Guardian Eye - Final Project Report

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Chapter 1

Introduction

In today's world, women's safety has become a critical concern requiring immediate technological solutions. The increasing need for personal security systems that can provide instant assistance during emergencies has highlighted the gap in accessible, real-time safety applications.

Guardian Eye is a comprehensive women's safety application designed to provide immediate emergency assistance, real-time location sharing, and proactive safety monitoring. It combines modern technologies with an intuitive interface to deliver a reliable and responsive safety network for women. As the developer of this project, I conceptualized and implemented Guardian Eye as part of my MCA coursework at Sapthagiri NPS University. The project focuses on creating a responsive and secure full-stack application using modern web technologies for the frontend, Spring Boot for the backend, and MySQL for database management.

The goal behind Guardian Eye is to bridge the gap between complex security systems and accessible safety solutions - ensuring usability, reliability, and immediate response capabilities in emergency situations.

Chapter 2

Problem Statement

Many women face safety concerns in their daily lives, with existing solutions often being inadequate or difficult to access when needed most. Common challenges include:

- Lack of instant emergency alert systems
- Difficulty in sharing real-time location with trusted contacts
- Complex interfaces that are hard to operate under stress
- Limited integration with emergency services
- No centralized platform for family safety coordination

- Inadequate proactive safety monitoring

There is a pressing need for a simple yet powerful safety platform that is accessible, intuitive, and effective during emergencies.

Chapter 3

Proposed Solution

Guardian Eye is designed as a comprehensive safety solution that provides immediate assistance and continuous monitoring through smart features and real-time connectivity. It enables users to:

- Activate instant emergency alerts with one tap
- Share real-time location with trusted contacts
- Manage family safety networks efficiently
- Set up safe zones and receive boundary alerts
- Access emergency services quickly
- Maintain safety history and patterns
- Use intuitive interfaces designed for stress situations

This approach empowers women with immediate access to help and provides peace of mind to their families through continuous monitoring capabilities.

Chapter 4

Technology Stack and Decision Rationale

Layer	**Technology**	**Rationale**
Frontend	HTML5, CSS3, JavaScript	Universal compatibility and fast performance
Backend	Spring Boot	Robust and scalable REST API framework
Database	MySQL	Reliable and easy to integrate with Spring

Layer	Technology	Rationale
Authentication	JWT	Ensures secure session management
Maps & Location	Google Maps API	Accurate real-time location services
Notifications	Web Push API	Instant browser-based notifications
Styling	CSS3 + Responsive Design	Ensures modern and adaptive interface
Icons	Font Awesome	Comprehensive icon library for better UX

These technologies were chosen to create a responsive, efficient, and user-focused application that supports real-time operations and ensures reliability during critical situations.

Chapter 5

Database Design

The database for Guardian Eye is implemented in MySQL. It follows a normalized structure with relationships between users, family members, emergency contacts, and safety records.

Database Schema Overview

Table	Purpose
users	Stores user credentials and profile information
family_members	Manages family network connections
emergency_contacts	Stores trusted contact information
safety_alerts	Records all emergency alert incidents
location_history	Tracks user location data

Table	Purpose
safe_zones	Manages user-defined safe areas

Schema Structure (SQL)

```
CREATE DATABASE IF NOT EXISTS guardian_eye;
USE guardian_eye;

CREATE TABLE IF NOT EXISTS users (
   id BIGINT AUTO_INCREMENT PRIMARY KEY,
   username VARCHAR(100) NOT NULL UNIQUE,
   email VARCHAR(150) NOT NULL UNIQUE,
   password VARCHAR(255) NOT NULL,
   phone_number VARCHAR(15),
   emergency_activated BOOLEAN DEFAULT FALSE,
   created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
);

CREATE TABLE IF NOT EXISTS family_members (
   id BIGINT AUTO_INCREMENT PRIMARY KEY,
   user_id BIGINT,
   name VARCHAR(100) NOT NULL,
   relationship VARCHAR(50) NOT NULL,
   phone_number VARCHAR(15) NOT NULL,
   email VARCHAR(150),
   permissions JSON,
   is_emergency_contact BOOLEAN DEFAULT FALSE,
   FOREIGN KEY (user_id) REFERENCES users(id)
```

```
);

CREATE TABLE IF NOT EXISTS emergency_contacts (
    id BIGINT AUTO_INCREMENT PRIMARY KEY,
    user_id BIGINT,
    name VARCHAR(100) NOT NULL,
    phone_number VARCHAR(15) NOT NULL,
    relationship VARCHAR(50),
    priority INT DEFAULT 1,
    FOREIGN KEY (user_id) REFERENCES users(id)
);

CREATE TABLE IF NOT EXISTS safety_alerts (
    id BIGINT AUTO_INCREMENT PRIMARY KEY,
    user_id BIGINT,
    alert_type VARCHAR(50) NOT NULL,
    location_lat DECIMAL(10, 8),
    location_lng DECIMAL(11, 8),
    message TEXT,
    status VARCHAR(20) DEFAULT 'ACTIVE',
    created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    resolved_at TIMESTAMP NULL,
    FOREIGN KEY (user_id) REFERENCES users(id)
);

CREATE TABLE IF NOT EXISTS location_history (
    id BIGINT AUTO_INCREMENT PRIMARY KEY,
    user_id BIGINT,
    latitude DECIMAL(10, 8) NOT NULL,
    longitude DECIMAL(11, 8) NOT NULL,
    timestamp TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    FOREIGN KEY (user_id) REFERENCES users(id)
);
CREATE TABLE IF NOT EXISTS safe_zones (
    id BIGINT AUTO_INCREMENT PRIMARY KEY,
    user_id BIGINT,
    name VARCHAR(100) NOT NULL,
    address TEXT NOT NULL,
    radius_meters INT DEFAULT 100,
    latitude DECIMAL(10, 8),
    longitude DECIMAL(11, 8),
    is_active BOOLEAN DEFAULT TRUE,
    FOREIGN KEY (user_id) REFERENCES users(id)
);
```

Relationships

- One User → Many Family Members
- One User → Many Emergency Contacts
- One User → Many Safety Alerts
- One User → Many Location History Records
- One User → Many Safe Zones

This ensures data consistency, enables efficient querying for real-time alerts, and supports comprehensive safety monitoring.

Key Characteristics

- Referential integrity enforced via foreign keys
- Unique constraints on usernames and emails
- Designed for real-time alert processing
- Scalable for multi-user operations with geospatial data
- JSON fields for flexible permission management

Chapter 6

System Workflow

The overall workflow of Guardian Eye follows a real-time safety protocol from user interaction to emergency response. Each component is designed for reliability and immediate action.

Frontend Layer (Web Application)

The frontend is built using HTML5, CSS3, and JavaScript. It manages all user interactions through intuitive interfaces and emergency controls.

- Users interact with components such as Emergency Button, Location Sharing, Family Management, and Safety Dashboard
- Emergency triggers initiate immediate API calls to the backend
- Real-time location tracking provides continuous safety monitoring

Backend Layer (Spring Boot)

The backend handles safety operations through Spring Boot REST controllers.

- Emergency requests are received at endpoints like /api/emergency/alert, /api/location/update, /api/family/notify
- The controller layer validates requests and initiates emergency protocols
- The service layer manages notification distribution and contact coordination

Emergency Alert Flow

1. User Action: Presses emergency button or activates safety trigger
2. Frontend: Sends POST request with user location and alert details
3. Controller: Receives emergency alert (EmergencyController), validates user authentication
4. Service Layer:
    - Stores alert in database
    - Retrieves emergency contacts
    - Sends SMS/email notifications
    - Updates family dashboard
5. Notification System: Simultaneously notifies all registered contacts
6. Response: Confirmation sent to user interface with alert status

Data Flow Summary

User → Web Interface (Emergency Trigger)

↓
HTTP Request (JSON with location data)

↓
Spring Boot Controller (EmergencyController)

↓
EmergencyService → NotificationService → ContactRepository

↓
MySQL Database (Tables: safety_alerts, emergency_contacts)

↓
Multi-channel Notifications → Family & Contacts

↓
Response → User Interface (Alert Confirmation)

Authentication and Security

The security system uses JWT (JSON Web Tokens) for secure access:

- Users login with credentials to access safety features
- JWT tokens are stored securely for session management
- All emergency requests include authentication tokens
- Location data is encrypted during transmission

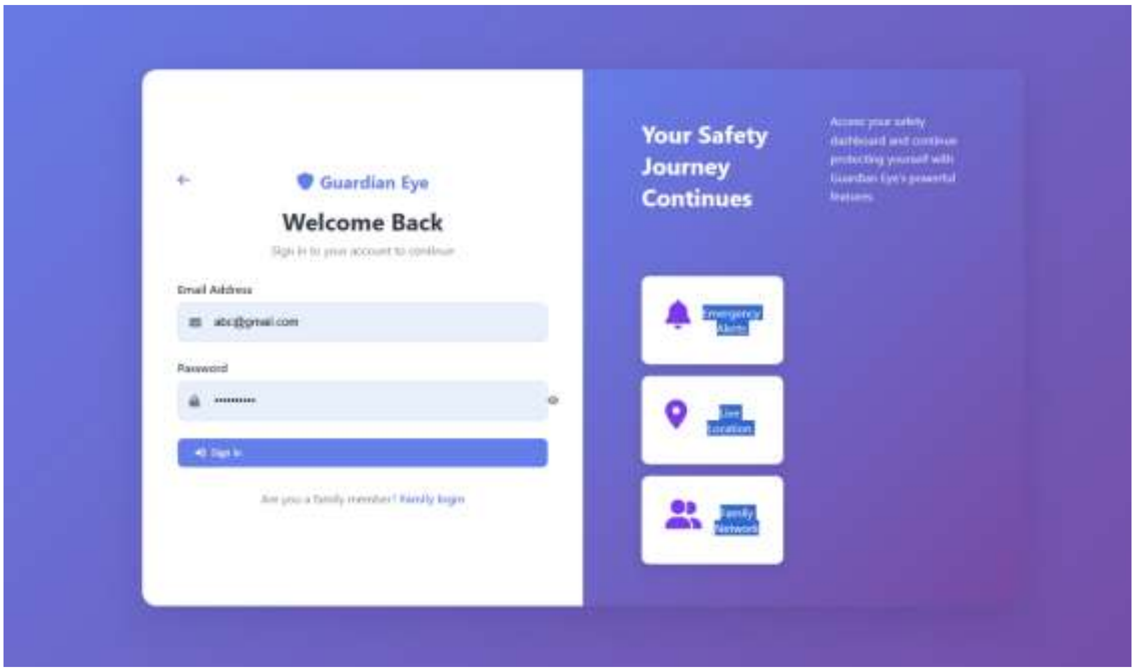
This ensures that safety features are accessible only to authenticated users while maintaining rapid response capabilities.

Chapter 7

Modules Implemented

1. Authentication Module

Handles secure login and signup using Spring Security and JWT tokens.
It ensures that only authorized users can access the dashboard and expense management features.



Guardian Eye

Welcome Back

Sign in to your account to continue

Email Address

abc@gmail.com

Password

••••••••••

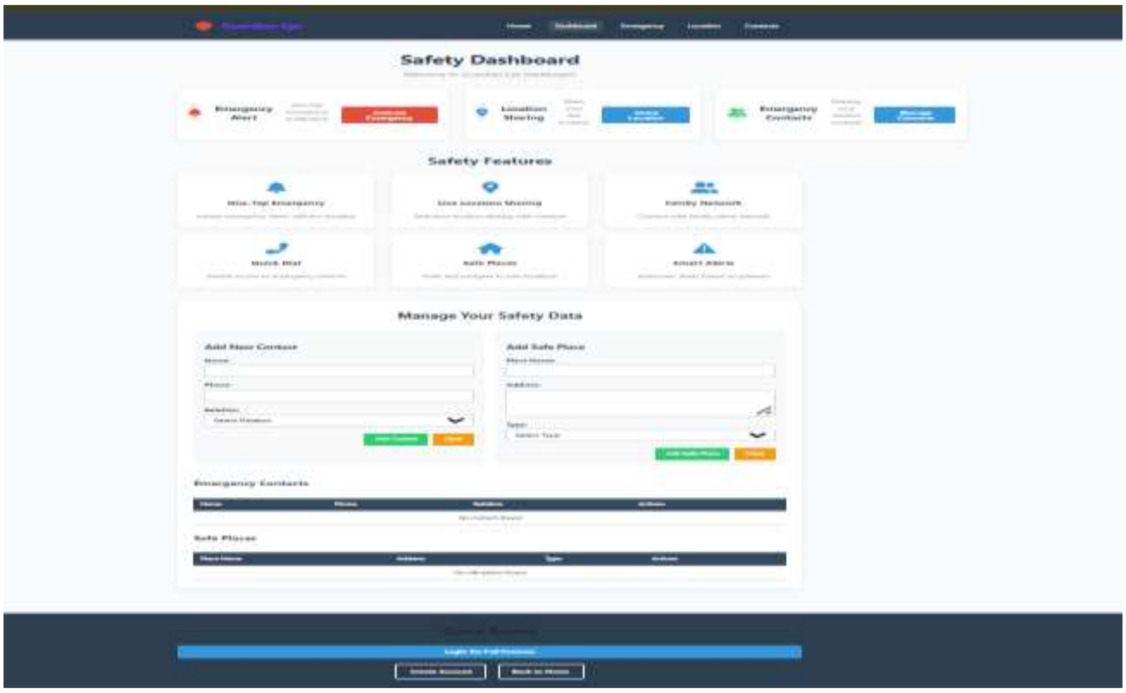
Sign In

Are you a family member? Family login

Your Safety Journey Continues

Access your safety dashboard and continue protecting yourself with Guardian Eye's powerful features.

2.User Module



Safety Dashboard

Emergency Alert

Location Sharing

Emergency Contacts

Safety Features

One-Tap Emergency

Live Location Sharing

Family Network

Quick Dial

Safe Places

Smart Alerts

Manage Your Safety Data

Add New Contact

Name:

Phone:

Relation:

Add Safe Place

Place Name:

Address:

Type:

Emergency Contacts

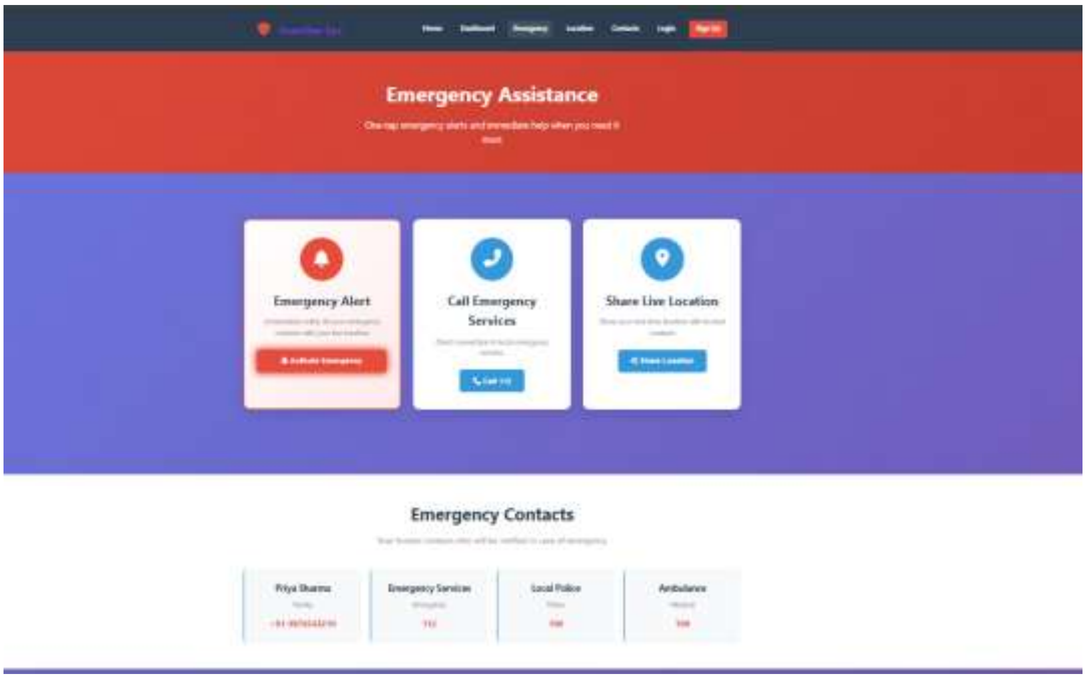
Name	Phone	Relation	Actions

Safe Places

Place Name	Address	Type	Actions

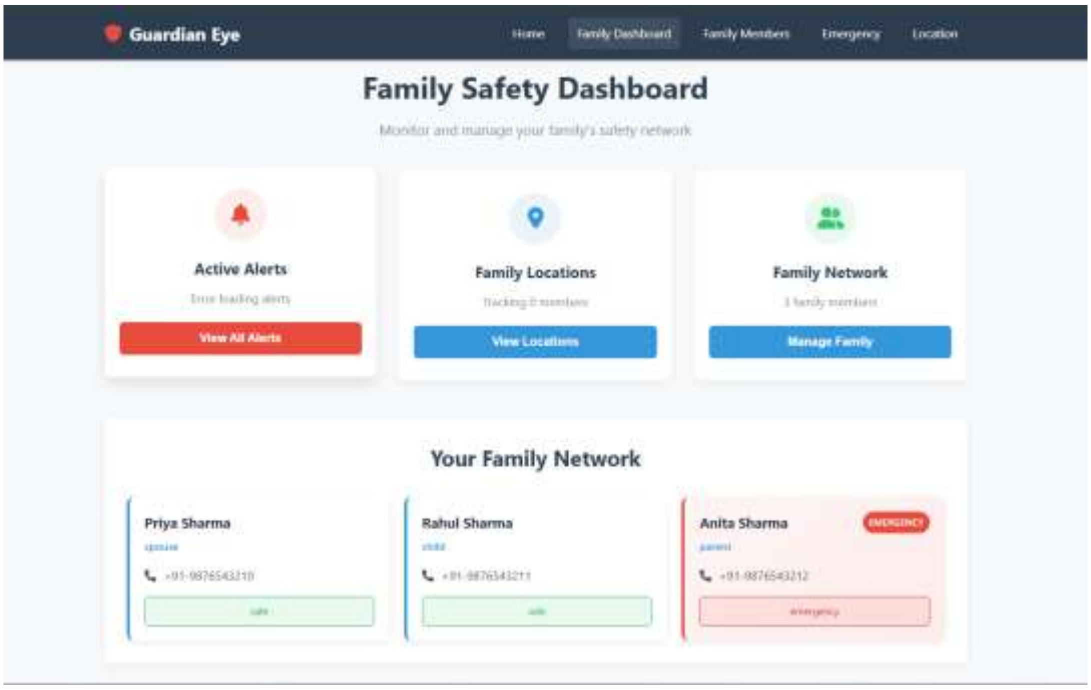
3. Emergency Alert Module

Handles instant emergency notifications with one-tap activation. Integrates with location services to provide precise coordinates to emergency contacts.



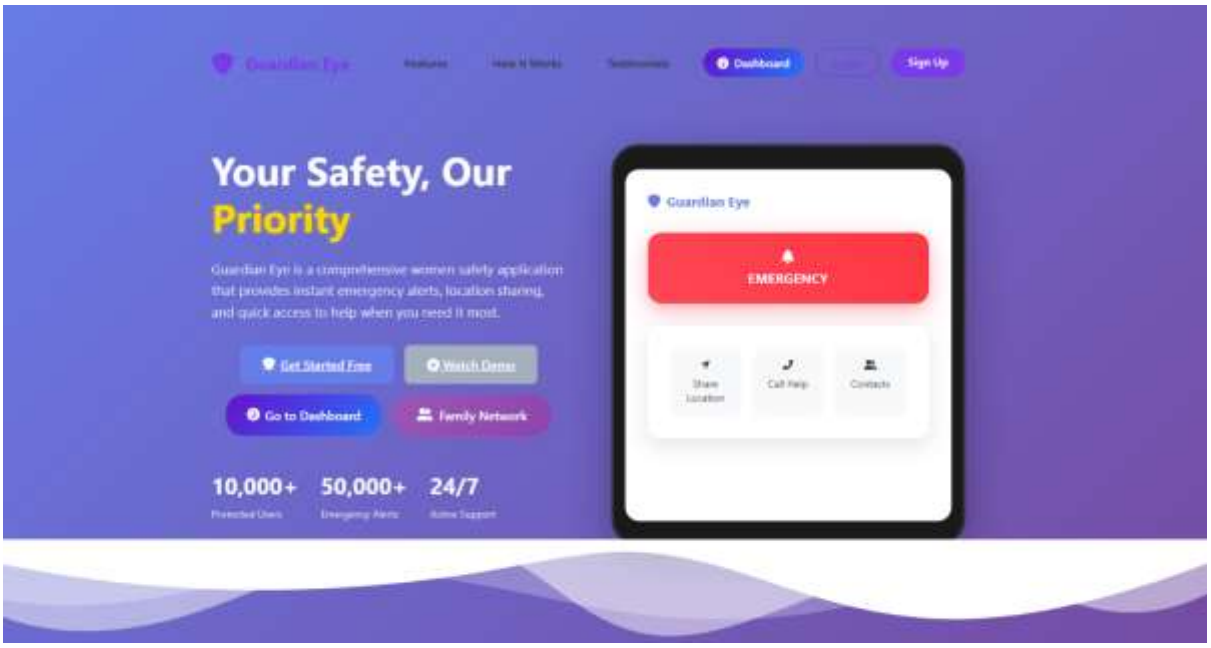
4. Family Safety Network Module

Manages family connections and safety permissions. Allows users to build trusted networks for mutual safety monitoring.



5. Dashboard Module

Provides comprehensive safety overview with visual analytics and safety pattern recognition.



Guardian Eye is a comprehensive women safety application that provides instant emergency alerts, location sharing, and quick access to help when you need it most.

Chapter 8

Future Enhancements

- AI-Powered Risk Assessment: Implement machine learning to predict potentially unsafe situations based on location patterns and time
- Integration with Local Authorities: Direct alert routing to police and emergency services
- Voice Activation: Hands-free emergency activation through voice commands
- Wearable Integration: Sync with smartwatches and wearable safety devices
- Community Safety Network: Connect users in proximity for mutual safety monitoring
- Advanced Analytics: Predictive safety insights and personalized safety recommendations
- Offline Functionality: Emergency protocols that work without internet connectivity
- Multi-language Support: Expand accessibility for diverse user base

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Chapter 9

Conclusion

The development of Guardian Eye demonstrates the complete design and implementation of a modern, responsive women's safety application. This project represents a significant step forward in making safety technology accessible and effective for everyday use.

This project enhanced my technical expertise in full-stack development, real-time systems, location-based services, and RESTful API design, while also deepening my understanding of user-centered design for critical applications.

Guardian Eye effectively addresses the urgent need for reliable safety solutions by combining immediate emergency response with proactive safety monitoring. It provides women with confidence and peace of mind while offering families a reliable way to stay connected and responsive during critical situations.

The application stands as a robust foundation for future safety technology innovations, balancing technical excellence with compassionate design to create genuinely impactful safety solutions.