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## How to Navigate and Read the Code on GitLab

Our GitLab repository contains two key versions of our project, reflecting the evolution from our initial Django-only prototype to our final web application using Django as a backend and React as a frontend. To help you navigate the repository and locate the most relevant code, follow these guidelines:

### 1. Understanding the Branches

Master Branch ([master](#)): This branch contains our initial prototype of the website, built purely with Django. The source code for this version is located in:

master → src

App Branch ([App](#)): This is the main branch containing the final version of our web application. This is the project we are presenting, and it can be found in:

App → sources

### 2. Accessing the Final Report

The final project report is available in **both branches**, located at:

[App/docs/3-final-reports](#)

[master/docs/3-final-reports](#)

## Why We Structured It This Way

Initially, we started with a Django-only prototype, where the entire website was built using Django as both the backend and frontend. However, as the project evolved, we decided to integrate React for the frontend while keeping Django as the backend. This required significant changes to the codebase.

Rather than overwriting our original prototype, we chose to create a separate branch ([App](#)) where we built the final version of the project. This approach allowed us to:

- Keep both versions of the project (the prototype and the final app) without losing any progress.
- Prevent conflicts and confusion while developing the new React-based frontend.
- Ensure we have a backup in case we need to refer back to the initial Django-only version.
- Clearly separate development phases, making it easier for others to understand how the project evolved.

## 1. Executive Summary

### 1.1 Introduction

SafeHer is an innovative personal safety application designed to provide individuals, particularly women, with a discreet yet powerful suite of tools to enhance personal security in environments that may pose risks. The platform integrates real-time tracking, an emergency alert system, and interactive safety features to offer a proactive approach to personal safety.

As societal concerns surrounding harassment, attacks, and gender-based violence grow, the need for intelligent, responsive, and user-friendly safety solutions has become more pressing. SafeHer directly addresses this demand by enabling real-time support, hazard reporting, and emergency alerts to create a secure and aware community. Unlike traditional safety solutions, SafeHer prioritizes prevention, preparedness, and peace of mind through smart technology while maintaining user privacy [2].

SafeHer is designed to be both reactive and proactive in enhancing personal security. The app provides timely alerts based on statistical trends of reported incidents, empowering users with the knowledge and tools needed to navigate their surroundings safely. Its adaptable design allows users—ranging from students and professionals to travelers and high-risk individuals to customize safety settings to meet their specific needs.

One of SafeHer's core strengths is its intuitive and discreet user experience. Features such as the panic button, silent SOS activation, and hazard reporting system ensure users can access essential safety tools quickly and efficiently. By fostering a collaborative security network, SafeHer encourages users to actively contribute to a safer environment by sharing real-time hazard updates.

SafeHer is built on extensive research and user feedback to align its features with real-world safety concerns. The ongoing development roadmap includes enhancements such as AI-driven safety insights and integration with wearable technology, ensuring SafeHer remains at the forefront of personal safety innovation.

### 1.2 Key Features

Our platform is designed with a comprehensive suite of safety tools to empower users in both everyday and high-risk situations. From real-time tracking and automated alerts to community-driven updates and interactive support, each feature is thoughtfully built to enhance personal security and peace of mind. Below is an overview of the core functionalities that define our safety-first approach.

1. Trip Duration and Periodic Check-Ins
  - Users set a trip duration, triggering automatic safety alerts at preset intervals.
  - If a user fails to check in, emergency contacts are notified automatically.
  - Ideal for solo travelers and individuals seeking discreet monitoring.
2. Emergency Alert System
  - A panic button that instantly alerts emergency contacts with live location tracking.
  - Distraction tools such as Fake Call and Police Sound to deter threats.
  - Silent distress alerts to communicate emergencies discreetly.
3. Interactive Safety Features
  - Self-defense tutorials and emergency response guidelines.
  - Community safety experience-sharing for peer support.
  - Live chat support for immediate safety assistance.
4. Real-Time Tracking
  - Users can trace safe routes and identify police stations, hospitals, and fire stations.
  - A marker color guide to indicate safety levels:
    - Red: Hazardous area
    - Green: Hospitals
    - Blue: Police stations
    - Red Marker: Fire stations
  - Users can share live locations with trusted contacts.
5. Hazard Reporting System
  - Community-driven hazard reporting, classifying incidents into suspicious activity, crime, or environmental hazards.
  - Real-time hazard updates that automatically expire after 48 hours.
6. Subscription Plans
  - Freemium (free) - Basic location tracking and emergency alerts.
  - Basic Plan (\$9.99/month) - Standard safety tools and support.
  - Premium (\$19.99/month or \$199.99/year) - Advanced tracking, stealth mode, and priority support.
  - Enterprise Plan - Custom pricing for institutions, corporate security, and government agencies.
  - Advertising Partnerships - Non-intrusive ads for freemium users.

### **1.3 Development Stages**

The development process was carried out in three key phases to ensure a smooth transition from a basic website to a fully functional web application. Each phase focused on improving functionality, performance, and user experience:

#### **Phase 1: Website Development**

- Built an initial website using Django, HTML, and CSS.
- Established platform foundation with optimized UI components and API integrations.

#### **Phase 2: Transition to Web Application**

- Migrated frontend to React for a modern, dynamic UI.
- Optimized backend using Django for seamless scalability and security.

#### **Phase 3: Local and Mobile Testing**

- Conducted extensive local testing for debugging and performance improvements.
- Enabled cross-device support for better UI/UX.
- Performed security and performance testing to ensure privacy and reliability.

## **2. Management Report**

### **2.1 Proposed Organisational Structure**

To ensure seamless development, SafeHer's team is structured into key roles to handle different aspects of development, security, and user experience.

#### **1. Project Leadership & Management**

- Project Manager (SammyJoe Macri) - Oversees project execution, stakeholder communication, and deadlines.
- Product Lead (Kheeswari Devi Ramanjooloo) - Ensures alignment with user needs and business goals, prioritises feature development.

#### **2.2 Technical Team**

Our technical team brings together a diverse set of skills to build and maintain a secure, user-friendly, and reliable safety platform. With expertise spanning software engineering, UI/UX design, cybersecurity, and compliance, each member plays a critical role in delivering a high-quality product that prioritizes both functionality and user trust. The team operates with agility, collaboration, and a deep commitment to safety innovation.

- Lead Software Engineer (SammyJoe Macri) - Designs system architecture, manages the Django and SQLite backend, and ensures database security.
- Frontend Developer (Kheeswari Devi, SammyJoe) - Develops and maintains the React-based UI for a seamless experience.
- Security Engineer (SammyJoe Macri - External Consultant) - Ensures data encryption, API security, and penetration testing.
- Testers (Kheeswari Devi, SammyJoe) - Conducts functional and performance testing on web and mobile platforms.
- UX Researcher (SammyJoe & Kheeswari Devi) - Conducts user studies, A/B testing, and iterative improvements.
- UI Designer (Kheeswari Devi) - Develops an intuitive, emergency-accessible interface.
- Legal & Compliance Advisor (Both team members) - Ensures adherence to data protection laws (GDPR, CCPA) and user privacy.

#### **2.3 Team Logs and Documentation**

Each team member maintains a detailed log to ensure accountability and structured development. Development milestones and tasks are tracked in individual logs. Detailed breakdown of who did what and when is provided in log entries. Logs ensure project transparency and traceability for each team member's contributions.

Team Member Logs:

- [Kheeswari Devi Ramanjooloo](#)
- [SammyJoe Macri](#)

#### **2.4 Time Description**

A Gantt chart and a detailed task table have been created to illustrate the timeline of project activities, showing who did what and when. These visual tools provide a clear breakdown of development phases, individual contributions, and key milestones. While the Gantt chart and task table offer a structured overview of time

allocation and task execution, more detailed time tracking and daily progress updates can be found in the project logs above.

Task ID	Task Name	Start Date	End Date	Progress	Predecessor	Resources
1	Partner Selection & Idea Development	2024-09-17	2024-09-23	100%		Sammy Joe, Devi
2	Repository Creation & Role Division	2024-09-24	2024-09-30	100%	1	Sammy Joe, Devi
3	Supervisor Selection & Business Model Development	2024-10-01	2024-10-07	100%	2	Sammy Joe, Devi
4	Ethics and Compliance	2024-10-08	2024-10-14	100%	3	Sammy Joe, Devi
5	Proposal Development	2024-10-15	2024-10-21	100%	4	Sammy Joe, Devi
6	Presentation Preparation & Code Development	2024-10-22	2024-10-28	100%	5	Sammy Joe, Devi
7	Stakeholder Presentation & Feedback	2024-10-29	2024-11-04	100%	6	Sammy Joe, Devi
8	Research, Planning, and Design	2024-11-05	2024-11-25	100%	7	Sammy Joe, Devi
9	Web Development - Core Features	2024-11-26	2025-01-20	100%	8	Sammy Joe
10	Web Testing and Refinement	2025-01-21	2025-02-17	100%	9	Sammy Joe
11	Web Integration & Finalization	2025-02-18	2025-03-10	100%	10	Sammy Joe
12	Mobile App Development - Setup & Design	2024-11-26	2024-12-23	100%	9	Sammy Joe, Devi
13	Mobile App Development - Core Features	2024-12-24	2025-02-17	100%	12	Sammy Joe, Devi
14	Mobile Testing and Refinement	2025-02-18	2025-03-17	100%	13	Sammy Joe, Devi
15	Mobile Integration & Finalization	2025-03-18	2025-04-07	80%	14	Sammy Joe, Devi
16	Integration & API Development	2025-02-18	2025-03-17	100%	13	Sammy Joe, Devi
17	Testing & QA	2025-03-18	2025-04-18	60%	14	Sammy Joe, Devi
18	Project Report Delivery	2025-04-18	2025-04-18	60%	17	Sammy Joe, Devi
19	Launch Preparation & Deployment	2025-04-20	2025-05-05	0%	18	Sammy Joe, Devi
20	Project Presentation	2025-05-06	2025-05-06	0%	19	Sammy Joe, Devi
21	Project Expo	2025-05-07	2025-05-07	0%	20	Sammy Joe, Devi

Fig.1 SafeHer Project Timeline and Task Breakdown Table

The table outlines the SafeHer project timeline, detailing 21 tasks from initial partner selection to the final project expo. Each task entry includes the start and end dates, progress percentage, dependencies (predecessors), and assigned team members. This structured format provides a clear view of task status and resource allocation.

Below the table, the Gantt chart visually represents the project schedule, showing task durations, dependencies, and progress through color-coded bars. Green indicates completed tasks, orange represents tasks in progress, and red marks those not yet started. This visual planning tool effectively tracks project flow and highlights upcoming milestones.

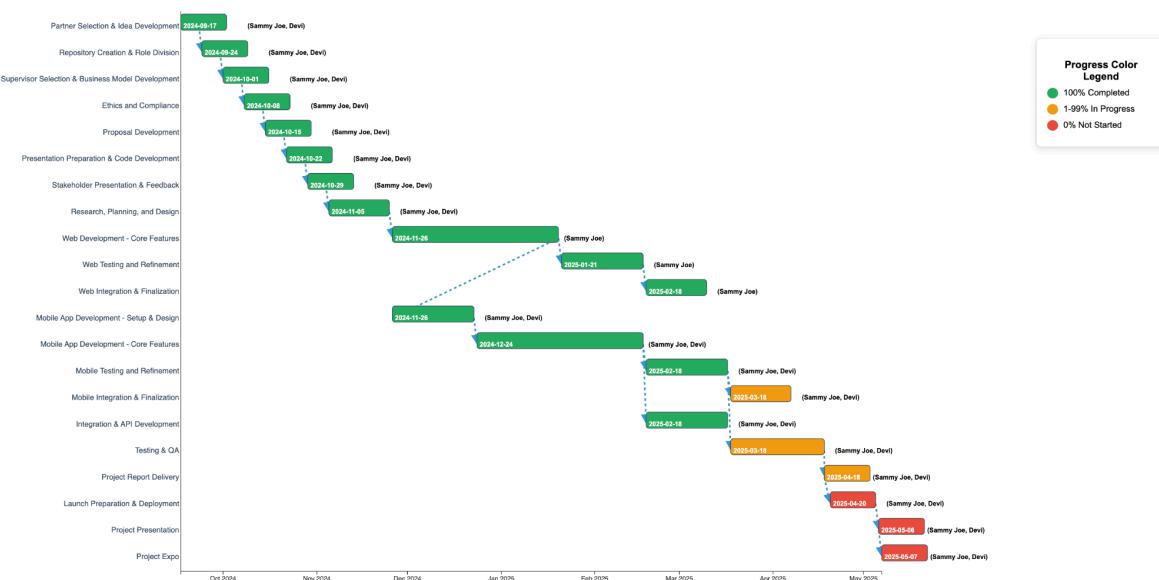


Fig.2 SafeHer GanttChart Task Breakdown

## **2.5 Long-Term Vision**

SafeHer aims to:

- Integrate AI-driven safety predictions for proactive threat detection.
- Expand wearable technology compatibility for smartwatches and IoT devices.
- Scale internationally, adapting to different cultural and legal environments.

SafeHer is not just an app - it is a movement towards empowering individuals through technology-driven safety solutions.

## **3. Product/Service Description**

SafeHer is a personal safety application providing real-time security measures for users in potentially dangerous situations. The platform integrates GPS tracking, emergency alerts, hazard reporting, and AI-driven predictive safety features to ensure immediate assistance and proactive safety recommendations.

Unlike traditional safety apps, SafeHer prioritises prevention, preparedness, and rapid response, enabling users to share their location, report hazards, and discreetly seek help. The interface is designed for ease of use, ensuring accessibility even in high stress situations. Community-based features allow users to report unsafe areas and share real-time alerts [4].

Accessible via web and mobile interfaces, SafeHer utilises a React frontend, a Django backend, and an SQLite database for secure storage and seamless performance. It follows a freemium model, offering essential features for free while providing premium plans with advanced functionalities such as AI-driven safety analytics and enhanced emergency response tools.

### **3.1 Value Analysis**

#### **3.1.1 Users & Customers**

SafeHer is built to serve a broad and diverse user base, addressing unique safety needs across personal, professional, and institutional contexts. From individuals seeking personal protection to organizations aiming to enhance public safety, SafeHer is designed to adapt to various user scenarios and security expectations.

- Women - Navigating urban areas, commuting, or traveling.
- Students - Needing additional safety on campus.
- Elderly Individuals - Requiring emergency assistance and tracking.
- Solo Travelers - Seeking navigation and safety resources.
- Nightshift & Gig Workers - Working in remote or high-risk areas.
- High-Risk Area Residents - Living or working in locations with security concerns.

SafeHer's customer base includes:

- End Users (B2C) - Individuals subscribing to premium safety features.
- Educational Institutions - Implementing SafeHer for campus safety.
- Corporations & Employers - Enhancing employee security.
- Government & Law Enforcement - Utilising hazard reporting and emergency response tools.
- Nonprofits & Advocacy Groups - Providing safety tools for vulnerable communities.

### 3.1.2 How SafeHer Helps

SafeHer delivers tailored safety solutions for both individuals and institutions. Whether providing real-time protection for everyday users or empowering organizations with actionable safety insights, the platform bridges personal safety with scalable security tools.

For Individual Users:

- Real-Time Safety Monitoring - Live location sharing with trusted contacts.
- Emergency Alerts - Instant notifications to contacts and authorities.
- Stealth Safety Features - Discreet SOS options like silent distress signals.
- Community Hazard Reports - Users stay informed about unsafe areas.
- AI-Driven Predictive Alerts - Proactive recommendations based on historical data.

For Organisations & Institutions:

- Campus & Workplace Safety - Institutions can integrate SafeHer into security initiatives.
- Incident & Risk Management - Access to real-time hazard data for public safety improvements.
- Brand Responsibility - Companies demonstrate commitment to safety.
- Custom API Integrations - Businesses can embed SafeHer's features for enhanced security monitoring.



Fig.3 Safety Apps Feature Comparison Chart

How These Scores Were Determined:

- Market Research on Safety Apps: Evaluating features from existing popular personal safety apps like bSafe, Noonlight, Life360 [14,15,16].
- Limitations in Existing Apps:
  - Many lack predictive AI-driven alerts (why SafeHer scores higher in innovation).
  - Emergency alert systems vary in responsiveness and automation.
  - Stealth mode features are uncommon in traditional apps.

- User Expectations & Adoption Trends: Research shows many apps don't integrate community hazard reporting effectively.
- Technical Feasibility: Traditional safety apps have limited real-time tracking accuracy, affecting usability in remote areas.

By combining AI-driven safety, real-time reporting, and a community-based security network, SafeHer creates a comprehensive and scalable safety solution that benefits individual users and large organizations alike.

### **3.2 Market Opportunity**

The urgency for innovative personal safety solutions has reached a critical tipping point in 2024–2025. Gender-based violence—particularly femicide—is not only persisting but increasing in frequency across multiple countries. SafeHer responds to this crisis by providing a real-time, AI-powered platform that offers both preventative protection and discreet emergency response, making it uniquely positioned in a market that is expanding out of necessity, not just demand.

Across the world, recent data illustrates the growing epidemic of femicide:

- In Italy, 2024 government reports highlight that over 100 women were killed by men in the first 10 months alone, averaging close to one femicide every 2.5 days. The majority of these victims were murdered by current or former partners, often after previous reports of threats or abuse. Despite increased media attention and legislative proposals, women still lack access to real-time, discreet safety tools [24,26].
- In Colombia, the situation is even more alarming. According to Observatorio Feminicidios Colombia, femicide cases have surged to nearly one per day in 2024. Many victims reside in rural or semi-urban zones where access to police or emergency services is limited. The gap between reported threats and actionable protection highlights the need for mobile-first safety solutions [22,23].
- Mexico remains one of the most concerning environments for women in Latin America. By mid-2024, more than 2,000 gender-based killings had already been reported. The national average holds steady at 10 to 11 women murdered per day, despite multiple state-led interventions. Public safety infrastructure, especially for working-class and rural women, remains dangerously inadequate [22,23].
- Even in countries with strong digital infrastructure like France, Spain, and the UK, 2025 data shows a continued upward trend in domestic violence, harassment, and public safety complaints. Women commuting alone or working night shifts report a growing sense of insecurity, and trust in emergency services is often lower in marginalized communities [24].

These statistics paint a grim but clear picture: a global safety gap exists, and digital innovation must be part of the solution.

With the increasing demand for personal safety solutions, SafeHer targets a broad and diverse primary market of individual users. The app is primarily designed for women aged 18 - 75, but it is inclusive and intuitive enough for anyone familiar with smartphone applications. This allows SafeHer to support a variety of individuals who may require personal safety assistance, including students, the elderly, working professionals, solo travelers, and individuals with disabilities.

The global safety technology sector is expanding rapidly, with growing interest in discreet and proactive tools that support real-time protection. SafeHer differentiates itself within this space by offering features such as community-based reporting, AI-powered predictive safety, and intelligent emergency alerts. These innovations directly serve the needs of SafeHer's *primary user base*, addressing concerns related to urban safety, gender-based violence prevention, and emergency readiness[2].

In addition to individual users, SafeHer also appeals to a significant *secondary market* made up of institutions and organisations. The app is well-positioned for adoption by businesses, universities, advocacy groups, and even government agencies that are seeking digital safety tools for their communities. As organizations increasingly integrate technology into their safety programs, SafeHer provides a scalable and customizable solution. With its flexible subscription tiers and enterprise version, the app is suitable for institutional deployment, making it both a personal and organizational safety platform.

### **3.2.1 Market Expansion Strategy**

SafeHer's market expansion strategy focuses on scalability, inclusivity, and intelligent adaptability to meet the evolving safety needs of a global audience.

- Global Accessibility: Expanding the app into multiple languages to accommodate international users.
- Corporate and Educational Partnerships: Collaborating with NGOs, universities, and workplaces to integrate SafeHer into safety programs for employees and students.
- Customizable Safety Features: Providing organizations with customizable safety solutions based on their unique needs and policies.
- AI-Driven Insights: Utilizing predictive analytics to identify high-risk zones and proactively inform users about safety concerns.

SafeHer is more than just an app - it is a continuously evolving intelligent safety ecosystem designed to adapt and respond to the diverse needs of its expanding user base.

### **3.2.2 Proposed Market & Supporting Data**

The personal safety app market has been experiencing significant growth, driven by increasing concerns over individual security and the widespread adoption of smartphones. In 2023, the market was valued at approximately USD 755.73 million and is projected to reach USD 2,407.66 million by 2032, reflecting a robust compound annual growth rate (CAGR) of 13.74% during the forecast period from 2024 to 2032 [1,8,9]. This growth is fueled by the increasing demand for solutions offering real-time tracking, emergency assistance, and discreet distress signaling, particularly for women and vulnerable demographics [1,2].

Market Demand & Emerging Trends Recent studies underscore an urgent and growing need for personal safety applications, particularly among:

- Women and Vulnerable Groups: WHO reports that 1 in 3 women experience violence, highlighting the need for accessible safety solutions [2,3].
- Solo Commuters and Night Workers: An increasing number of individuals seek proactive safety monitoring.
- Gig Economy Workers: Many face job-related safety concerns, driving demand for real-time safety tracking.
- Smart City Initiatives: Governments are integrating personal safety apps into emergency response systems.

Key Market Insights from User Surveys conducted between 2022 and 2024 provide valuable insights into user behavior and expectations for safety applications:

- 85% of surveyed women feel unsafe when traveling alone [10,11].
- 70% of respondents prefer real-time tracking and emergency alerts.
- 60% favor discreet security features like silent distress signals.
- 40% of gig workers report job-related safety concerns.
- 55% of solo travelers actively seek personal safety applications for navigation and security in unfamiliar environments.

These insights illustrate a clear market opportunity for SafeHer as a trusted, AI-powered, and community-driven safety application tailored to the specific needs of at-risk individuals. By leveraging advanced technology and strategic partnerships, SafeHer is poised to become a leading solution in the personal safety technology sector [4].



Fig.4. Personal Safety App Market Chart [9]

### 3.3 Key Value Propositions

For individuals who prioritize personal safety in unpredictable environments, SafeHer is a smart safety companion that proactively prevents harm and discreetly responds to emergencies—unlike traditional apps that only react after danger occurs.

SafeHer doesn't just wait for something to go wrong—it empowers users with AI-powered prevention, stealth response tools, and community-driven hazard awareness, making safety a proactive, everyday experience.

#### What Makes SafeHer's Value Proposition Strong

##### 1. AI-Powered Predictive Safety

SafeHer goes beyond static emergency buttons by using machine learning to analyze crime trends, user location patterns, and environmental factors. This allows the platform to:

- Warn users before entering high-risk zones.
- Recommend safer routes based on real-time data.

##### 2. Discreet Emergency Tools

Designed for real-world threats where drawing attention may increase risk, SafeHer offers:

- Fake Call: Simulates a call to help users de-escalate situations.
- Silent SOS: Sends location-based alerts to emergency contacts without displaying on screen.
- Disguised Interface: Makes the app appear as something else for stealth access.

##### 3. Intelligent Check-Ins for Travel Safety

Safety isn't just about emergencies—it's also about prevention during travel. With trip tracking and periodic check-ins:

- Users can schedule safety confirmations.
- Missed check-ins trigger alerts to trusted contacts, even if the user can't act.

#### 4. Real-Time Community Hazard Reporting

SafeHer harnesses the power of its user base to crowdsource safety data. Users can:

- Report incidents or hazards (e.g., suspicious activity, environmental danger).
- Get notified when entering areas flagged by others.

#### 5. Comprehensive Emergency Alert System

When prevention isn't enough, SafeHer's emergency alert system provides:

- One-tap panic button with live GPS sharing.
- Planned upgrades to include audio and live video streaming for more context in emergencies.

#### Why SafeHer is Positioned to Lead the Safety Tech Market

By solving real pain points in both preventative safety and discreet emergency response, SafeHer goes far beyond what traditional safety apps offer. Its strategic advantage lies in the combination of:

- Predictive technology
- User-first stealth design
- Community intelligence
- Global scalability and legal compliance

This positions SafeHer not just as a safety app, but as a holistic safety ecosystem for individuals, institutions, and enterprise partners worldwide.

#### **3.4 Key Resources, Costs, Revenue Streams, and Activities**

To support SafeHer's development, scale, and market entry, the platform relies on a combination of strategic resources and clearly defined revenue streams. The core resources include a secure, scalable tech infrastructure (React frontend, Django backend), AI-powered analytics for predictive safety insights, a reliable data storage system (transitioning from SQLite to PostgreSQL), and ongoing cybersecurity compliance frameworks (GDPR, CCPA). Human resources also play a key role, including a cross-functional team of developers, testers, UI/UX designers, legal advisors, and a customer support staff offering 24/7 emergency assistance. These components are reinforced by a cloud-based deployment pipeline and third-party integrations (e.g., location APIs, AI models, wearable tech APIs) that enable seamless service delivery and future scalability.

SafeHer's operational costs are strategically distributed across six major areas, as illustrated in the figure below. App development accounts for the largest share (30%) to support continuous innovation, bug fixes, and feature rollout. Marketing and outreach (25%) are essential to drive user acquisition and build brand trust in safety-conscious communities. Cybersecurity and compliance (15%) ensure data protection, legal integrity, and secure user experiences. Customer support (10%) maintains user confidence, while legal and institutional engagement (10%) helps foster university, NGO, and enterprise partnerships. Operational costs (5%) cover server hosting, admin tools, and contingency reserves. SafeHer's revenue model is equally diversified, including B2C subscriptions (freemium, Basic, and Premium tiers), B2B enterprise licensing, and targeted brand partnerships. These revenue streams are aligned with user demand and have been validated through market research and interviews.

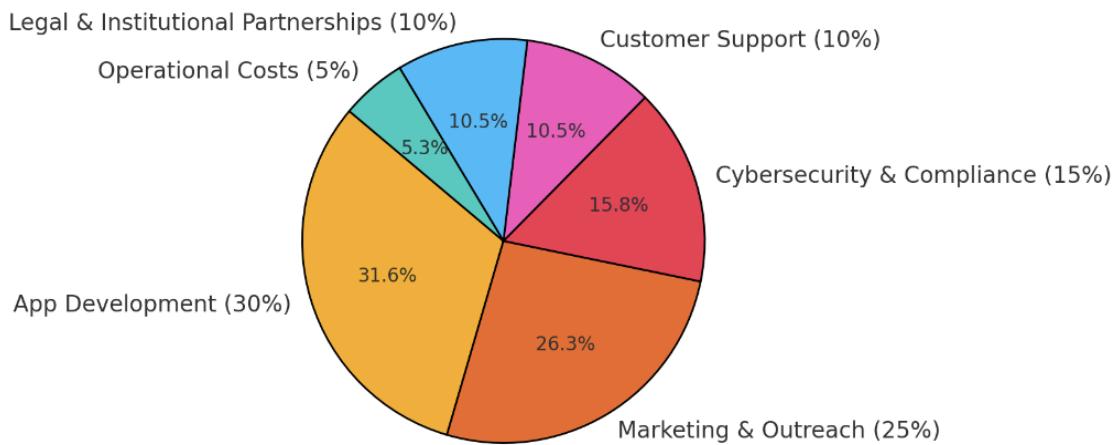


Fig.5 SafeHer Operational Costs Chart

### 3.5 Supporting Industry Trends

As more individuals seek solutions for real-time protection, emergency assistance, and predictive safety alerts, the industry is witnessing exponential growth. SafeHer is positioned in a fast-growing sector, capitalizing on key trends:

#### 1. AI-Powered Safety Solutions

- AI-driven safety apps predict risks before incidents occur, offering proactive alerts and safer route recommendations.
- Machine learning enhances hazard mapping accuracy using user reports and law enforcement data.
- Gartner (2024) estimates AI-powered personal security solutions will grow by 15% annually [3].

#### 2. Post-Pandemic Growth in Women's Safety Apps

- Over 50% increase in safety app downloads among women (2020-2023) [5].
- Rising demand for discreet emergency alerts (stealth distress signals).
- Statista (2024) projects the personal safety app market to reach \$5.2 billion by 2027 [1].

#### 3. Government Investment in Digital Safety Technologies

- Governments partner with safety tech companies to integrate security solutions into emergency networks.
- Europe & North America lead in AI-driven security regulations [7].
- Initiatives like India's Nirbhaya Fund and the UK's StreetSafe Initiative provide grants for safety technology.

#### 4. Expansion into Smart Wearables & IoT

- Emergency alerts and real-time tracking are now integrated into smartwatches and fitness bands.
- IDC (2023) reports that 45% of smartwatch users want built-in personal safety features [6].

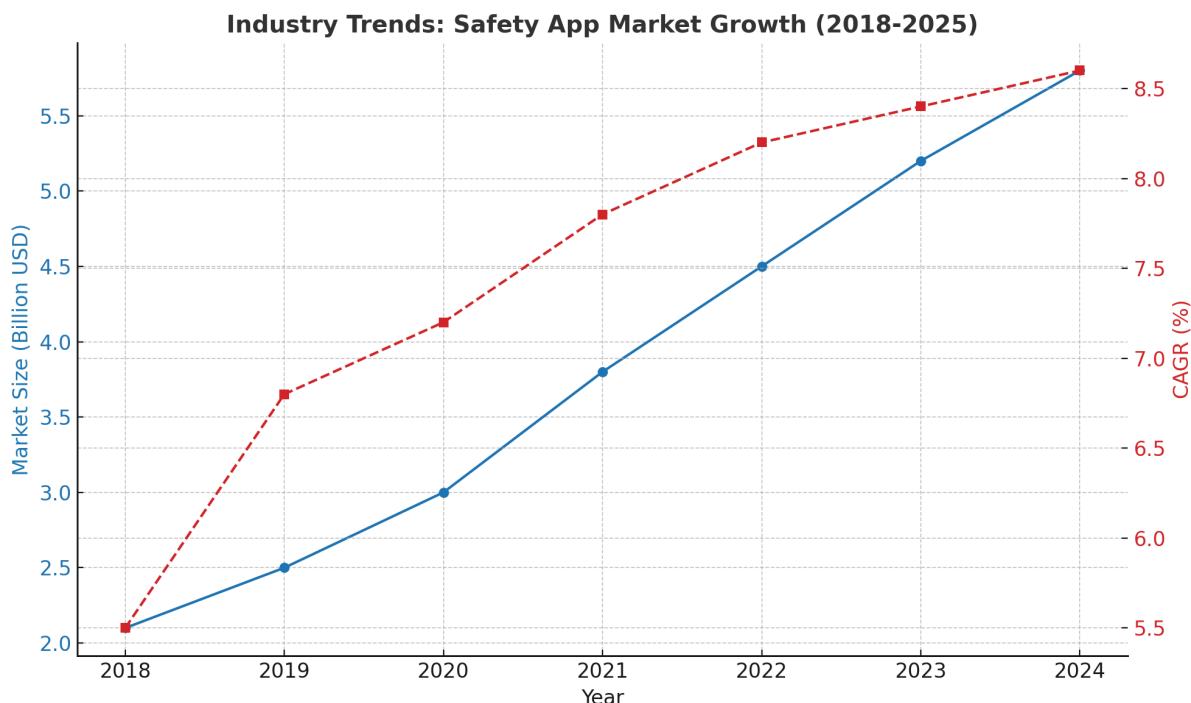


Fig.6 Safety App Market Growth Chart

#### Key Insights from the Graph:

- Market Size Growth (Blue Line): The safety app market has shown consistent expansion, growing from \$2.1 billion in 2018 to a projected \$5.8 billion by 2025 [3].
- CAGR (Red Dashed Line): The compound annual growth rate (CAGR) has steadily increased, indicating strong investor and consumer interest in personal safety technology [1,8,9].
- Notable Growth Trends:
  - Rapid post-pandemic adoption of safety apps, especially among women.
  - Increasing government investment in digital safety and emergency response technologies.
  - Expansion of AI-driven predictive analytics in safety solutions.

## 4. Pricing Model

SafeHer's pricing model is designed to balance accessibility and revenue generation, ensuring broad adoption while maintaining premium feature monetisation. The freemium to premium model encourages user engagement, while enterprise licensing expands revenue streams through B2B partnerships.

Plan	Price	Key Features
Free	\$0	Basic tracking, emergency alerts, hazard reporting
Basic	\$9.99/mo	Stealth mode, periodic check-ins, custom hazard alerts
Premium	\$19.99/mo	Law enforcement integration, AI-driven predictive alerts
Enterprise	Custom	Bulk licensing for businesses, universities, agencies

Fig.7 SafeHer Pricing Model Overview Table

## Justification for Pricing Model:

- Freemium Model Ensures Mass Adoption: Free-tier users contribute to network effect & hazard reporting.
- The Basic Plan (\$9.99) is priced affordably for students, professionals, and commuters.
- The Premium Plan (\$19.99) targets users seeking full AI-driven security features.
- Enterprise Model for Large-Scale Adoption:
  - Universities, workplaces, and law enforcement agencies adopt SafeHer at bulk pricing.  
Example: A corporation can implement SafeHer as a workplace safety solution for female employees & night-shift workers.

### 4.1 Competitor Pricing Benchmarking

SafeHer provides a comprehensive personal safety solution, balancing affordability with cutting-edge features. Compared to industry leaders like Noonlight, bSafe, and Life360, SafeHer delivers superior value with advanced AI-driven safety tools, stealth distress features, and predictive hazard alerts at competitive price points [14,15,16].

Competitor	Pricing	Key Differences
bSafe	\$9.99/mo	Lacks AI-driven predictions & stealth mode
Noonlight	\$10/mo	Only offers emergency alerts, lacks hazard reporting
Life360	\$14.99/mo	Designed for family tracking, not personal safety
SafeHer	\$9.99 - \$19.99/mo	Crime prediction hazard alerts, stealth distress signals

Fig.8 Competitor Pricing and Key Differences Table

Feature	SafeHer	bSafe	Noonlight	Life360
AI-Driven Crime Prediction	Yes	No	No	No
Stealth Distress Signals	Yes	No	No	No
Real-Time Hazard Alerts	Yes	No	No	No
Live Location Sharing	Yes	Yes	Yes	Yes
24/7 Emergency Dispatch	Yes	Yes	Yes	Yes
Voice-Activated SOS	Yes	Yes	No	Yes
Family & Friend Alerts	Yes	Yes	Yes	Yes
Safety Check-Ins	Yes	Yes	Yes	Yes
Panic Button	Yes	Yes	Yes	Yes
Geofencing for Safety Zones	Yes	No	No	Yes
Anonymous Reporting of Unsafe Areas	Yes	No	No	No

Fig.9 Feature Comparison Across Leading Safety Apps Table

The feature comparison table underscores SafeHer's strategic advantage in both functionality and affordability. While competing apps offer limited features—often focused solely on emergency response or location tracking—SafeHer delivers a more comprehensive suite, including AI-powered crime prediction, real-time hazard alerts, stealth SOS tools, and anonymous hazard reporting. Despite offering significantly broader capabilities, SafeHer remains competitively priced, starting at \$9.99/month, aligning with or undercutting less feature-rich alternatives. This combination of value and depth positions SafeHer as a leading choice for users seeking both proactive and discreet safety support.

Why SafeHer is a Better Value:

- Predicts risks, not just emergency responses.
- Stealth Emergency Mode - No competitors offer disguised SOS activation.
- Community Driven Hazard Reporting - Real-time crowdsourced safety data.

## 4.2 Commercial Viability & Scaling

SafeHer offers strong commercial potential due to its focus on AI-enhanced safety and community-driven features that address an urgent societal need. However, to further strengthen the case for scalability and adoption, the following enhancements have been added:

Marketing and Scaling Strategy:

- Phase 1 – Initial Rollout: Focused digital marketing targeting universities, women's organizations, and high-density metropolitan areas.
- Phase 2 – Partner Integration: Enterprise licensing with NGOs, law enforcement, and educational institutions.
- Phase 3 – Global Localization: Language and cultural adaptation for wider international reach, with geo-specific hazard reporting.

Go-to-Market Channels:

- App Stores (iOS & Android), website subscription portal
- Influencer partnerships and self-defense instructors
- Bundled partnerships with telecom providers or wearable devices

Enhanced Competitor Analysis: Compared to bSafe [14], Noonlight [15], and Life360 [16], SafeHer differentiates itself by offering:

- AI-driven predictive alerts (not available in bSafe)
- Disguised SOS mode and real-time hazard mapping (absent in Life360)
- Community-based crowdsourced hazard reporting (underdeveloped in Noonlight)

## 5. Risk Assessment & Resource Allocation

To ensure SafeHer's sustainability and efficiency, a structured risk assessment and resource allocation strategy has been implemented.

Risk Type	Potential Issue	Mitigation Strategy
Data Privacy Risks	User location data could be misused	End-to-end encryption and user-controlled privacy settings to ensure data security.
Regulatory Compliance	Compliance with GDPR, CCPA, and other privacy laws	A dedicated legal team to ensure strict adherence to regulations.
Market Competition	Other safety apps may pose competition	Differentiation through community-driven hazard reporting and real-time emergency features.
Technical Challenges	GPS inaccuracy or battery drain	Multi-source tracking (GPS, WiFi, Cellular) and battery-optimized updates.
User Adoption	Users may forget to check-in or report hazards	Automated check-ins, incentives, and engagement reminders to increase participation.

Fig.10 SafeHer Risks and Mitigation Strategies Table

This table presents key risks for the SafeHer app along with mitigation strategies.

- Data privacy, the main concern is the misuse of user location data. To address this, SafeHer implements end-to-end encryption and gives users control over their privacy settings.
- Regulatory compliance, particularly with global laws like GDPR and CCPA. A dedicated legal team ensures ongoing compliance.
- Market competition from other safety apps is mitigated by SafeHer's unique features such as community-driven hazard reporting and real-time emergency alerts.
- Technical challenges, such as GPS inaccuracy and battery consumption, are handled using a combination of GPS, WiFi, and cellular tracking with optimized update frequencies.
- User adoption, the app includes automated check-ins, reminders, and engagement incentives to encourage consistent use.

## 5.1 Resource Allocation Breakdown

SafeHer's budget is strategically distributed across critical areas to ensure efficiency and scalability:

Category	% Budget Allocation	Explanation
App Development	35%	Feature enhancements, real-time tracking, security updates.
Marketing & Outreach	25%	Digital ads, influencer partnerships, social media campaigns.
Cybersecurity & Compliance	15%	Data encryption, privacy protection, global compliance.
Customer Support	10%	24/7 emergency response and user assistance.
Legal & Institutional Partnership	10%	Government collaborations, university partnerships.
Operational Costs	5%	Server maintenance, administrative costs.

Fig.11 SafeHer Resource Allocation Breakdown Table

The following financial projections use the percentage allocations outlined above, scaled proportionally to the projected expenses in each year. This ensures consistency in budgeting across development, marketing, support, and compliance as SafeHer grows.

## 5.2 Three-Year Financial Projection

SafeHer's financial projections outline expected revenue, costs, and net profitability over the next three years. These figures are based on user growth, revenue diversification, and industry trends.

To successfully bring SafeHer to completion and prepare it for market launch, an initial investment of approximately \$178,000 is required in the first year. This funding will cover critical aspects of development, legal and compliance, operations, and early-stage marketing efforts to build brand awareness and acquire users [5].

This initial investment is crucial for laying the technical and operational foundation of the platform. It includes the cost of deploying a secure and scalable infrastructure, establishing compliance with privacy laws, and preparing for institutional-level partnerships with schools, companies, and local governments.

Over the following two years, operational costs are expected to increase moderately in line with user growth, while revenues will grow substantially due to the expansion of paid subscriptions and enterprise licensing. SafeHer is projected to reach net profitability by the end of Year 2, with a strong financial surplus by Year 3.

The funding requirement is realistic, based on standard startup cost models for SaaS and safety-focused platforms. By securing the Year 1 investment, SafeHer will be positioned to achieve scalable growth, demonstrate social impact, and generate sustainable revenue through diversified channels [5].

**Three-Year Financial Projection**

Category	Year 1	Year 2	Year 3
Basic Plan Revenue	\$59,940	\$239,760	\$599,400
Premium Plan Revenue	\$47,976	\$239,880	\$719,640
Enterprise Licensing	\$25,000	\$75,000	\$150,000
<b>Total Revenue</b>	<b>\$132,916</b>	<b>\$554,640</b>	<b>\$1,469,040</b>
App Development	\$80,000	\$100,000	\$130,000
Marketing & Outreach	\$40,000	\$70,000	\$120,000
Cybersecurity & Compliance	\$25,000	\$40,000	\$60,000
Customer Support	\$15,000	\$30,000	\$55,000
Legal & Institutional Partnerships	\$10,000	\$20,000	\$45,000
Operational Costs	\$8,000	\$15,000	\$15,000
<b>Total Expenses</b>	<b>\$178,000</b>	<b>\$275,000</b>	<b>\$425,000</b>
Net Profit	- \$45,084	\$279,640	\$1,044,040

Fig.12 SafeHer Three Years Financial Projection Table

In the first year, SafeHer experienced moderate user growth with 500 Basic plan users and 200 Premium plan users, generating total revenues of \$132,916. However, due to initial startup expenses including app development, marketing, and cybersecurity, the total expenses amounted to \$178,000, resulting in a net loss of \$45,084. This loss is typical for new apps in their initial phase, prioritizing growth and market penetration.

In the second year, user acquisition significantly increased, reflected by 2,000 Basic users and 1,000 Premium users, along with expanded enterprise licensing agreements. Revenue jumps to \$554,640, while expenses moderately increase to \$275,000 due to scaling operations and marketing efforts. This year marks a positive turnaround with a net profit of \$279,640, indicating successful market adaptation and strong growth momentum.

By the third year, SafeHer saw substantial growth with 5,000 Basic users and 3,000 Premium users. This growth, complemented by robust enterprise licensing revenue, leads to total revenues of \$1,469,040. Expenses also rise to \$425,000, reflecting continued investment in development, customer support, and marketing. Nevertheless, the significantly higher revenues result in a notable net profit of \$1,044,040, indicating strong market establishment and sustainable profitability.

Key Assumptions:

- Moderate initial user growth reflecting realistic market penetration for a new app.
- Steady increase in user adoption due to strategic marketing, referrals, and awareness campaigns.
- Effective premium feature monetization and growing enterprise partnerships.
- Ongoing investment in app improvements and compliance measures to sustain competitive advantages.

These figures are based on projected user growth, planned enterprise expansion, and consistent operational scaling. Budget proportions remain fixed to ensure stability, while actual dollar amounts increase with revenue. Minor adjustments may occur in future scaling phases based on actual usage and performance data.

## 6. Customer Interviews

**To inform SafeHer's design with real-world insight, we conducted a user-centered research process combining both survey data and structured interviews.**

The **survey received responses from 124 participants**, exploring user habits, safety concerns, and openness to using technology like SafeHer in real-life situations. Survey participants completed a form that included questions about safety experiences, willingness to use discreet tools (like fake calls), and their preferences for app pricing, features, and subscription models. Respondents ranged in age from **18 to 60+**, and included diverse gender identities.

In addition to this, **we conducted 23 one-on-one interviews** over a two-week period (Week 6 to Week 8 of the project). These interviews were carried out remotely via video or voice call, using a semi-structured script to explore in depth how users would interact with SafeHer and what safety tools they found most meaningful.

Before each interview, participants gave **informed consent** through a standardized ethics form. This form covered data protection, confidentiality, withdrawal rights, and GDPR compliance, ensuring all responses were ethically collected and securely handled.

**Interviewees spanned a range of ages (18 to 60+) and lived in both urban and rural areas**, offering insights into varying safety needs—commuters, late-shift workers, students, and parents alike. Feedback was rich and constructive, directly shaping core features such as:

- **Discreet panic button** and fake call tool
- **Custom check-in intervals**
- **Voice activation for SOS**
- **Hazard reporting with photos and trust ratings**
- **Offline support for low-connectivity zones**

A detailed summary of each interview and participant feedback can be found in the References [20 ,21].

In analyzing this feedback, several patterns emerged across different demographics, revealing distinct safety concerns and priorities:

- Urban Women: Notably, these women tend to feel safer, but we still want to address the late-night commutes, mismanaged streets, and walking alone during odd hours.
- Rural Women: Women living in rural or more underdeveloped areas rely on GPS tracking and emergency alert systems a lot more than others due to the longer emergency service response times. These women reiterated the need for a personal safety tool that you can really rely on when mobile network is weak or absent, so as to be able to call for help in isolated locations.
- Trends with Users Age Group: The study indicates that women between the ages of 18-45 are the majority user group for personal safety apps. Here, the focus is on data security, user privacy and minimal works in function to get the work done well, which is gaining in popularity.

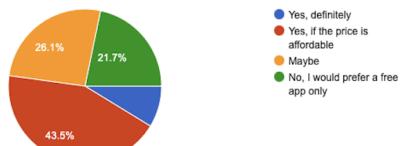
**The 23 interviews conducted during Weeks 6–8** of the project cycle offered valuable qualitative insights into user preferences and real-world safety needs [21], uncovering significant aspects crucial to finalizing SafeHer's features:

- Offering Assurance to Users: Women elucidated how a hidden emergency button or the option to be tracked live would enable them to stay safe when they are in vulnerable environments.
- Multifaceted Application: Users were in favour of adding a community-based component where providers and users could report hazards and offer safety advice and assist each other in creating a safer experience.
- Support for Underprivileged Sections of Society: There is an evident opportunity for SafeHer to extend its scope beyond just women in urban settings to other underprivileged groups more at risk such as lone or elderly women and those in other socially deprived areas.
- Ability to Tailor and Modify: Women preferred that checks for safety are conducted at intervals of their choosing which allows them to use some features according to their schedules.
- Trust and Reliability: We all know that data security is the primary concern for the users. Across the board, users called for transparency alongside strong data protection, if the app is reaching for deep pockets of their personal data.
- Encouraging Safe Behaviour: Other users believed that SafeHer would be beneficial in promoting safe behaviour especially in mobilising community vigilance and using real-time data to work with the local authorities to improve safety.

These recurring themes from the interviews aligned closely with patterns we observed in the survey results, reinforcing the consistency and reliability of user feedback across different formats. **Below, we have included examples of key survey questions that reflect the same topics explored during the interviews,** demonstrating the integrated approach we used to validate user needs and prioritize SafeHer's core features.

If SafeHer offered a free version with basic safety features, but charged for premium features, would you consider subscribing to the premium version?

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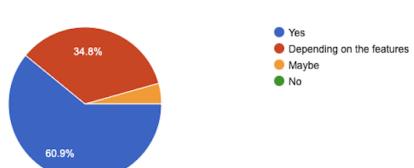
How much would you be willing to pay for premium safety features on a monthly basis?

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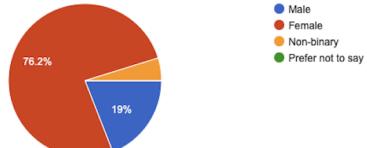
Would you recommend a safety app like SafeHer to friends or family?

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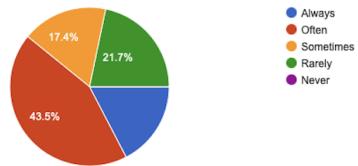
What is your gender?

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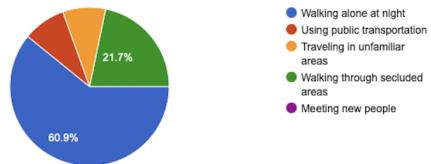
How often do you feel concerned about your personal safety in public spaces?

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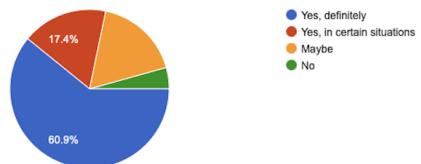
Which situations make you feel most unsafe?

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Would you use an app designed to enhance personal safety, like SafeHer, in situations where you feel unsafe?

[Copy chart](#)



If SafeHer provided a fake incoming call feature to help you get out of uncomfortable situations, would you use it?

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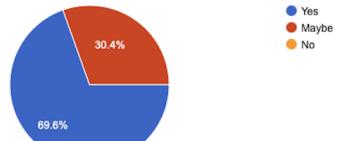


Fig. 12 SafeHer User Survey Results – Summary of Key Insights from 124 Participants

## 7. BPMN – Business Process Model and Notation

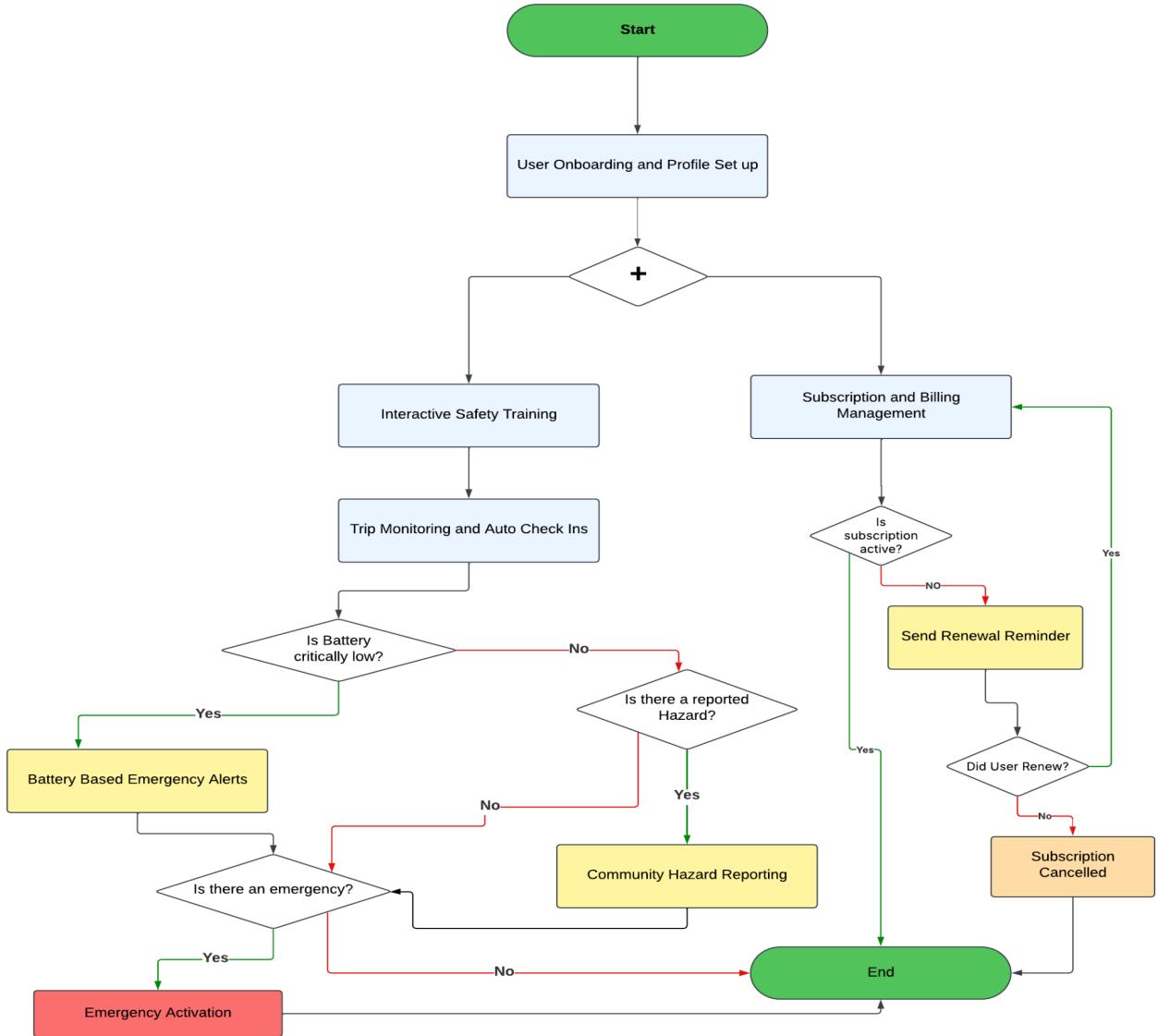


Fig. 13 SafeHer BPMN

The BPMN diagram for SafeHer maps key workflows, ensuring user safety, trip monitoring, emergency handling, and subscription management. The process starts with User Onboarding & Profile Setup, followed by a Parallel Gateway (+) that allows Interactive Safety Training and Subscription & Billing Management to run simultaneously.

After training, Trip Monitoring & Auto Check-Ins begin, leading to decision points. If the battery is critically low, an Emergency Alert is triggered; if not, the system checks for reported hazards. If a hazard exists, it is logged, and the system evaluates if an emergency requires activation.

For subscriptions, the system checks if it is active. If expired, a renewal reminder is sent. If the user renews, billing continues; if not, the subscription is cancelled.

The process ends when the trip is safely completed, an emergency is handled, or a subscription decision is finalised. This BPMN ensures efficient operations, user security, and automated decision-making.

SafeHer is a safety-focused application designed to empower users by providing features such as real-time tracking, emergency alerts, and secure messaging. The platform integrates React (frontend), Django (backend), and SQLite (database) to ensure a seamless and secure experience.

## 8. Architectural Overview

The SafeHer application follows a client-server architecture, clearly separating responsibilities between the frontend and backend:

- Frontend (Client-Side):
  - Built using React as a Single Page Application (SPA) for an intuitive, seamless user experience.
  - Utilizes Axios to communicate with backend APIs.
  - Integrates Google Maps API for real-time location tracking and hazard visualization.
  - Employs Firebase Cloud Messaging (FCM) for delivering push notifications.
  - Implements WebSockets for real-time communication, including emergency alerts and messaging.
- Backend (Server-Side):
  - Developed using Django and Django REST Framework (DRF) to provide secure, RESTful APIs.
  - Uses Django Channels and WebSockets for real-time features, such as live location tracking and messaging.
  - Currently leverages SQLite as a lightweight database for data storage.
  - Integrates with the OpenAI API to deliver AI-powered safety recommendations and chatbot interactions.
- External API Integrations:
  - Google Maps API provides robust geolocation capabilities and future geo-fencing functionalities.
  - OpenAI API offers AI-driven safety insights and real-time emergency decision support.
- Emergency Alert System:
  - Real-time SOS alerts triggered and delivered instantly using WebSockets for maximum responsiveness.

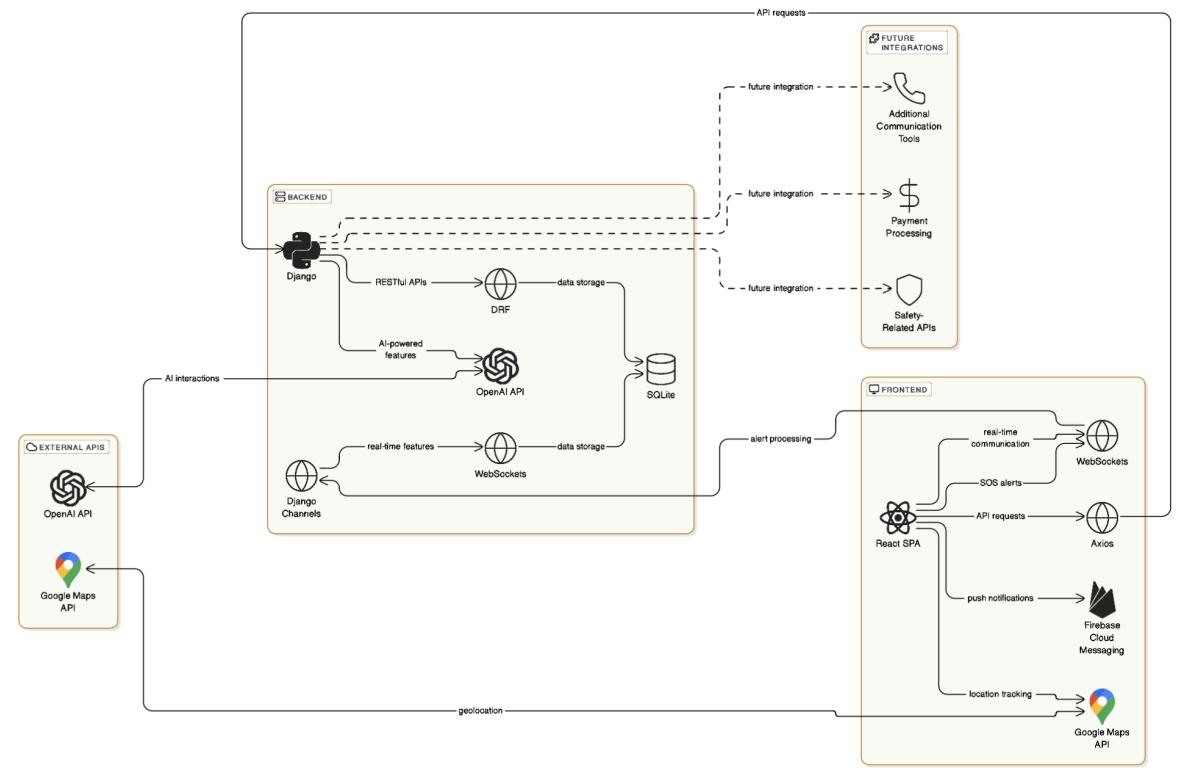


Fig. 14 SafeHer Architecture Diagram

This modular architecture ensures efficient, scalable interactions between users, real-time systems, databases, and third-party services, clearly visualized in the accompanying architecture diagram.

## 8.1 Deployment & Infrastructure

This section outlines the current development environment and future deployment roadmap for SafeHer. While the platform is in its early stages with foundational hosting, key upgrades are planned to support scalability, reliability, and production-readiness as user demand grows.

- Dockerization: For scalability and easier deployments.
- Cloud Migration: AWS/GCP planned to support a larger user base.
- PostgreSQL Implementation: Transition from SQLite to enhance performance.
- Production Deployment: Kubernetes (AWS EKS/GCP) considered for future but not currently prioritized.

## 8.2 Security & Compliance

Ensuring user safety also means securing user data. This section details SafeHer's current and planned security measures, authentication protocols, and compliance roadmap to align with global privacy regulations and ensure robust protection against threats.

- Authentication & Authorization: JWT currently; Firebase Auth planned.
- Data Encryption: Future AES-256 encryption for sensitive data.
- GDPR & Compliance: Full compliance.
- Rate Limiting & Firewall: Future security enhancements.
- Audit Logging: Planned implementation for compliance.

### 8.3 Logical Database Design & Data Storage Requirements

SafeHer's data infrastructure is designed for scalability, performance, and real-time responsiveness. This section provides an overview of the current database setup and the planned migration toward more robust solutions to support advanced tracking and analytics.

- Current: SQLite (development phase).
- Planned: PostgreSQL for scalability; Firebase Firestore for real-time tracking.

#### 8.3.1 Key Database Entities & Relationships

At the heart of SafeHer's functionality is a structured database schema that captures user behavior, safety interactions, and emergency protocols. This section outlines the core entities and their relationships, forming the backbone of the app's intelligent safety ecosystem.

- User: Personal details, preferences, links to emergency contacts, hazard reports, alert history, and check-ins.
- Emergency Contacts: Multiple contacts per user for emergency situations.
- Hazard Reports: User-submitted safety reports.
- Alerts: Notifications in emergencies, alerting contacts and authorities.
- Stealth Mode: Discreet functionality for risky scenarios.
- Location: Real-time tracking for safety zone entry/exit alerts.

Together these entities create an integrated safety management system.

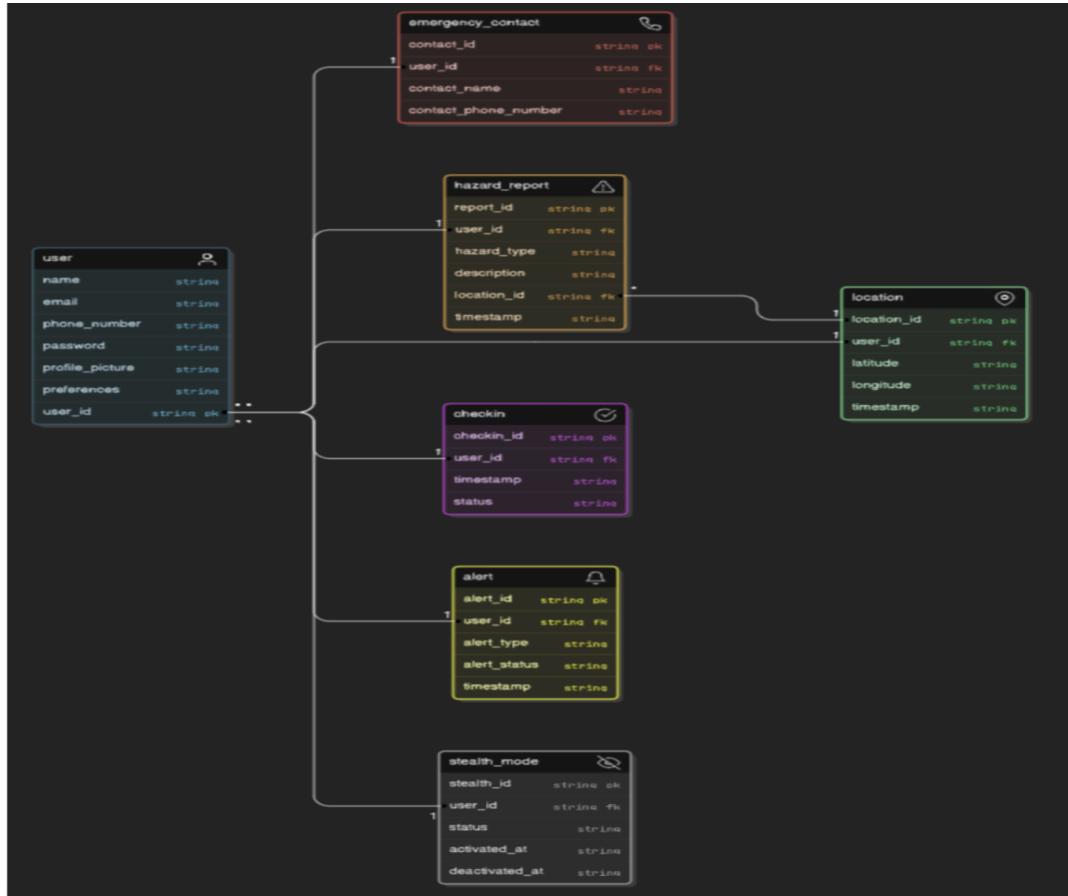


Fig. 15 SafeHer Entity-Relationship Diagram (ERD) – Core Database Structure

### 8.3.2 Data Storage Strategy

SafeHer's data storage strategy is built around privacy, efficiency, and compliance. This section outlines how different types of data ranging from user credentials to AI-generated insights are securely stored, accessed, and retained, with tailored retention policies to balance safety and data minimization.

- User Data: bcrypt password hashing, role-based access control (RBAC).
- Location Data: Encrypted, auto-deleted after 7 days.
- Emergency Alerts & Reports: Stored for 72 hours based on severity.
- AI Safety Insights: Temporarily stored for 48 hours.

## 9. Context Diagram

### 9.1.1 Context Diagram (DFD Level 0)

The Context Diagram (DFD Level 0) presents a high-level view of SafeHer's system environment, illustrating how the core app interacts with users, emergency services, third-party APIs, and data storage services. This visual model focuses on external communications, providing clarity on how SafeHer functions during critical safety events.

- Core System: SafeHer App manages data flow between users, emergency contacts, authorities, and external services.
- User Interactions: Registration, login, and triggering emergency alerts.
- Emergency Alerts: App retrieves user location (via Google API), notifying emergency contacts and authorities.
- AI Assistance: Integration with OpenAI API for safety guidance and queries.
- Data Storage: Firebase stores chat histories, emergency records, and user information.
- Real-time Notifications: Push notifications to users and contacts.

This high-level view emphasizes external interactions without internal processing details, clearly illustrating the SafeHer system's coordination capabilities during emergencies.

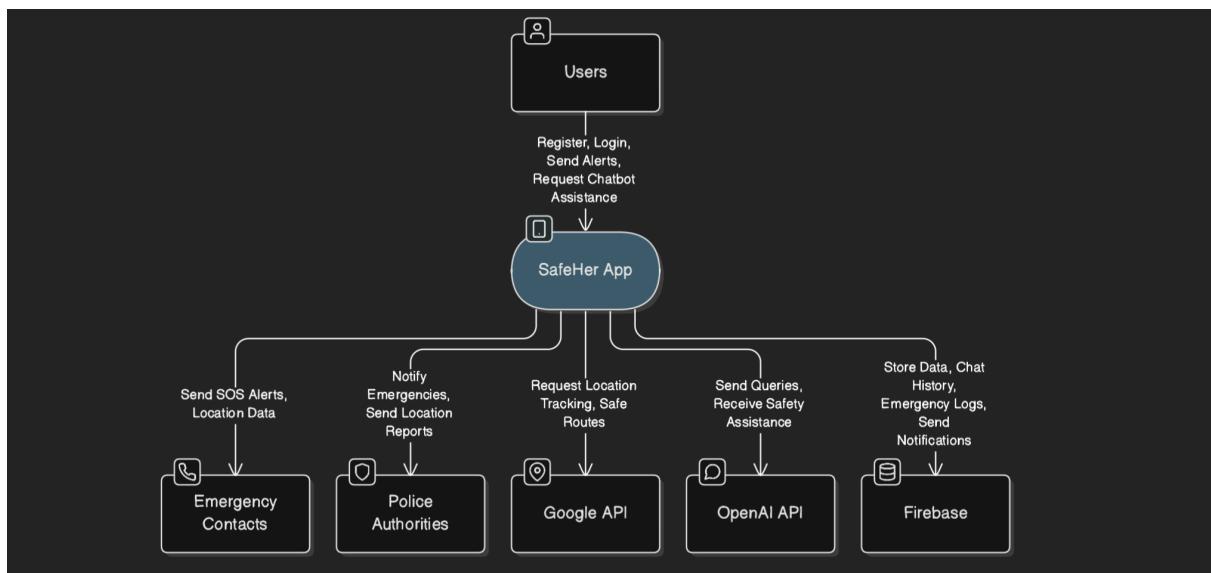


Fig. 16 SafeHer DFD Level 0

### 9.1.2 DFD Level 1: Breakdown of Core Modules

This diagram provides a detailed view of SafeHer's internal data flow, focusing on core safety processes:

- User Device: Central interaction point; user actions drive data flow.
- Location Tracking: Continuously collects and updates real-time location data in the Location Database for tracking and safety features.
- Hazard Reporting: Users report unsafe incidents; reports stored in Hazard Reports Database and can alert Emergency Contacts if needed.
- Alerting Process: Triggered by user emergencies; alerts Emergency Contacts, logs incidents in Alerts Database, and notifies Authorities if necessary.
- User Management: Manages user authentication, profile updates, and emergency contact details; data securely stored in User Database.
- Check-in Process: Allows routine status updates, logged in User Database for monitoring user safety.
- Stealth Mode: Enables discreet location deactivation; updates user status in User Database to maintain user discretion in risky situations.

These interconnected processes and databases ensure effective, integrated safety management and quick emergency response.

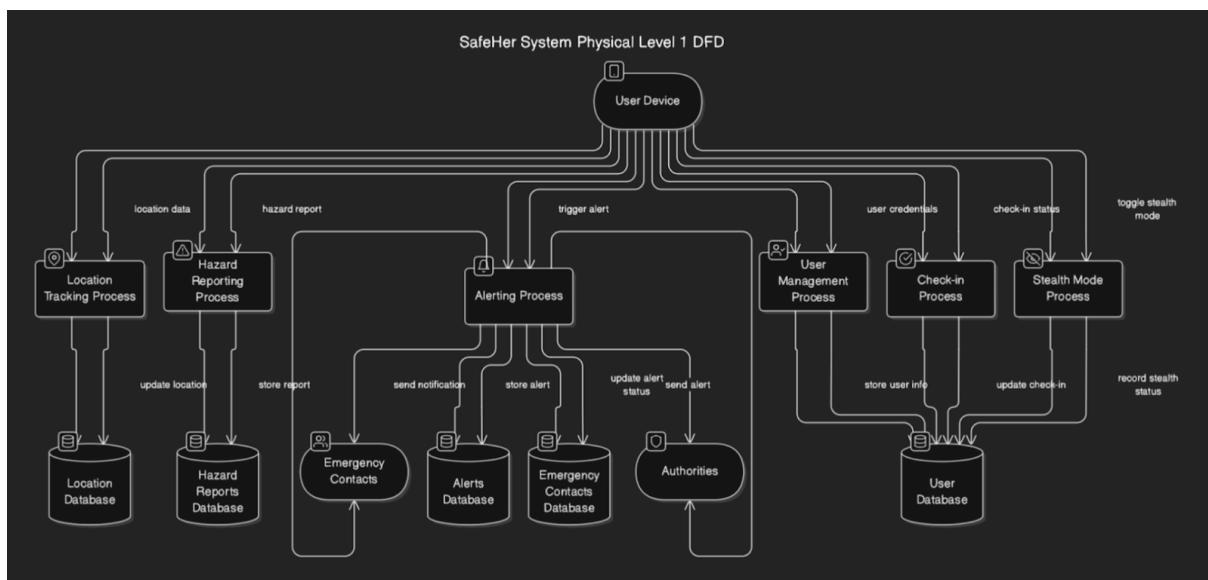


Fig. 17 SafeHer DFD Level 1

### 9.2 UML Sequence Diagram

The UML Sequence Diagram depicts interactions between users, emergency contacts, admins, AI systems, and payment services within SafeHer:

- User Actions: Register, log in, update profiles, add emergency contacts, share location, send secure messages, report hazards, and trigger SOS alerts.
- Emergency Alerts: Successful alerts notify emergency contacts and authorities; failures notify the user directly.
- Emergency Contacts: Receive alerts, track user locations, and communicate to assist promptly.

- Admins: Manage users, review hazard reports, oversee emergencies, and monitor the system for trends or misuse.
- AI System: Analyzes user behaviors, provides safety insights, and suggests preventive measures.
- Payments: Users manage subscriptions, process payments, and handle refunds.

The diagram effectively illustrates SafeHer's integrated approach to user safety, emergency response, AI-driven assistance, and streamlined payment management.

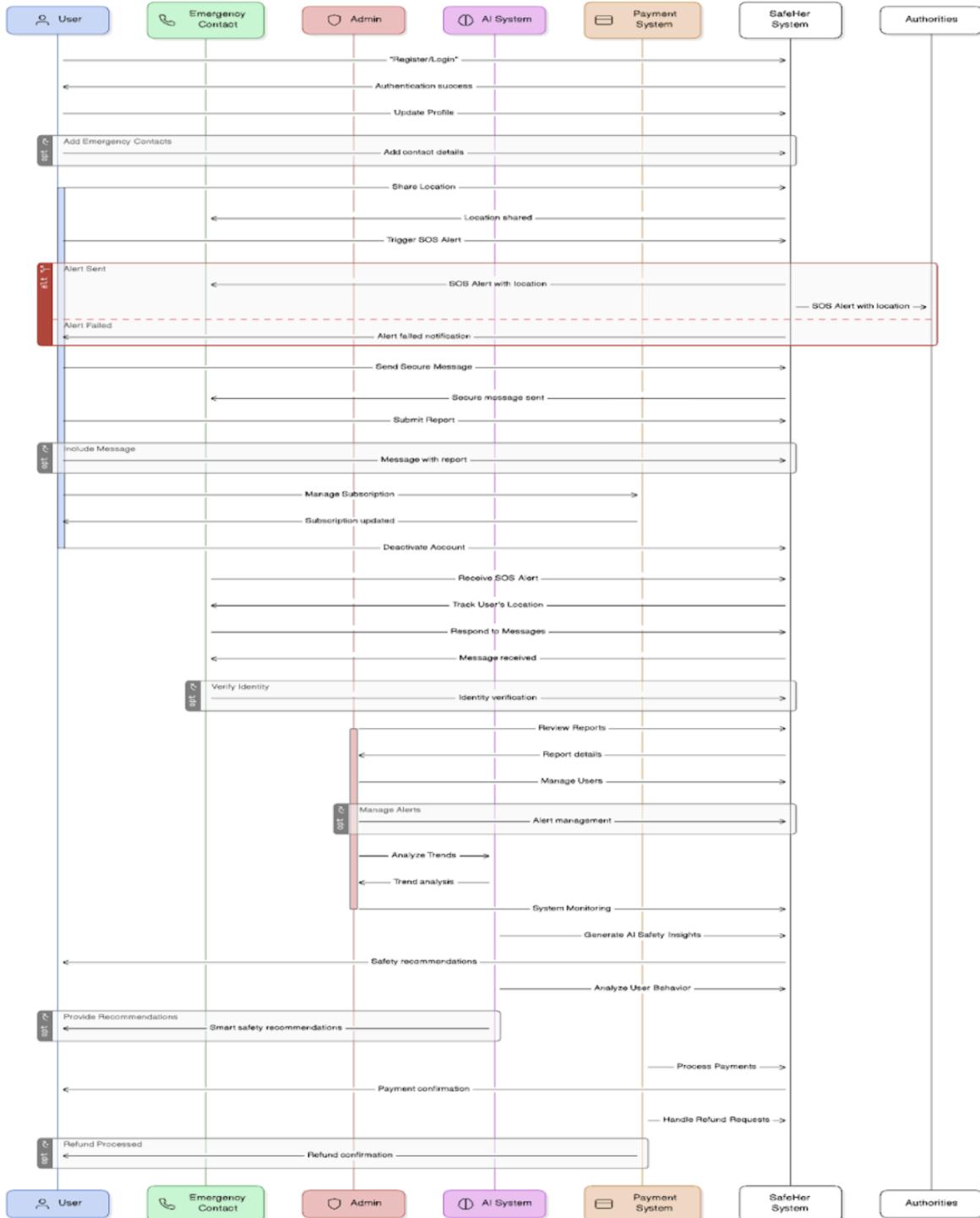


Fig. 18 SafeHer UML Sequence Diagram

### 9.3 UML Use Case Diagram

This diagram visualizes the functional interactions between core system components and key external actors. It outlines how users, emergency contacts, admins, AI services, and the payment gateway each engage with the SafeHer platform, emphasizing user-driven actions, system automation, and operational oversight.

- User:
  - Registers/logs in, manages profile.
  - Shares location, triggers SOS alerts.
  - Sends secure messages, reports hazards.
- Emergency Contact:
  - Receives alerts, tracks user locations.
  - Responds to emergencies, verifies identity for sensitive access.
- Admin:
  - Manages users, moderates content, and oversees safety reports.
  - Analyzes trends, monitors alerts, and maintains system integrity.
- AI System (OpenAI API):
  - Provides safety recommendations and chatbot assistance.
  - Detects risks by analyzing user behavior.
- Payment System will be implemented with (Stripe API):
  - Manages subscription payments and refunds.

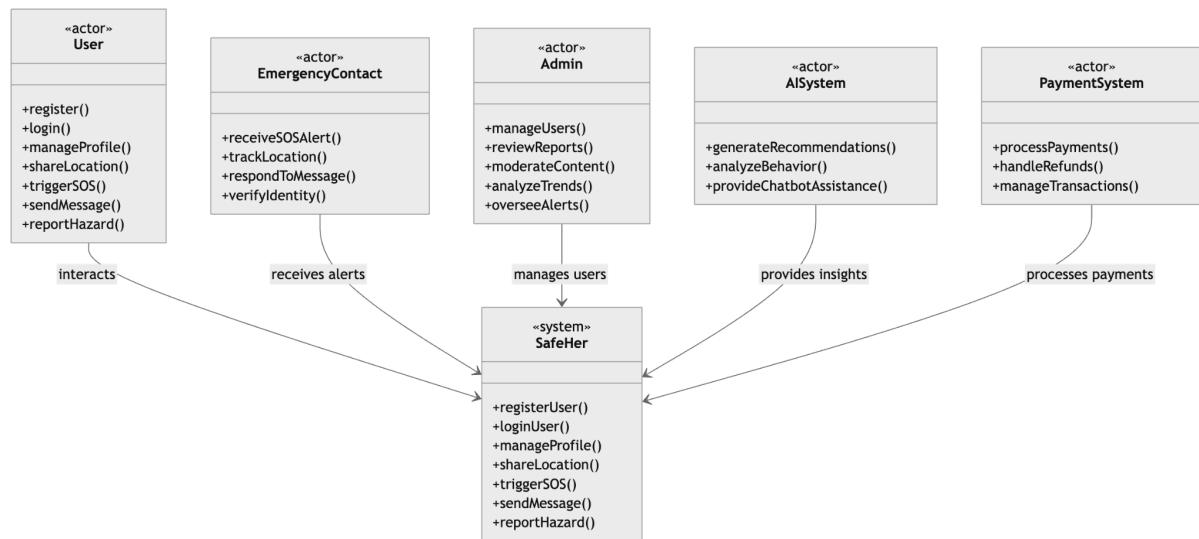


Fig. 19 SafeHer Use Case Diagram

## 10. Use Cases & System Interactions

Each user interacts with the SafeHer platform through a range of safety-focused and account-related functions. These use cases reflect the core actions users can perform to personalize their experience, manage emergencies, and stay connected with trusted contacts.

### A. User Use Cases

1. Register/Login – Users create an account or authenticate via email/password.
2. Update Profile – Modify emergency contacts and privacy settings.
3. Share Location – Enable live tracking with emergency contacts.
4. Trigger SOS Alert – Sends an emergency alert with location data.
5. Send Secure Message – Communicate securely with emergency contacts.
6. Submit Report – Users report hazardous locations or safety concerns.

### B. Emergency Contact Use Cases

1. Receive SOS Alert – Emergency contacts get a real-time alert.
2. Track User’s Location – View the live location of the user in danger.
3. Respond to Messages – Securely communicate with the user during emergencies.
4. Verify Identity – Authenticate before accessing user location data.

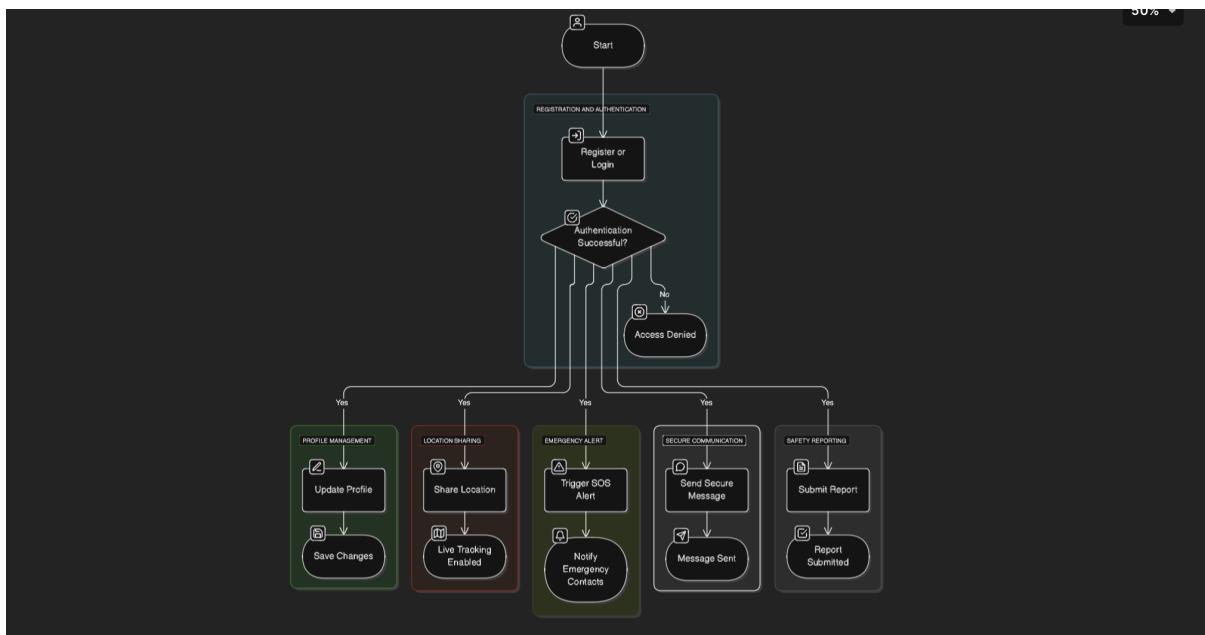


Fig. 20 SafeHer Use Case Diagram

### 10.1 Relationships in Emergency Contact Use Cases:

This section explores how specific emergency contact actions are interconnected within the SafeHer system. By analyzing use case relationships such as tracking and identity verification, it ensures emergency contacts can respond effectively while upholding user privacy and security protocols.

- "Receive SOS Alert" includes "Track User's Location" – Contacts must track the user upon receiving an alert.
- "Verify Identity" extends "Track User's Location" – Security measure to protect sensitive information

### C. Admin Use Cases

Admins are responsible for maintaining system integrity, user safety, and operational efficiency. This section outlines the administrative capabilities that support moderation, user management, and data oversight across the platform.

1. Review Reports – Moderates hazard reports submitted by users.
2. Manage Users – Suspend, disable, or delete user accounts.
3. Manage Alerts – Review emergency alerts and take necessary actions.
4. Analyze Trends – Detect emerging safety risks from hazard reports.
5. System Monitoring – Ensure uptime, prevent system abuse, and manage resources.

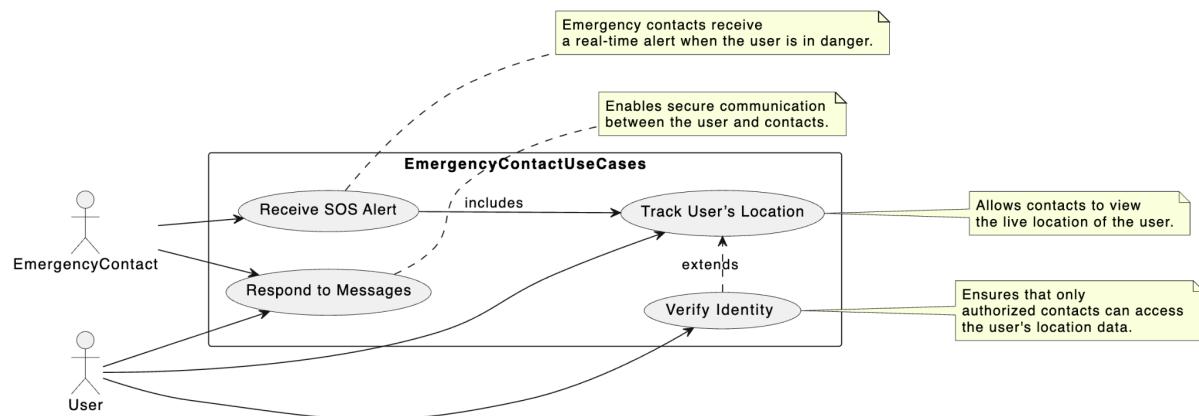


Fig. 21 SafeHer Emergency Contact Use Case Diagram

### 10.2 Relationships in Admin Use Cases:

The admin use case relationships highlight how moderation and system management functions are interlinked. These dependencies ensure efficient workflows—from analyzing safety trends to managing alerts and user activities in a streamlined, responsible manner.

- "Review Reports" includes "Analyze Trends" – Reports contribute to trend analysis.
- "Manage Users" extends "Manage Alerts" – Admins handle false or inappropriate alerts.

### D. AI System Use Cases

SafeHer's AI system plays a pivotal role in delivering proactive safety features. This section outlines how artificial intelligence is used to generate personalized insights, analyze behavioral patterns, and provide context-aware safety recommendations to users.

1. Generate AI Safety Insights – Provide location-based safety recommendations.
2. Analyze User Behavior – Detects potential safety threats based on movement patterns.
3. Provide Smart Safety Recommendations – Suggest safe routes and alert levels.

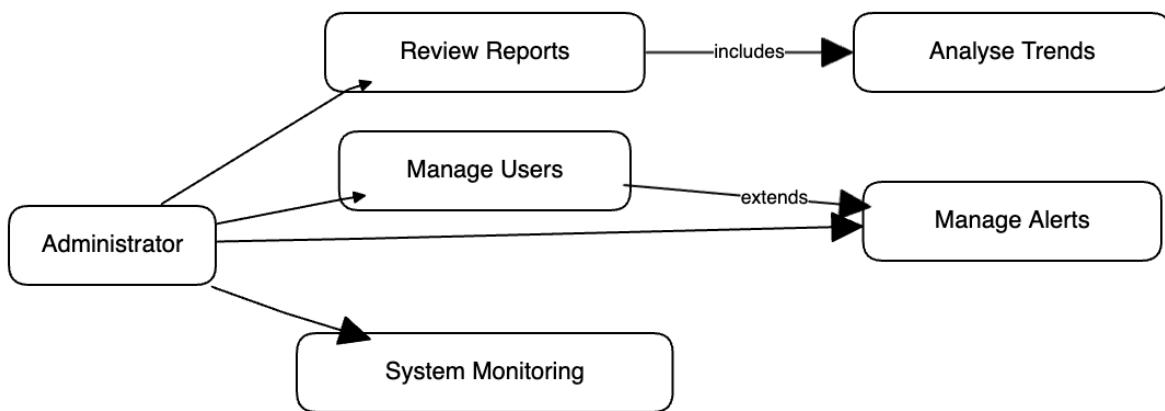


Fig. 22 SafeHer Use Case Relationships Diagram

### 10.3 Relationships in AI Use Cases:

This section explains how the AI use cases interact to form a feedback loop between behavioral analysis and smart recommendations. These relationships ensure that AI-generated insights are both timely and relevant, strengthening predictive safety capabilities.

- "Analyze User Behavior" includes "Generate AI Safety Insights" – AI recommendations depend on user behavior analysis.
- "Provide Smart Safety Recommendations" extends "Analyze User Behavior" – AI provides personalized safety alerts.

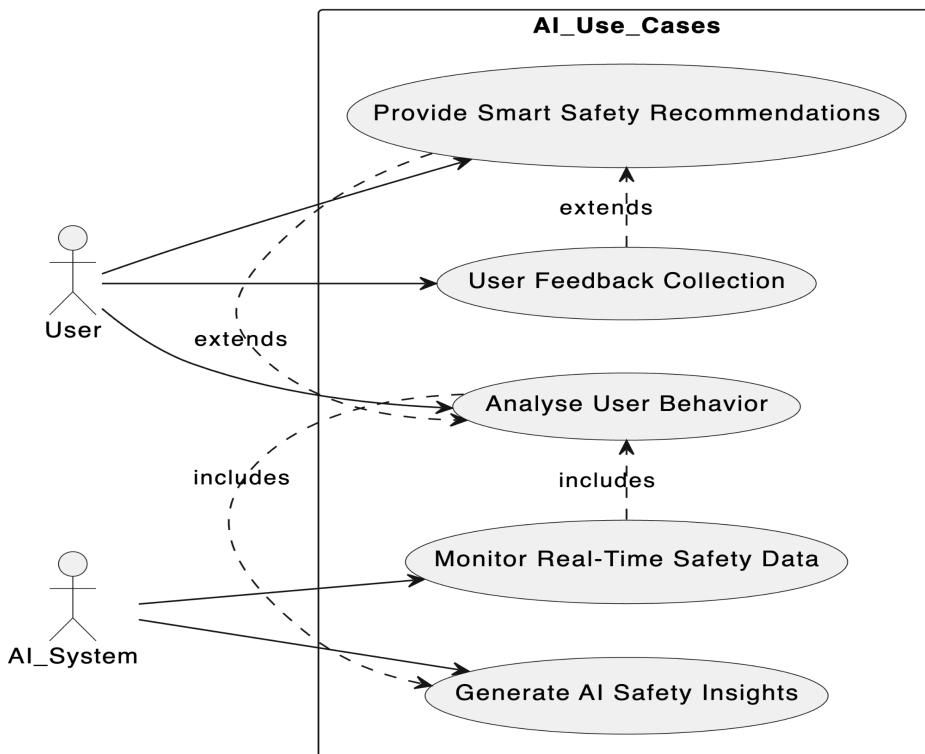


Fig. 23 SafeHer AI Use Case Diagram

## 11. Understanding How This Fits into the Larger Vision

SafeHer's current prototype marks the foundation of a much broader vision—a global safety network that evolves with technology. This section outlines the platform's phased roadmap, showing how core functionalities will scale over time to address larger public safety challenges through AI, crowdsourcing, and cross-sector integration.

### Short-Term Goals (Prototype Phase)

- Implement basic tracking, messaging, and SOS alerts.
- Ensure secure authentication & data encryption.
- Start with SQLite, then migrate to PostgreSQL for scalability.

### Mid-Term Goals

- AI-driven safety insights based on crime data & movement patterns.
- Blockchain-based tamper-proof reports.
- Crowdsourced safety data to build a real-time 'Safety Map'.

### Long-Term Vision

- Integration with Smart Wearables (Apple Watch, Fitbit) to trigger SOS alerts hands-free.
- Government & Law Enforcement API Access for instant safety alerts.
- Global Expansion – Covering multiple regions with real-time safety reports.
- IoT Integration – Smart home security integration (automated lock/unlock based on safety threats).

### 11.1.1 Zachman Framework for SafeHer – Owner & Technical Designer Perspective

This subsection applies the Zachman Framework to illustrate SafeHer's structure from both the business owner's and technical designer's viewpoints. It clarifies stakeholder needs, goals, and the architectural considerations that guide SafeHer's strategic development.

Interrogative	Business View (Owner's Perspective)
What (Data/Things)	Users, emergency contacts, alerts, hazard reports, AI safety insights, payments
How (Functions/Processes)	User registration, profile management, location sharing, SOS alerts, secure messaging, hazard reporting
Where (Network/Location)	Cloud-based mobile/web app, Google Maps API for location tracking, Firebase/Twilio for notifications
Who (People/Roles)	Users, emergency contacts, admins, authorities, AI system, payment providers (Stripe)
When (Events/Timing)	User actions (SOS activation, check-in failures), system events (AI hazard alerts), external triggers (law enforcement notifications, maintenance)
Why (Motivation/Goals)	Enhance personal safety, real-time tracking, emergency communication, AI recommendations, user trust, data security, scalability

Fig. 24 Zachman Framework - Owner Designer Perspective Table

### 11.1.2 Framework from the Technical Designer's Perspective (Technology View)

Here, the Zachman Framework is used to drill down into the system's technical infrastructure. It focuses on the technology stack, development processes, and implementation details that support SafeHer's functional and security requirements.

Interrogative	Technology View (Technical Designer's Perspective)
What (Data/Things)	User profiles, emergency contacts, location data, hazard reports, chat messages, payment transactions
How (Functions/Processes)	Microservices-based architecture, React frontend, Django backend, REST APIs, WebSockets, OpenAI AI integration
Where (Network/Location)	AWS/GCP deployment, Docker containers, Google Maps API for location tracking, Firebase Cloud Messaging, Twilio for messaging
Who (People/Roles)	Backend engineers (Django), frontend developers (React), AI specialists (ML/AI), security experts, DevOps engineers
When (Events/Timing)	Event-driven architecture, WebSockets for instant notifications, scheduled tasks for renewals and security audits
Why (Motivation/Goals)	Scalability, security, responsiveness, high availability, low latency, GDPR compliance, AES-256 encryption, fault tolerance

Fig. 25 Zachman Framework - Technical Designer Perspective Table

## 12. Discussion of External Software Interfaces for SafeHer

To deliver a seamless and responsive user experience, SafeHer relies on several external software interfaces. This section outlines the APIs and third-party services integrated into the platform—covering current implementations, security considerations, and future expansion opportunities that support core functionalities like location tracking, alerts, AI assistance, and payments.

Since SafeHer integrates multiple third-party services for location tracking, messaging, AI assistance, and payments, external software interfaces play a critical role in ensuring seamless operation. These interfaces include APIs, SDKs, and cloud-based services that allow SafeHer to interact with external systems effectively.

### 1. External Software Interfaces & Roles

- Google Maps API: Real-time location tracking, geofencing, hazard mapping; exchanges coordinates and geolocation data.
- Firebase (FCM): Sends real-time emergency alerts, notifications, and subscription updates from Django backend.
- OpenAI API: AI chatbot provides safety recommendations; exchanges user input for safety guidance.

### 2. Security & Compliance Considerations

- Google Maps API: GDPR compliance, encrypted location data, temporary data storage.
- Firebase: End-to-end encrypted notifications for authenticated users.
- OpenAI API: Privacy-first design; future self-hosted models planned.

### 3. Potential Future Integrations

- Firebase Authentication (OAuth via Google, Facebook, Apple).
- Blockchain verification for hazard reports.

- AWS Rekognition for identity verification.
- Weather and disaster alert APIs for real-time crisis notifications.

## 13. Performance & Scalability Requirements

SafeHer is designed to operate reliably under high-demand conditions while maintaining security, responsiveness, and data efficiency. This section defines the system's performance benchmarks, scalability targets, and technical optimizations across encryption, latency, real-time updates, and cross-platform compatibility.

### Security & Compliance

- AES-256 encryption for sensitive data.
- bcrypt hashed passwords, restricted API access.

### Database Query Efficiency

- Queries execute under 200ms using PostgreSQL indexing and caching.

### System Responsiveness & Latency

- Emergency Alerts: SOS alerts sent within 2 seconds; received by contacts within 3-5 seconds.
- Location Updates: Real-time updates every 1-2 seconds; reduced to 10-15 seconds in low-power mode.
- Secure Messaging: Delivery under 1 second via WebSockets.

### Scalability

- Supports 10,000 simultaneous users initially; scalable to 1 million.
- Handles 500+ requests per second (peak).
- Auto-scaling triggers above 70% CPU for 2+ minutes.

### Security & Data Protection Performance

- Authentication: Completes within 1 second.
- AES-256 Encryption: Decryption delay under 500ms.
- Rate Limiting/Firewall: Blocks malicious requests within 1 second.

### Battery & Resource Optimization

- CPU Usage: Below 10% in normal use.
- Battery Drain: Less than 5% per hour with continuous location tracking.

### Data Storage & Retrieval Speed

- Profile data retrieval under 300ms.
- Location history retrieval under 1 second.
- Media uploads at 500 ms per 1MB (4G connection).

### Performance Benchmarks:

- 98% success rate for alert delivery

- 300ms or less data retrieval (SQLite → PostgreSQL migration)
- 1-second delivery time for secure messages (via WebSocket)

Platform Compatibility:

- Fully functional on iOS (Safari/Chrome) and Android (Chrome/Firefox)
- Tested on screen sizes: 5.5"-15"

## 14. Technical Challenges in Bringing SafeHer to Market

Launching SafeHer at scale presents a set of complex technical and operational challenges. This section explores key obstacles, ranging from real-time tracking accuracy and secure data handling to global deployment and reliable emergency integration, along with the solutions and strategies in place to overcome them.

- Real-time Location Tracking:
  - Challenge: Reliable tracking in areas with poor GPS signals.
  - Solution: Combine GPS, Wi-Fi triangulation, Bluetooth beacons, and offline SMS alerts.
- Privacy and Data Protection:
  - Challenge: Protecting sensitive location data.
  - Solution: AES-256 encryption, minimal data storage, user consent management, clear privacy policies, and data anonymization.
- User Authentication and Authorization:
  - Challenge: Secure access to sensitive user information.
  - Solution: Implement multi-factor authentication (MFA); ensure rapid emergency access without unnecessary barriers.
- Reliability of Emergency Services Integration:
  - Challenge: Rapid, dependable connection to emergency services.
  - Solution: Collaborate with local authorities, integrate reliable fallback methods (e.g., SMS if data connection fails).
- Global Expansion and Localization:
  - Challenge: Adapting to diverse regional safety protocols and laws.
  - Solution: Localization of language, emergency contacts, and legal guidelines through dynamic regional databases.

## 15. Source code highlights

```
const displayHazardReports = useCallback(() => {
  if (!map) return;

  hazardReports.forEach((report) => {
    const position = {
      lat: report.latitude ? parseFloat(report.latitude) : 53.349805,
      lng: report.longitude ? parseFloat(report.longitude) : -6.26031,
    };

    new google.maps.Circle({
      map,
      center: position,
      radius: 500, // 500-meter hazard radius
      fillColor: "#FF0000",
      fillOpacity: 0.3,
      strokeColor: "#FF0000",
      strokeOpacity: 0.8,
      strokeWeight: 2,
    });

    const marker = new google.maps.Marker({
      position,
      map,
      title: report.name,
      icon: {
        path: google.maps.SymbolPath.CIRCLE,
        fillColor: "#FF0000",
        fillOpacity: 1,
        strokeWeight: 1,
        scale: 10,
      },
    });
  });

  const infoWindow = new google.maps.InfoWindow({
    content: `<h4>${report.name} || "Hazard"</h4>
    <p><strong>Location:</strong> ${report.street_name || "Unknown"}, ${report.city || "Unknown"}, ${report.country || "Unknown"}</p>
    <p><strong>Description:</strong> ${report.description || "No description available"}</p>
    <p><strong>Time:</strong> ${new Date(report.timestamp).toLocaleString()}</p>`,
  });
}

marker.addListener("click", () => {
  infoWindow.open(map, marker);
});

}, [map, hazardReports]);

useEffect(() => {
  const fetchHazardReports = async () => {
    try {
      const response = await axios.get("https://172.20.10.3:8000/hazardous_areas/");

      if (response.data && Array.isArray(response.data.hazards)) {
        const now = new Date();
        const filteredHazards = response.data.hazards.filter((hazard) => {
          const hazardTime = new Date(hazard.timestamp);
          return now - hazardTime < 72 * 60 * 60 * 1000; // Last 72 hours only
        });

        setHazardReports(filteredHazards.reverse());
      } else {
        setHazardReports([]);
      }
    } catch (error) {
      console.error("Error fetching hazard reports:", error);
      setHazardReports([]);
    }
  };

  fetchHazardReports();

  const intervalId = setInterval(fetchHazardReports, 5 * 60 * 1000); // Refresh every 5 minutes
  return () => clearInterval(intervalId);
}, []);

```

### 15.1 Displaying Hazard Circles and Markers on the Map:

This snippet visually displays reported hazards on the Google Map as red circles (500-meter radius) and red circular markers. When a marker is clicked, an info window shows detailed hazard information, including location, description, and time of the report.

### 15.2 Fetching and Filtering Hazard Reports:

This snippet fetches recent hazard reports from the server, filtering them to only include hazards reported within the last 72 hours. It automatically updates hazard data every 5 minutes, ensuring the information remains current for users.

```

const findNearbyPlaces = (location) => {
  if (!map) return;

  const service = new google.maps.places.PlacesService(map);

  // Clear old markers
  nearbyPlaces.forEach((place) => place.setMap(null));
  setNearbyPlaces([]);

  const placesTypes = ["hospital", "police", "fire_station"];

  placesTypes.forEach((type) => {
    const request = {
      location,
      radius: 5000, // 5 km radius
      type,
    };

    service.nearbySearch(request, (results, status) => {
      if (status === google.maps.places.PlacesServiceStatus.OK) {
        const markers = results.map((result) => {
          const marker = new google.maps.Marker({
            position: result.geometry.location,
            map,
            title: result.name,
            icon: getMarkerIcon(type),
          });

          marker.addListener("click", () => {
            alert(`You clicked on ${result.name}`);
          });

          return marker;
        });
      }

      setNearbyPlaces((prev) => [...prev, ...markers]);
    });
  });
};

const getMarkerIcon = (type) => {
  switch (type) {
    case "hospital":
      return "https://maps.google.com/mapfiles/ms/icons/green-dot.png";
    case "police":
      return "https://maps.google.com/mapfiles/ms/icons/blue-dot.png";
    case "fire_station":
      return "https://maps.google.com/mapfiles/ms/icons/red-dot.png";
    default:
      return "https://maps.google.com/mapfiles/ms/icons/gray-dot.png";
  }
};

```

// Midway check-in

```

const handleMidwayCheckIn = useCallback(() => {
  if (!checkInTriggered.midway) {
    const confirmCheckIn = window.confirm("Midway Check-in: Are you safe?");
    if (!confirmCheckIn) {
      alert("Emergency alert triggered!");
      handleEmergencyButton();
    }
    setCheckInTriggered((prev) => ({ ...prev, midway: true }));
  }
}, [checkInTriggered]);

// Final Check-in
const handleFinalCheckIn = useCallback(() => {
  if (!checkInTriggered.final) {
    const confirmCheckIn = window.confirm("Final Check-in: Have you arrived safely?");
    if (!confirmCheckIn) {
      alert("Emergency alert triggered!");
      handleEmergencyButton();
    }
    setCheckInTriggered((prev) => ({ ...prev, final: true }));
  }
}, [checkInTriggered]);

```

### 15.3 Displaying Hospitals, Police Stations, and Fire Stations on the Map:

This snippet retrieves and displays nearby critical locations Hospitals, Police Stations, and Fire Stations on the Google Map. Each location type is marked using distinct icons:

- Green markers: Hospitals
- Blue markers: Police Stations
- Red markers: Fire Stations

### 15.4 Midway and Final Check-in

These functions trigger safety check-ins during a user's journey:

- Midway Check-in: Prompts users halfway through their trip to confirm they are safe.
- Final Check-in: Confirms the user has safely reached their destination when the trip timer ends.

If a user does not confirm safety, an emergency alert is activated automatically.

```

const handleFakeCall = () => {
  if (currentAudio) {
    stopCurrentAudio();
    return;
  }

  stopCurrentAudio(); // Ensures no other audio is playing

  const ringtoneAudio = new Audio(ringtone);
  const conversationAudio = new Audio(conversation);

  setCurrentAudio(ringtoneAudio);
  ringtoneAudio.play();

  // Stop ringtone after 6 seconds, start conversation audio
  const ringtoneTimeout = setTimeout(() => {
    ringtoneAudio.pause();
    ringtoneAudio.currentTime = 0;
    setCurrentAudio(conversationAudio);
    conversationAudio.play();
  }, 6000);

  // Stop conversation after 60 seconds
  const conversationTimeout = setTimeout(() => {
    conversationAudio.pause();
    conversationAudio.currentTime = 0;
    setCurrentAudio(null);
  }, 60000);

  // Save timeouts so they can be cleared if needed
  setTimeoutIds([ringtoneTimeout, conversationTimeout]);
};


```

## 15.5 Fake Call Functionality (Discreet Safety Tool)

This function simulates a fake phone call:

- Plays a ringtone for 6 seconds, mimicking an incoming call.
- Automatically transitions to a realistic conversation sound after the ringtone.
- Ends the conversation after 60 seconds.
- Useful for users needing to discreetly escape or defuse potentially dangerous or uncomfortable situations.

## 16. WebApp Testing

To ensure reliability, security, and user satisfaction, SafeHer underwent rigorous testing across multiple layers of the web application. This section outlines the tools, methods, and findings from functional, usability, security, and compatibility testing, all aimed at validating the platform's performance across real-world scenarios and environments.

SafeHer was tested across multiple layers using both manual and automated testing protocols:

### 1. Functional Testing

- Tools: Postman (API), Jest (React components), Django test client
- Focus: Alerts, Location Sharing, Hazard Reporting
- Result: 100% pass rate for MVP functionalities after 2 sprints

### 2. Usability Testing

- Participants: 10 users (students, working professionals)
- Method: Walkthroughs with scenario tasks (e.g., fake call, alert activation)
- Findings: Users preferred large CTA buttons, simple UI, visible color indicators (Red = danger)

### 3. Security Testing

- Scope: Password security, data encryption, role access control
- Future upgrade planned for AES-256

#### 4. Compatibility Testing

- Platforms Tested: Desktop, Android, iOS
- Browsers: Chrome, Firefox, Safari, Edge
- Result: Fully responsive and functional on all major browsers

### 17. User Interface

SafeHer design is strategically crafted to enhance usability, emotional reassurance, and accessibility, making it an effective personal safety app for women.

#### Why Violet? The Psychology Behind the Color Choice

Violet and purple tones are often associated with calmness, empowerment, and security. Research suggests that purple has been historically linked to women's rights movements, making it a symbol of strength and safety for women. It evokes trust, dignity, and awareness, reinforcing the app's mission [17,18,19].

#### 17.1 Visual Hierarchy & Readability

- Contrast & Legibility: White text on a violet background ensures high contrast for readability, even in low-light environments.
- Button Design: Large, high-contrast buttons in bold pink and white make emergency actions instantly recognizable.
- Spacing & Layout: Generous whitespace enhances clarity and focus, reducing clutter for faster interaction.

#### 17.2 Intuitive UI for Quick Decision-Making

- Minimalist Navigation: Clearly defined sections allow users to instantly locate key safety features.
- Typography: Uses modern sans-serif fonts for a clean, accessible look that aligns with safety and tech-friendly applications.
- Iconography: Universal symbols ( ) ensure that features are immediately recognisable, reducing cognitive load.

#### 17.3 Consistency & User Trust

- A cohesive design language with uniform color usage and button styles builds trust and predictability, making interactions instinctive.
- Progressive Disclosure: Less critical features are subtly integrated, ensuring the interface remains uncluttered yet fully functional.

### 18. Use Story

#### 1. Real-Time Safety Map – Linda (The Single Mother)

##### Persona Story:

Linda, a 40-year-old school teacher, always worries when her 12-year-old daughter, Emma, walks home alone. She wants to ensure Emma avoids unsafe areas but doesn't always have real-time updates on the neighborhood's safety.

## Feature Solution:

- A dynamic map that marks high-risk areas based on real-time crime reports.
- Highlights safe locations like hospitals, police stations, and fire stations nearby.
- Provides route suggestions to avoid dangerous zones.

## How It Helps Linda:

Now, before Emma leaves school, Linda quickly checks the SafeHer map to ensure her route home is safe. If there's an incident nearby, she can call Emma and suggest a safer path.

Gives Linda peace of mind by helping her track safe and unsafe areas, ensuring Emma stays out of danger.

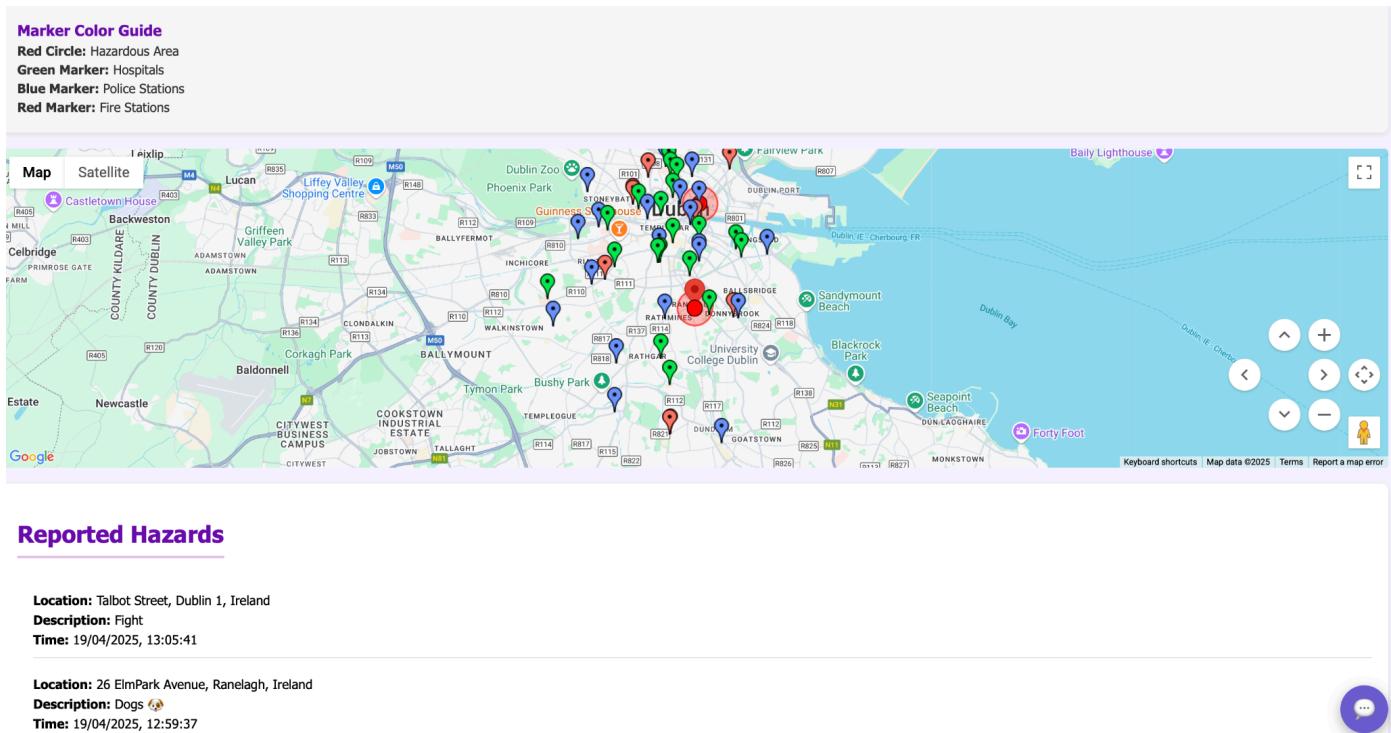


Fig. 26 SafeHer UI for Hazard Reports and Map

## 2. Fake Call Feature – Sarah (The Young Professional)

### Persona Story:

Sarah, a 27-year-old marketing executive, often attends work events and business trips in unfamiliar cities. One night, she takes a rideshare, but the driver starts asking personal questions, making her uncomfortable. She doesn't want to cause a scene but needs a way to exit safely.

## Feature Solution:

- Fake incoming calls with customisable caller names (e.g., "Mom" or "Boss") to create an excuse to leave.
- Pre-set voice prompts that sound realistic, mimicking a real conversation.
- Quick activation gesture, like pressing the power button three times discreetly.

## How It Helps Sarah:

She quickly activates the fake call, pretends she's needed at work, and asks the driver to drop her off at the

nearest public place. The interaction feels natural, avoiding confrontation. A subtle way for Sarah to escape uncomfortable or unsafe situations without raising suspicion.

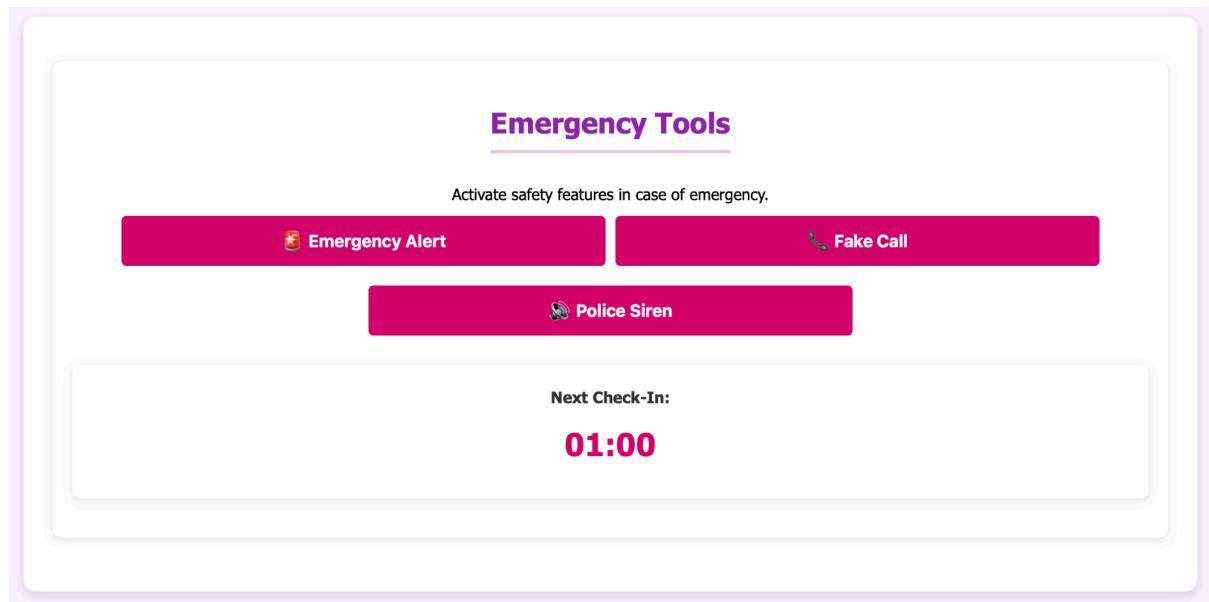


Fig. 27 SafeHer UI for Emergency Tools

### 3. Self-Defense Tutorials – Maya (The College Student)

#### Persona Story:

Maya, a 20-year-old college student, often stays late at the library. Walking back to her dorm at night makes her nervous, especially when the campus is quiet. She wants to feel more prepared in case something happens but has never taken a self-defense class.

#### Feature Solution:

- Quick self-defense video tutorials for common threats (e.g., escaping a grab, blocking an attack).
- Step-by-step emergency response tips tailored for different situations (e.g., being followed, catcalling, or physical threats).
- Practice mode with reminders to help users develop reflexive responses.

#### How It Helps Maya:

Before heading out, Maya watches a short tutorial on how to break free if grabbed. One night, when she senses someone following her, she remembers the key moves and walks confidently, making herself a less vulnerable target.

Empowers Maya with real-life self-defense techniques, boosting her confidence and ability to react in danger.

**Interactive Safety Tutorials**

**Essential Safety Tips for Women**



**DO TO FEEL SAFE?**

**Self-Defense & Awareness Guide**



**WOMEN SELF-DEFENSE 5 SIMPLE TIPS**

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**Safety Tips Blog**

[Women's Safety Main](#)
[Self-Defense Tips](#)

---

**Share Your Experience**

**Sammy**

I was afraid of walking home yesterday night

[Delete Experience](#)

**Comments**

No comments yet. Be the first to comment!

**Sammy**

I had a bad experience yesterday walking home , I felt like I was followed by someone

[Delete Experience](#)

**Comments**

No comments yet. Be the first to comment!

**Maria**

I had a really bad time yesterday walking home alone

[Delete Experience](#)

**Comments**

No comments yet. Be the first to comment!

Fig. 28 SafeHer UI for Safety Features Page

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## 20. Appendix:

### 20.1 Team CV

- [Team CV](#)

#### 20.2.1 SQLite vs MySQL: Key Differences

Feature	SQLite	MySQL
Setup	Built-in, no setup needed	Requires installation & configuration
Speed	Fast for small apps	Better for large-scale apps
Scalability	Not great for large data	Handles large data well
Multi-User Support	Single-user database	Supports multiple users concurrently
Storage Type	Saves data in a single file (.db)	Uses a server-based storage system
Use Case	Best for small projects, local apps, prototyping	Best for production apps, web services

## 20.2.2 Django vs Django + React

Aspect	Django Only (Django + Templates)	Django + React (API + Frontend)
<b>Development Speed</b>	Faster development with everything in one place	More complex setup with separate frontend and backend
<b>Deployment Complexity</b>	Easier deployment with a single Python-based stack	Requires API development (Django REST Framework)
<b>Frontend Interactivity</b>	Limited interactivity, requires full-page reloads	Highly interactive, supports real-time updates
<b>SEO Capabilities</b>	Better SEO with server-rendered pages	SEO challenges requiring SSR for better indexing
<b>Use Case</b>	Best for traditional web apps (blogs, CMS, admin panels)	Best for SPAs, interactive dashboards, scalable applications