Verification** to prevent unauthorized access

Package Structure

- Com.insurai.controller
- Com.insurai.service
- Com.insurai.config
- Com.insurai.entity
- Com.insurai.repository
- Com.insurai.dto

Backend Files:

- controller/AuthController.java
- service/AuthService.java
- config/JwtAuthenticationFilter.java
- config/SecurityConfig.java
- entity/User.java
- repository/UserRepository.java

Module 2: Voice Recognition – AI Customer Query System

This module enables users to interact with the InsurAI system using voice commands. It converts speech to text and processes the request using **Gemini AI**, which responds with relevant insurance information. The module improves accessibility and enhances the overall user experience with real-time intelligent assistance.

Key Features

- **Speech-to-Text Conversion** for natural communication
- Queries sent to **Gemini AI Model**
- Provides instant **policy details**
- Guides users with **claim procedures**
- AI-based answers to **FAQs**
- Integrated **voice assistant UI button** for interactive usage

Backend Files

- service/GeminiService.java
- controller/AiController.java

Role in System

- Makes customer support faster and automated
- Reduces dependency on manual agent responses
- Enhances accessibility for users facing digital interaction barriers

Module 3: Agent Availability Management

This module manages the working schedules of insurance agents within the InsurAI system. Agents can define and update their availability, ensuring that customers can view only valid time slots while booking appointments. This improves efficiency and eliminates scheduling conflicts.

Key Features

- Agents can add, update, or delete their availability schedule (CRUD operations)
- Availability includes date, time slot, and agent ID
- Customers can view available agents in real time during appointment booking
- Ensures conflict-free scheduling and prevents double bookings
- Admin can monitor agent activity and availability status

Purpose in System

- Helps agents manage workload efficiently
- Improves customer convenience by showing real-time slots
- Forms a core dependency for the Appointment Scheduling module

Module 4: Appointment Scheduling Interface

Features:

1. **User Selection**
    - Choose an **Agent** from the available list.
    - Pick an **Available Time Slot**.
    - Specify **Reason for Appointment**.

2. **Backend Validations**

    - Check for **time slot conflicts** with existing appointments.
    - Save appointments if the slot is free.
    - **Trigger notifications** to relevant parties (agent/user).

Frontend

- **Framework:** React

- **HTTP Requests:** Axios

- **UI Components:**

    - Calendar component for date selection.
    - Slot selector for choosing available times.
    - Form input for appointment reasons.

Backend

- **REST API Endpoints:**

    - `GET /agents` → Fetch available agents.
    - `GET /agents/{id}/availability` → Fetch available time slots for selected agents.
    - `POST /appointments` → Create new appointments (with conflict check).

- **Business Logic:**

    - Validate slot availability.
    - Save appointment details in the database.
    - Send notification (email, SMS, or in-app).

Module 5: Appointment Management

Purpose:

Facilitates seamless scheduling, updating, and tracking of appointments between customers and agents. Ensures conflict-free booking, real-time status updates, and efficient coordination.

Features:

- View Appointments: Customers and agents can view upcoming and past appointments.
- Auto Conflict Resolution: Prevents overlapping bookings and ensures smooth scheduling.
- Dynamic Status Updates: Appointment statuses change in real-time based on actions by customers or agents.

Appointment Statuses:

- PENDING: Appointment requested but not yet confirmed.
- CONFIRMED: Appointment successfully scheduled and confirmed.

Entities:

1. Appointment
   Attributes: `id`, `customer_id`, `agent_id`, `date`, `start_time`, `end_time`, `status`, `notes`

2. Agent
   Attributes: `id`, `name`, `specialization`, `availability`

3. Customer
   Attributes: `id`, `name`, `contact_info`, `preferences`

Module 6: Plan Information Management

Manages customer policy and plan information, enabling updates, tracking, and administrative access to client data.

Features:

- **Customer Profile Management:** Customers can update their profile details (e.g., contact info, preferences).
- **Admin Access:** Admins can fetch and view client details for management or reporting purposes.
- **Policy Renewal Tracking:** Tracks policy start/end dates and renewal status to ensure timely actions.

Module 7: Notification System

- **Appointment Confirmation**
    - Triggered when an appointment is successfully booked.
    - Sends a confirmation notification to the customer (and optionally the agent).

- **Appointment Reminder**
    - Triggered before the appointment date/time (configurable, e.g., 24 hours prior).
    - Send a reminder to ensure the customer does not miss the appointment.

- **Policy Renewal Reminder**
    - Triggered when a policy is nearing its end date (configurable, e.g., 7–15 days before expiry).
    - Send a renewal notification to the customer to avoid lapse.

Technologies Used

- **Spring Email Service**
    - Handles automated email notifications for all triggers.

- **Optional SMS Gateway**
    - Can be integrated to send SMS reminders in addition to emails**.**

Module 8: Admin Dashboard

Purpose:
Provides administrators with a centralized interface to monitor and manage users, agents, appointments, and policies efficiently.

Features:

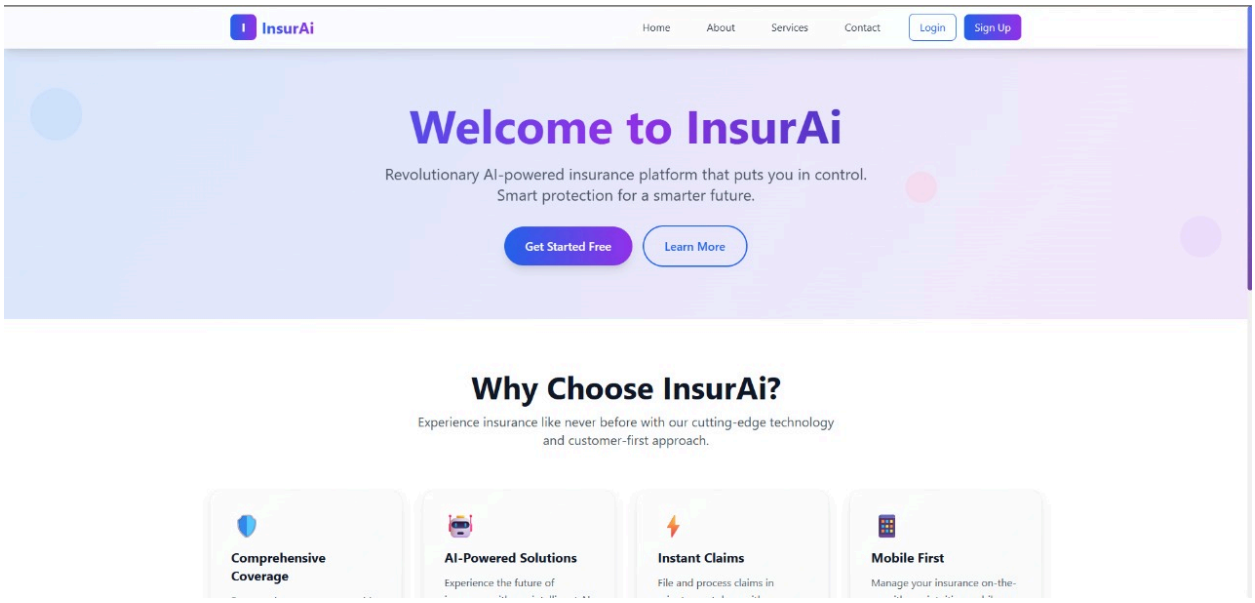
- **View Total Users:** Quickly see the total number of customers registered.
- **Add/Edit/Delete Agents:** Manage agent records, including availability and contact info.
- **Manage Appointments:** View, confirm, cancel, or reschedule appointments.
- **Manage Policies:** Monitor policy status, renewals, and updates.
- **Notification Panel:** Centralized alerts for appointments, policy renewals, and other important updates.

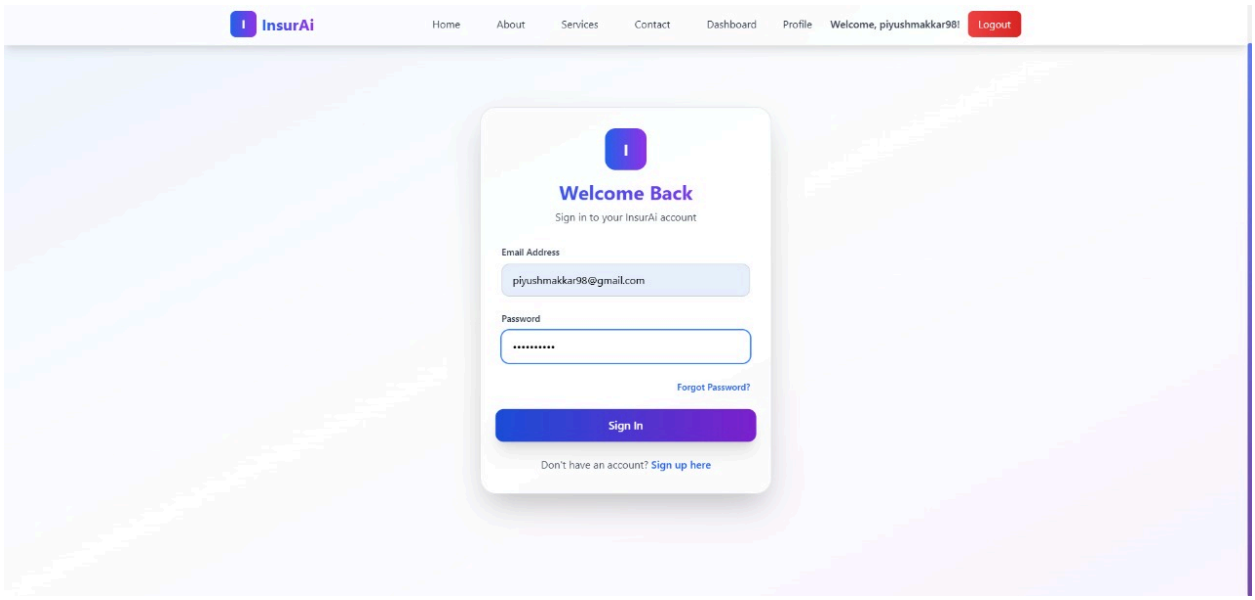
Modules Inside Dashboard:

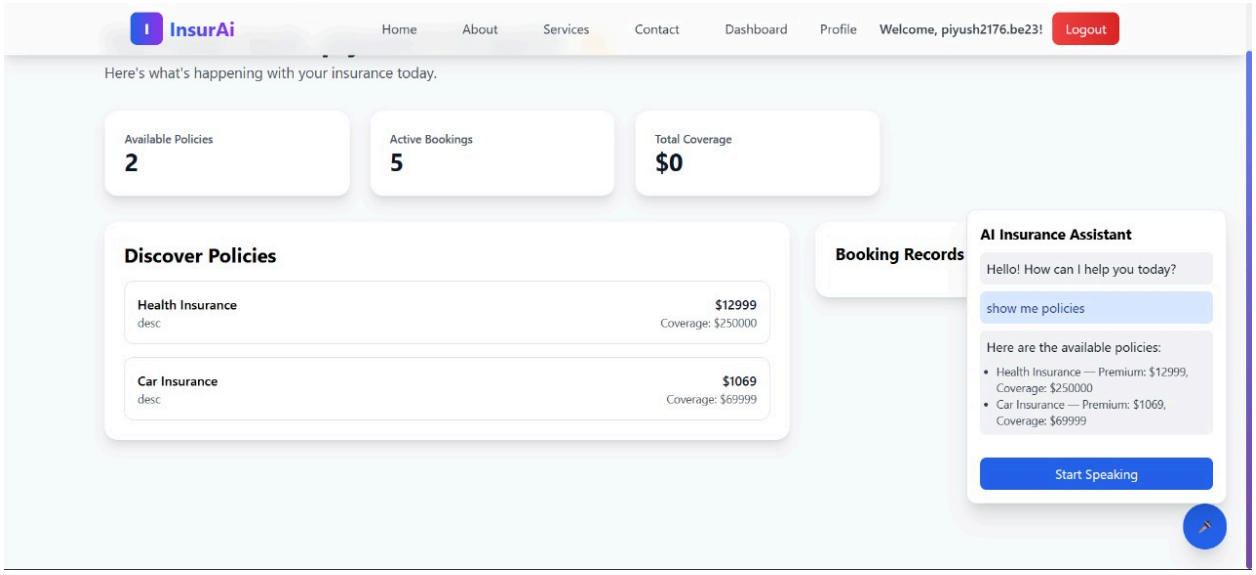
1. **User Management** – Manage customer profiles and data.
2. **Agent Management** – Add, edit, or remove agents and track their availability.
3. **Appointment Summary** – Overview of upcoming, past, and pending appointments.
4. **Plan Overview** – Summary of all policies, premiums, and renewal statuses.

9. TESTING & OUTPUT

- API testing using Postman
- UI testing with React DevTools
- Test scenarios: Login, Appointment Booking, Policy Fetching, Notifications



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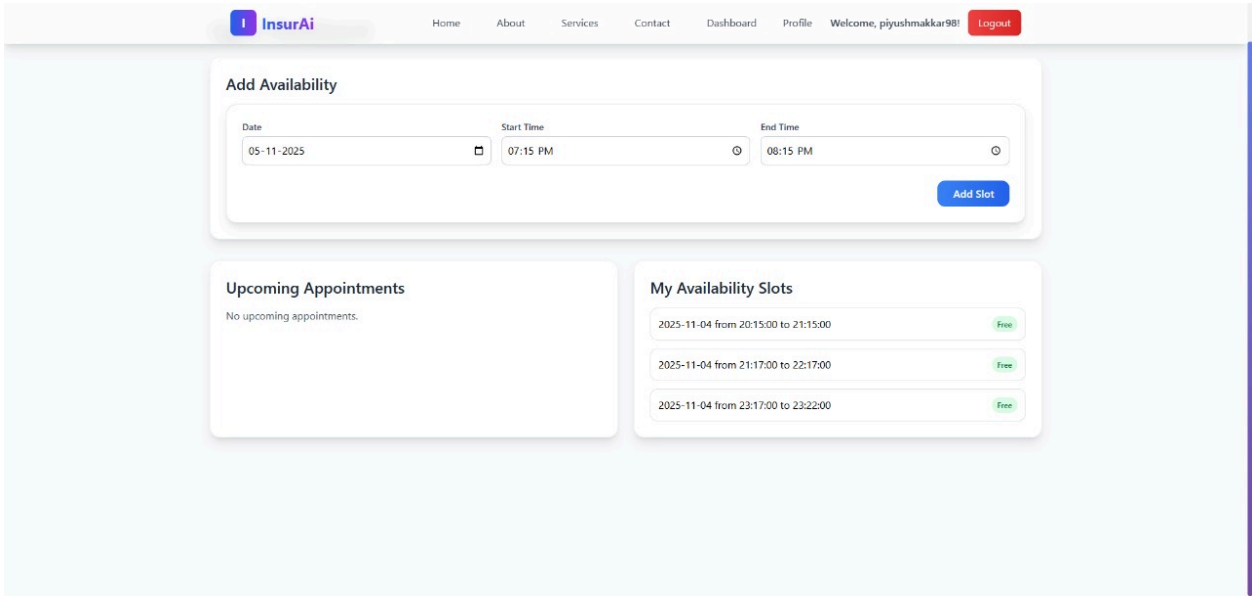
Home
About
Services
Contact
Dashboard
Profile
Welcome, piyush2176.be23!
Logout
Here's what's happening with your insurance today.
Available Policies
2
Active Bookings
5
Total Coverage
$0
Discover Policies
Health Insurance
desc
$12999
Coverage: $250000
Car Insurance
desc
$1069
Coverage: $69999
Booking Records
AI Insurance Assistant
Hello! How can I help you today?
show me policies
Here are the available policies:
Health Insurance — Premium: $12999, Coverage: $250000
Car Insurance — Premium: $1069, Coverage: $69999
Start Speaking


InsurAi
Home
About
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Contact
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Profile
Welcome, piyushmakkar98!
Logout
Add Availability
Date
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Start Time
07:15 PM
End Time
08:15 PM
Add Slot
Upcoming Appointments
No upcoming appointments.
My Availability Slots
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Free
2025-11-04 from 21:17:00 to 22:17:00
Free
2025-11-04 from 23:17:00 to 23:22:00
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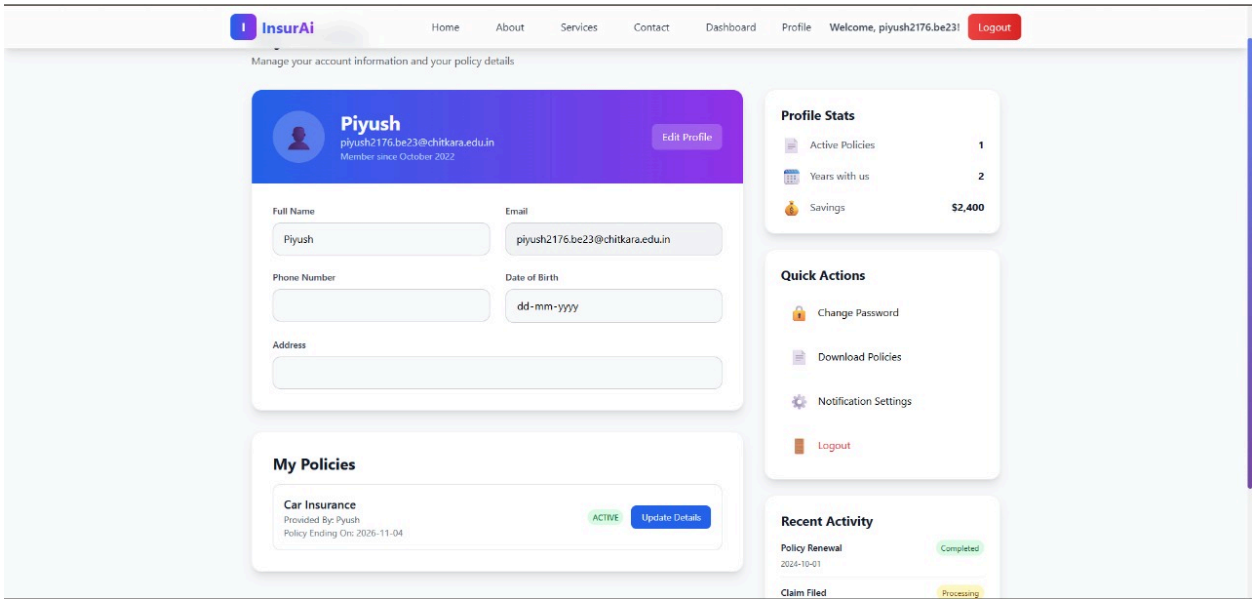

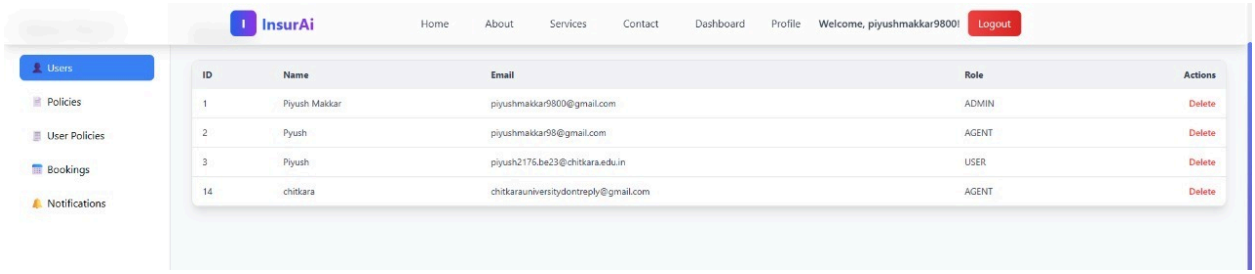

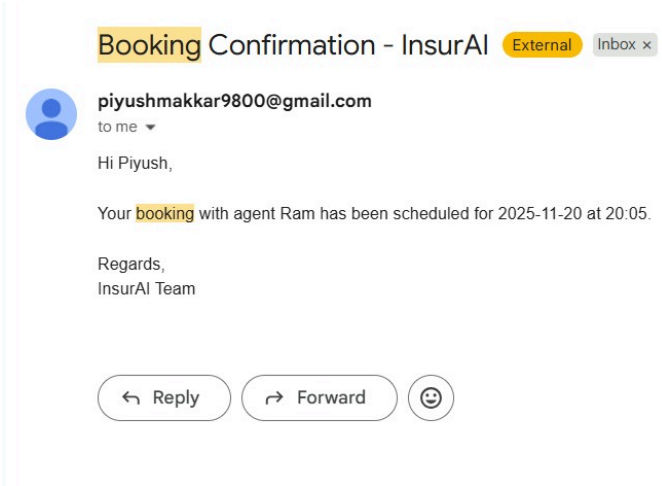

10. CONCLUSION

InsurAI successfully automates corporate insurance workflows by integrating AI-driven solutions, secure authentication, and a scalable system architecture. The platform enhances customer experience through efficient appointment scheduling, policy management, and real-time notifications, while significantly reducing manual effort for agents and administrators. Its modular design ensures flexibility, maintainability, and the ability to scale with growing business needs.

11. FUTURE ENHANCEMENTS

- Real-time WebSocket notifications
- Policy recommendation using ML
- Multi-language AI voice support
- Admin analytics dashboard improvements

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5. Spring Email Service – https://spring.io/guides/gs/sending-email/
6. AI & Voice Recognition Overview – Relevant whitepapers or documentation of chosen AI service (e.g., Gemini API)