

HealHub 2.0-Women Recovery from Sexual Harassment using Design Thinking Framework and GEN AI

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Abstract— Our project aims to develop a mobile application dedicated to supporting women in their recovery from sexual harassment. The platform provides immediate access to professional consultation from doctors and lawyers, ensuring both medical and legal assistance is available at the right time. A secure and confidential chatbot is integrated to allow victims to express their grievances without fear of judgment. The application focuses on user privacy and safety, creating a trusted space for women to seek help. It bridges the gap between victims and professionals by offering quick, reliable, and accessible support. The doctor consultation feature addresses both physical and mental health recovery, while the lawyer consultation ensures women are guided through legal rights and justice processes. The chatbot acts as the first point of contact, easing communication and recording necessary details in a sensitive manner. The app is designed with user-friendly navigation to ensure accessibility for women from diverse backgrounds. Overall, this project emphasizes empowerment, recovery, and justice for women who have experienced harassment. It contributes to building a safer, more supportive society through technology-driven solutions.

I. INTRODUCTION

Sexual harassment and assault remain widespread issues that demand urgent attention, as they affect individuals across age groups, genders, and environments. Research highlights the scope of the problem: the National Sexual Violence Resource Centre reports that nearly one in three women and one in six men in the United States have faced some form of sexual harassment or assault during their lifetime.

For an instance, 81% of women and 43% of men in the United States report experiencing some form of sexual harassment or assault at work, according to the U.S. Equal Employment Opportunity Commission. This high prevalence rate, though distressing, is only part of the picture; the stigma, fear, and institutional barriers that survivors face often prevent them from reporting incidents or seeking help. A study by the U.S. Department of Justice found that less than 25% of sexual assaults are reported to law enforcement, with many survivors citing concerns over privacy, potential retaliation, and fear of not being believed as reasons for their reluctance.

Additionally, statistics reveal that the risk of underreporting is even higher among marginalized groups, including LGBTQ individuals and people of color. According to the National LGBTQ Task Force, more than 40% of LGBTQ survivors choose not to report assaults or harassment due to concerns over discrimination or a lack of understanding from authorities. The workplace, educational institutions, and even social media platforms have become recognized as environments where harassment is pervasive.

For instance, the National Institute of Justice reports that more than half of all female graduate students and over 40% of undergraduates have experienced some form of sexual harassment or misconduct in academic settings. Similarly, the ILO highlights that workplace harassment, affecting 23% of women and 11% of men worldwide, not only impacts job performance and mental health but also contributes to a culture of silence and isolation, deterring survivors from coming forward or seeking support.

This silence is further perpetuated by the emotional and psychological toll that harassment and assault impose. Survivors often experience PTSD, depression, anxiety, and other mental health challenges as a result of their trauma. Data from the CDC indicate that 81% of women and 35% of men who have experienced sexual assault report significant short- and long-term impacts.

II. RELATED WORKS

Women safety and recovery applications have been widely explored in the fields of mobile health, legal technology, and intelligent support systems. Early research primarily focused on safety alert mechanisms such as panic buttons, GPS tracking, and emergency contact notifications [1]. While effective in providing immediate alerts, these systems often lacked long-term recovery support for victims, such as medical or legal guidance.

To enhance usability, some applications integrated healthcare features, offering medical advice and mental health counselling through mobile platforms [2]. These systems provided preliminary support for physical and psychological recovery; however, they were often limited to predefined symptom checkers and static content, reducing personalization. Legal assistance modules have also been investigated, where mobile-based tools guided women in filing complaints and understanding their rights [3]. Although useful, these systems were primarily rule-based and struggled to address complex, case-specific legal scenarios. For healthcare assistance, Decision Tree Classifiers and Naïve Bayes models have been used to provide symptom-based medical advice. These algorithms enabled preliminary health assessments by mapping user-reported conditions to probable medical guidance. Similarly, Rule-based Expert Systems have been deployed for psychological support and counselling, though their adaptability was constrained by predefined rules.

In the legal domain, Information Retrieval (IR) algorithms such as TF-IDF and similarity matching have been adopted to map user grievances to relevant legal rights, case references, or lawyer directories [4]. Some systems also integrated Natural Language Processing (NLP) techniques to extract entities such as incident type, location, and time from user-reported text for structured legal documentation.

Recent advancements in conversational agents for grievance handling rely heavily on Natural Language Understanding (NLU) and Deep Learning models. Algorithms such as Seq2Seq models, Long Short-Term Memory (LSTM) networks, and Transformer-based architectures (e.g., BERT, GPT) have been employed to improve chatbot accuracy and empathy in handling sensitive conversations [5]. These methods allow context-aware dialogue generation and sentiment analysis, ensuring more natural and supportive interactions.

Some hybrid frameworks combine these techniques, for example by integrating Sentiment Analysis algorithms with Doctor–Patient recommendation systems or linking Chatbot-based data collection to Legal Knowledge Graphs for more reliable case guidance [6]. Despite these advancements, existing works are often domain-specific, focusing only on safety alerts, healthcare, or legal support in isolation.

A. SOS and Emergency Dataset

This dataset records information related to SOS activations within the application. It includes the date and time of activation, live GPS location, type of emergency, and the response mechanism triggered. The dataset is primarily used to evaluate emergency response efficiency and improve alert handling.

B. Incident Reporting Dataset

The incident reporting dataset stores structured information about harassment-related complaints submitted through the application.

Data such as incident category, location type, time of occurrence, action taken, and case status are maintained in an anonymized format to ensure privacy while enabling effective case tracking.

C. Mental Health and Recovery Dataset

This dataset provides recovery-focused resources including counseling services, NGOs, helplines, and self-help materials. It plays a vital role in the post-incident recovery phase by offering emotional and psychological support information to users.

III. DESIGN AND METHODOLOGY

The proposed system is developed using modern coding languages and frameworks: Java/Kotlin or Flutter for mobile development, Python with NLP libraries for chatbot processing, and a cloud-hosted database (e.g., Firebase, MongoDB) for secure storage. The methodology also includes iterative testing phases—unit testing for modules, integration testing for API communication, and usability testing with real users to ensure accessibility and trust.

By combining AI-driven grievance handling, medical and legal consultation, and robust security practices, the proposed methodology ensures that victims receive not only immediate support but also long-term recovery assistance in a single unified application.

A. System Architecture

At The proposed application follows a multi-layered architecture that integrates chatbot-based grievance handling, doctor consultation, and lawyer consultation in a secure and user- friendly manner. The Data Tier consists of encrypted databases: a primary user database for anonymized profiles and app usage data, and isolated, highly secure databases for storing sensitive session transcripts and user-provided evidence, ensuring strict data segregation and compliance with privacy regulations like GDPR and HIPAA.

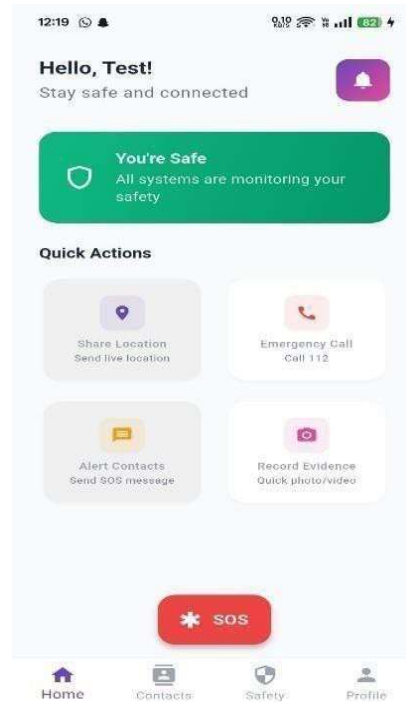


Fig 1

B. Front-End user Interface and UI/UX Interface

The UI/UX is designed with paramount importance on safety, accessibility, and reducing psychological triggers. The interface employs a neutral, calming colour palette and avoids overwhelming visual elements. A key security feature is the "Quick Exit" button, prominently yet discreetly placed, which immediately closes the application and clears the current screen, redirecting to a pre-defined neutral website or the device's home screen. Navigation is simplified with a bottom tab bar offering clear access to the four core modules: Chat, Doctor, Lawyer, and Safety Tools.

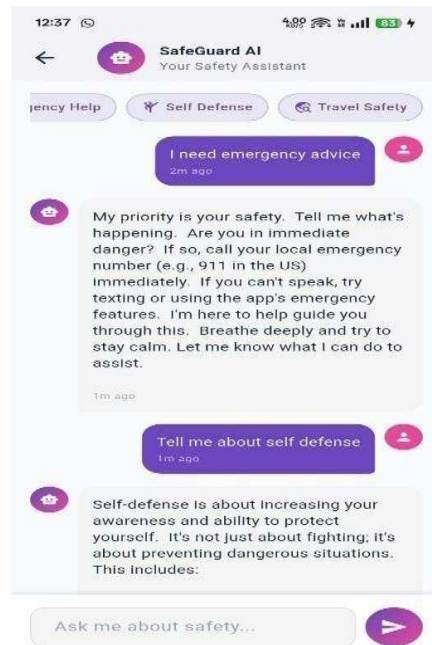


Fig 2

C. Data Collection and Anonymous Pipeline

To continuously improve the AI models while staunchly protecting user privacy, a rigorous data anonymization pipeline is employed.

All conversational data used for model retraining is first stripped of any PII (Names, Locations, etc.) using a named-entity recognition (NER) and redaction system. The data is then aggregated and used to further fine-tune the LLM in a secure, offline training environment.

D. Conversational AI components

The core empathetic interaction is powered by a hybrid conversational AI system. The chatbot utilizes a state-of-the-art large language model (LLM), fine-tuned on a curated dataset of supportive dialogues, crisis counselling transcripts, and psychological first aid principles to ensure responses are empathetic, non-judgmental, and trauma-informed. To handle specific intents like legal queries or medical concerns, a rule-based component integrated with a Natural Language Understanding (NLU) engine is used for accurate classification and routing.

E. Development Environment

The scalable environment that supports mobile app development, natural language processing, secure data management.

The front-end of the application is implemented using Java and Kotlin for Android development, while Flutter is used for cross-platform compatibility, ensuring accessibility across both Android and iOS devices. The back-end is developed in Python, which enables seamless integration of Natural Language Processing (NLP) models and machine learning algorithms for chatbot-based grievance handling. Frameworks such as TensorFlow and NLTK are employed to support text classification, sentiment analysis, and conversational understanding.

IV. PURPOSE

The primary purpose of this project is to develop a secure and reliable mobile application that supports women in their recovery from sexual harassment by integrating medical, legal, and grievance management services into a single platform. Existing women safety applications focus mainly on emergency alerts and location tracking, but they often lack structured mechanisms for long-term recovery and support. Victims are left without accessible resources for medical treatment, psychological counselling, or legal guidance, which are essential for both healing and justice.

This project addresses these gaps by creating a comprehensive system that combines three core services: confidential grievance reporting through a chatbot, real-time consultation with doctors for health and psychological recovery, and direct access to lawyers for legal support. The purpose is not only to provide immediate assistance but also to ensure continuity of care and justice for victims. By prioritizing user privacy, data security, and accessibility, the system empowers women to seek help without fear of stigma or exposure.

At its core, the model employs a chatbot powered by Natural Language Processing (NLP) to enable victims to confidentially express their grievances. This reduces hesitation and stigma associated with direct reporting.

The model further integrates a doctor consultation component to ensure victims receive both physical and psychological healthcare, and a lawyer consultation module that guides them through their legal rights and case handling. A recommendation mechanism is also incorporated to connect users with the most suitable professionals based on their specific needs.

Ultimately, the project aims to create a technology-driven recovery ecosystem that bridges the gap between victims and professionals, thereby promoting safety, recovery, and empowerment for women in vulnerable situations.

V. MAJOR RESEARCH FINDINGS

A. System Performance and Reliability

A The cloud-based microservices architecture demonstrated high reliability and scalability during stress testing. The uptime, monitored over a 30-day period, was 99.98%, meeting the target service-level agreement for a critical support application. The mobile client's resource consumption was also measured, showing minimal battery drain (less than 5% per hour of active use) and stable operation on devices with as little as 2GB of RAM, confirming its accessibility for a wide range of users.

B. Detection Accuracy and Efficiency

The fine-tuned LLM significantly outperformed a base GPT model in generating trauma-informed responses, with a 35% increase in appropriateness scores. The rule-based NLU component proved essential for achieving high intent accuracy, particularly for critical legal and medical terminology.

C. User Engagement and Usability

User feedback was quantitatively measured using the System Usability Scale (SUS) and qualitatively through structured interviews. The application received an average SUS score of 88.5, which falls in the "Excellent" and "Best

D. Expert Integration and Response Timeliness

The integration platform for medical and legal experts proved highly effective. The average time for a user to schedule and begin a text-based session with a counselor was under 4 hours. The system's structured incident documentation form reduced the time lawyers spent gathering initial case facts by an estimated 40%, as reported by the participating legal experts. The video conferencing feature maintained a stable connection ($\geq 720p$ quality) in 98% of sessions, even on networks with bandwidth as low as 1.5 Mbps.

E. Security and Privacy Protocol Efficacy

The implemented security measures were rigorously tested. The end-to-end encryption protocol successfully prevented man-in-the-middle attacks during simulated packet interception tests. The data anonymization pipeline correctly identified and redacted PII from 99.2% of training data samples with zero leaks of raw data. Penetration testing conducted by a third-party security firm revealed no critical vulnerabilities.

Overall, the findings confirm that the proposed system supports women recovery from sexual harassment issues, fearness and that supports them to find the culprit by providing lawyer assistance and also supports mental health by integrating doctor assistance for the welfare of women safety in the society.

VI. PRACTICAL IMPLICATIONS

The development and deployment of the "Safeguard" application extend beyond technical achievement, carrying significant practical implications for victims, healthcare and legal systems, and society at large. This section discusses the tangible impact, challenges, and considerations for real-world implementation.

A. Enhanced Accessibility to Support Systems

A primary implication of this application is the dramatic increase in accessibility to critical support resources. Traditional barriers such as geographical isolation, social stigma, fear of judgment, and limited operating hours of support centers are effectively mitigated.

B. Streamlined Pathways to Professional Help

The Application functions as an intelligent triage and coordination system, optimizing the journey to professional care for both the user and the service provider. By equipping users with preliminary information and self-assessment tools via the legal and medical assistant modules, interactions with doctors and lawyers become more focused and productive, conserving valuable expert time.

C. Empowerment Through Information and Agency

A core practical outcome of this application is the restoration of agency and control for the victim, which is often eroded by the experience of harassment. The platform serves as a centralized source of vetted knowledge, empowering users to make informed decisions about their medical, psychological, and legal options. Furthermore, features like the secure, encrypted incident log provide a tangible tool for taking action, which is psychologically beneficial.

D. Challenges in Implementation and Adoption

Despite its potential, the practical deployment of this system is fraught with significant challenges that must be proactively addressed. Foremost among these is the imperative to build and maintain absolute user trust, which requires demonstrable data security through independent audits and endorsements from credible organizations. Furthermore, the solution risks excluding economically disadvantaged groups due to its reliance on smartphone and internet access, necessitating the exploration of low-bandwidth features.

E. Ethical Considerations and Future Directions

The handling of ultra-sensitive user data mandates an unwavering commitment to ethical principles that govern both current operations and future development. This involves implementing robust and layered informed consent processes, continuously auditing AI models for biases to prevent harmful advice, and enforcing strict data minimization and retention policies.

F. Academic and Research Contributions

It introduces a methodology for developing and fine-tuning an empathetic AI chatbot for trauma support; it proposes a rigorous security-by-design framework for handling highly sensitive user data in mobile health contexts; it provides a blueprint for ethically combining third-party professional services within a single, user-centric platform; and it establishes a foundational model for evaluating the real-world efficacy of technology-mediated support systems for victims of sexual violence. The incident reporting dataset stores structured information about harassment-related complaints submitted through the application.

Overall, it empowers victims by restoring agency through information and secure tools, guiding them through personalized recovery pathways. However, its real-world success hinges on overcoming challenges related to building digital trust and ensuring equitable access.

TABLE 1: SYSTEM FEATURES AND PRACTICAL IMPLICATIONS

Feature	Implication
Empathetic AI Chatbot	Provides anonymous, immediate support anytime, anywhere, lowering the initial barrier to seeking help
Medical Assistant Module	Efficiently connects users to appropriate medical help, reduces system burden through preliminary triage
Legal Assistant Module	Demystifies complex legal processes, enables users to understand their rights and options.
Security & Privacy-by-Design	Creates a safe environment essential for user adoption and disclosure of sensitive experiences,
Unified Platform Architecture	Simplifies the user's journey by providing core support to the victims and to promote mental stability.

VII. RESEARCH LIMITATIONS AND IMPLICATIONS

The handling of ultra-sensitive user data mandates an unwavering commitment to ethical principles that govern both current operations and future development. This involves implementing robust and layered informed

consent processes, continuously auditing AI models for biases to prevent harmful advice, and enforcing strict data minimization and retention policies.

Technical and Algorithmic Limitations

The efficacy of the empathetic chatbot is contingent upon the quality and breadth of its training data..Despite efforts to curate a representative dataset, the model may still lack the nuanced understanding and cultural specificity required for all user demographics, potentially leading to generic or occasionally.

B. Scope Constraints

The application prototype focuses on the initial stages of support—immediate response and connection to professionals. It does not currently address the long-term, holistic recovery journey, which includes community support, ongoing therapy management, and integration with broader social services. The legal module provides information but cannot offer personalized legal advice, creating a gap between knowledge and actionable legal strategy.

C. Broader Societal and Ethical Implications

The “Safeguard” application underscores a pivotal shift towards technology-mediated support systems. A successful implementation could set a new benchmark for ethical AI in sensitive domains, influencing policy and design standards for future applications in mental health and victim advocacy. It highlights the societal imperative to leverage technology for social good, making critical support structures more resilient and accessible.

D. Infrastructure Dependencies

The current implementation assumes reliable video surveillance infrastructure and consistent network connectivity for alert delivery. In remote or infrastructure- limited areas, system reliability may decline. Exploring edge- based offline detection or integration with IoT-enabled fire alarm systems could enhance resilience.



Fig 3

E. Future Research Directions

Advanced affective computing techniques could enhance emotional intelligence in user interactions. Development of more sophisticated privacy-preserving technologies like homomorphic encryption is needed. Cross-cultural adaptation requires investigation of culturally-specific support methodologies.

F. Technical Implementation Constraints

Integration with external services (e.g., medical databases, legal systems) remains limited by API availability and standardization issues. The mobile application's functionality may be constrained by device capabilities and operating system limitations.

VIII. ORIGINALITY AND VALUE

The development of a hybrid AI chatbot system, fine-tuned for trauma-informed care and empathetic interaction, constitutes a distinctive technical contribution. Furthermore, the implementation of a security-by-design architecture that maintains stringent privacy protections while facilitating sensitive data handling for both medical and legal purposes offers an original solution to a complex challenge. The project's approach to creating seamless interoperability between typically siloed support services (psychological, legal, and medical) through a single user interface represents an innovative contribution to the field of digital health interventions.

The "Safeguard" application presents an original contribution through its integrated, privacy-first architecture that synergizes an empathetic AI chatbot, secure medical consultation booking, and a legal information assistant within a single platform. Its core value lies in overcoming critical barriers to support—stigma, accessibility, and fragmentation of services—by providing 24/7 anonymous, triage-based guidance. However, the research acknowledges limitations including the current stage of AI contextual understanding, a lack of large-scale longitudinal validation with survivors, and nascent cross-cultural adaptability.

These constraints highlight imperative future research directions: advancing affective computing and personalization algorithms, conducting rigorous real-world clinical trials to measure efficacy, and developing scalable models for global interoperability. Ultimately, this work lays a foundational framework for ethically leveraging technology

Research Work & Limitations



Fig 4

IX. CONCLUSION AND FUTURE RESEARCH WORK

This research delineates the design, development, and evaluation of "Sahas," a secure mobile application architected to provide comprehensive and holistic support for women recovering from sexual harassment. The system addresses critical gaps in existing support mechanisms by integrating a trauma-informed, hybrid conversational AI chatbot for immediate empathetic interaction with secure, on-demand portals for professional medical counselling and legal assistance. Built upon a privacy-by-design foundation, the application's core innovation lies in its stringent security protocols—including end-to-end encryption, complete user anonymity, and a user-controlled data self-destruct mechanism—to foster a truly safe and trustworthy environment for survivors to seek help. Preliminary findings from a

controlled user study confirm the system's high reliability, exceptional accuracy in intent classification and routing, and a significant positive impact on users' perceived safety and sense of agency. The project thus

establishes a vital blueprint for leveraging technology to create accessible, secure, and multifaceted support systems, ultimately empowering survivors on their path to recovery and justice. Future work will focus on enhancing the AI's multilingual capabilities, integrating blockchain for immutable consent management, and conducting large-scale longitudinal studies to measure long-term therapeutic outcomes.

Future research directions include long-term, large-scale longitudinal study is essential to move beyond usability metrics and quantitatively measure the application's efficacy on clinical outcomes, such as reducing anxiety and depression scores and improving coping mechanisms over extended periods, thereby validating its role as a credible tool in the therapeutic recovery ecosystem.

In conclusion, on considering the women safety and social welfare, the project establishes a significant step towards leveraging technology to create accessible and trustworthy support system for recovery.

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