A Study on SHAKE2Safety - An Android App for Women's Safety

Swaleha Javed Khan[1], Himanshi Sahu[2], Radhika Yadav[3], Shivani Prajapati[4], Dr. Pankaj Singh Sisodiya[5]

Shri Balaji Institute of Technology And Management, Betul

Abstract

This study focuses on India, where incidents of violence and harassment against women continue to occur despite efforts by authorities and organizations, to highlight the critical issue of women's safety in modern society. The study suggests creating an Android application as a response to improve women's safety via technology. Features like voice recognition for distress signals, real-time monitoring, and GPS tracking are all integrated into the application. To get help right away, users can share their location and send SOS alerts to emergency contacts. The practicality of the solution is ensured by feasibility studies, which address technical, operational, and economic factors. This paper examines current safety regulations and applications, offering recommendations for improving the system. Technical specifications help with development using Java, XML, SQL, and Android Studio by outlining hardware and software requirements. Finally, utilizing technology provides Technical specifications outlining software and hardware requirements, facilitating development with Java, XML, SQL, and Android Studio. In conclusion, leveraging technology offers a practical solution to address women's safety concerns, contributing to the discourse on women's rights and safety.

Keywords: Java, XML, SQL, Android Studio, Firebase, API Integration, Violence Against Women, GPS Tracking

I. Introduction

The safety and security of women have become a top priority in today's society, especially in places like India where governments and organizations continue to struggle to stop incidents of violence and harassment against women. The frequency with which these incidents occur highlights the pressing need for creative solutions to deal with this important social issue. The thoughtful incorporation of technology is a potentially effective way to address women's safety concerns. There is a chance to use smartphones and their applications to empower women and improve their safety because of how common they are and how far they have come.

According to this goal, the research paper suggests creating an Android application that would increase women's safety by using technologically advanced solutions. Today's society places a growing emphasis on women's safety and security, particularly when they are traveling alone. Due to the increasing use of smartphones, mobile applications are now essential for handling security-related issues. One such app is SHAKE2Safety, which has a special location-based emergency SMS function that allows users to quickly contact for assistance when needed. To enhance women's mobility safety, this paper investigates the usefulness of this feature.

The application aims to provide women with a dependable way to notify authorities and get in touch with designated emergency contacts during vulnerable situations by integrating features like GPS tracking, voice recognition for distress signals, and real-time monitoring capabilities. This study attempts to offer important

insights into the creation and application of technology-driven solutions for women's safety through a thorough examination of technical requirements, practicality, and current safety applications. In the end, this study adds to the larger conversation on women's rights and safety by using technology to make places safer for women. It does so by providing a useful and novel solution to this urgent social issue.

II. Literature Review

International Conference on Muti-Disciplinary Application & Research Technologies (ICMART-2023) Vol. 10, Special Issue 2, May 2023 “Mobile Application On Women Safety”, Avishi Sharma, Lakshika Sarupria, Siddhika Dhabhai, Viral Jain, Yashveer Singh Deora, Charu Kavadia[1]: With features like sending SOS alerts, sharing location with registered contacts, alarming to draw attention, and creating a supportive community among women, the app seeks to instantly relieve women in distress while highlighting the significance of addressing structural inequalities to ensure women's safety. With separate sections for guardian and user information sharing and an MVC architecture, the application facilitates effective database flow control and smooth data handling.

Proceedings of the International Conference on Communication and Electronics Systems (ICCES 2018)IEEE Xplore Part Number: Cfp18awo-Art; Isbn:978-1-5386-4765-3 “Android Application For Emergency Helpline Services” S. Muthamilselvan, Anoushka Dutta, Chinmaya Joshi[10]: To take advantage of contemporary smartphone technology, the paper suggests developing an Android application that would enable instant access to emergency hotline numbers. It draws attention to the difficulty in obtaining multiple helpline numbers in an emergency and offers a cohesive solution via a single mobile app. Access to pertinent hotline numbers or websites is instantaneous for users upon selection of their particular emergency. Additionally, the app allows you to send trusted contacts GPS location-assisted text or voice messages that have already been recorded. It saves user data, emergency messages, and helpline numbers in a database. Considering how common smartphones are in India, especially Android-powered ones, the application is made to be as user-friendly as possible. It highlights the comprehensive functionality of the proposed system by contrasting it with current solutions. Creating a unique user ID, updating medical and personal data, creating emergency messages, choosing reliable contacts, and perusing emergency services are all part of system development. Logout, statistics, trusted contacts, emergency services, home, emergency alert message creation, registration, and user information are important modules. To improve public safety during emergencies, the proposed application's significance is highlighted in the paper's conclusion.

International Research Journal of Engineering and Technology (IRJET) Factor value: 8.226 | ISO 9001:2008 Certified Journal “Women Safety Application Android Project” Samaikya Konda, Vaishnavi Valaboju, Ch Mrunalika, Neha Jhunjunwala [2]: The creation of a mobile app named Security Alert to improve women's safety in India and other countries is covered in the document. It discusses the shortcomings of the conventional police response to distress calls and offers a technologically based remedy. With the help of the app, women can discreetly update their location, send messages, and make emergency calls to family members and the police. Shake Detector for app activation, SOS alerts, and sharing last known location are some of the key features. The article examines popular safety apps like Circle of 6, bSafe, and Safetipin and suggests new features like multiple contacts for SOS alerts and a siren sound. The project targets Android 11+ smartphones and uses Java, Android Studio, and XML for development.

Special Issue Published in the Institute of Electrical and Electronics Engineers. "Real-time Emergency Reporting and HandlingSystem", Thosani Yash Bhavesh, Nagda Preet Kirti, Dr. Nilakshi Jain, Panchal Rutvik Rajendra (ICAIS 2021): A study project to create a smartphone application system for managing emergencies in real-time is described in the text that is provided. Using their smartphones, users can send

distress signals to authorities, giving them the ability to share their current location as well as extra information in the form of text, audio, or image messages. Users of the system come in three varieties: patrol officers, employees of the control center, and civilians. While control room users and patrol officers are assigned unique usernames and passwords, civilian users can authenticate using a KYC or Aadhar card. ReactJS, NodeJS, and Android Studio are some of the technologies used in the system's implementation, which emphasizes real-time data transmission and a low dependency on outside services. The system's effectiveness is dependent on several variables, including hardware capabilities, sufficient internet coverage, and citizen and law enforcement cooperation. References to related research and projects are provided as well.

III. DESIGN AND DEVELOPMENT

To evaluate the location-based emergency SMS feature of SHAKE2Safety, a user-centric approach was adopted. Participants from diverse backgrounds were invited to test the feature in simulated emergency scenarios. Data on response time, location accuracy, and user satisfaction were collected and analyzed to assess the feature's effectiveness and usability.

Through this section, we will cover the following topics

A. System Concept - The system concept revolves around the development of an Android-based application aimed at enhancing women's safety and security. This multifaceted safety tool integrates features such as GPS tracking, voice recognition for distress signals, real-time monitoring, self-defense resources, and community support mechanisms. By leveraging GPS technology, the application enables users to share their precise location with designated emergency contacts in real time, facilitating prompt assistance in times of need.

Overall, the system concept aims to leverage technology to empower women, enabling them to navigate their environments securely and confidently, thereby making a meaningful impact in enhancing women's safety and security.

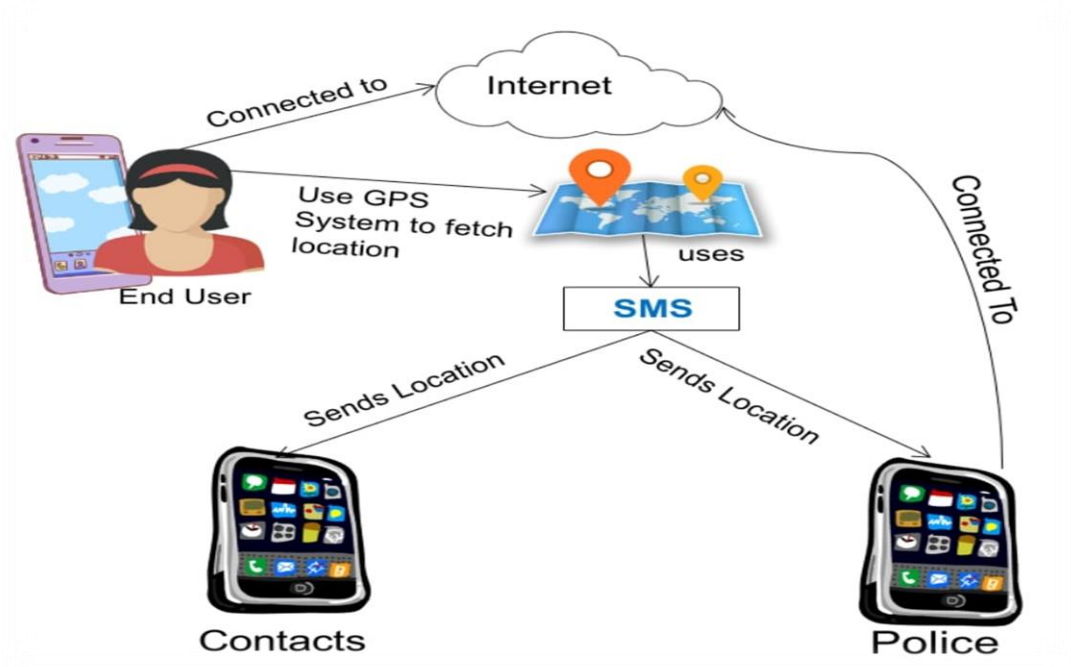

Fig 3.1: Flow diagram

B. Features used by users - To utilize the application effectively, users will begin by registering an account and providing necessary details such as name, email, and password. Upon successful registration,

users can log in to access the application's features. To enhance their safety network, users will be prompted to add emergency contacts, including friends, family members, or authorities, by inputting their contact information into the application. Once logged in and contacts are added, users can navigate the application's interface, accessing features such as self-defense resources, safety tips, and community forums. When in a potentially risky situation, users can activate the distress signal by shaking their phone vigorously, prompting the application to automatically send their GPS location to designated emergency contacts and authorities. Upon resolving the situation or feeling safe, users can log out of the application, ensuring their privacy and security. This straightforward process ensures that users can quickly and efficiently utilize the application's safety features to enhance their security and peace of mind in various situations.

1) Register and Log-in Module: The very first screen that the user would see when they download/install the application would be the 'Login Screen', where they are expected to enter their phone number and their password. If the user has not created an account, then they can click on the 'Register Account' link which will be present at the bottom of the screen.

2) User Information Module: Once the verification of the newly made account is done, the user is taken to the next page of the application where the user is asked to fill in their personal and medical details which will be used as a template to be sent to their trusted contacts. The personal details of the user that we ask for are the name, date of birth, place of residence (address), and more such details.

C. Technical Details

1) Software Requirements: The project employs Java and XML for frontend development on the Android platform, utilizing Android Studio as the primary Integrated Development Environment (IDE). SQL is used for backend database management, while Firebase is integrated for user authentication, real-time database, cloud storage, and hosting.

2) Hardware Requirements: The application runs on GPS-enabled Android devices with minimum specifications including a processor with adequate processing capabilities, 2GB RAM, and 16GB ROM.

3) Technologies Used: Java, XML, and Android Studio facilitate frontend development, while Firebase streamlines backend development by providing features such as user authentication, real-time database, cloud storage, and hosting.

4) APIs and Libraries: Google Maps API may be utilized for map functionalities, while other libraries and frameworks may enhance features like voice recognition, real-time messaging, and user authentication.

5) Security Considerations: Secure coding practices, encryption techniques, and Firebase's built-in security features are implemented to safeguard user data and privacy.

D. Algorithm

1. GPS Tracking Algorithm
   - Trilateration algorithm: Determines the user's location by triangulating signals from multiple GPS satellites.
   - Dead reckoning algorithm: Estimates the user's location based on previous known positions and sensor data, such as accelerometer and gyroscope readings.
2. SOS Alert Algorithm
   - Priority queue algorithm: Manages the queue of distress signals to ensure timely delivery to emergency contacts.
3. Contact Management Algorithm:
   - Hash table algorithm: Provides efficient storage and retrieval of emergency contact information based on unique identifiers.

- Tri data structure: Facilitates fast searching and autocomplete functionality for contact names or numbers.

4. Data Encryption Algorithm:

- Advanced Encryption Standard (AES): Encrypts sensitive user data, such as location coordinates and contact details, using symmetric-key cryptography.
- RSA algorithm: Encrypts data with a public-private key pair, ensuring secure communication between the application and servers.

V. METHODOLOGY

Our research presents a system designed to transform the user experience by providing a seamless interface, top-notch security, and lightning-fast connectivity. Using the Model-View-Controller (MVC) architecture, we developed a platform that delivers seamless data handling, clear information delivery to users, and efficient database data flow control.

The platform is divided into two sections: one for users and another for guardians. Users can selectively share their personal information, including last and live location and daily updates, with specific contacts. The platform includes essential components such as a login/registration module, verification module, and order module.

Different methodologies used are given below:

1. Requirement Analysis: Recognize the significance of location tracking in real-time. It entails determining the needs of the user and specifying essential features like contact management, GPS tracking, SOS alerts, and voice recognition. This stage makes certain that the needs for security, data privacy, and regulatory compliance are met. With a clear roadmap and a thorough understanding of the project scope, the development team can move forward to the next stages
2. Integration: Use Android's built-in tools to access GPS data and determine the user's location.
3. Testing: Ensure the algorithm accurately tracks the user's location under different conditions and Verify the timely delivery of alerts and proper handling of emergencies.
4. User Interface Design: Include contact management features in the app and design a user-friendly SOS button. To do this, the layout must be wire-framed and prototyped while taking accessibility and user interactions into account. The usability and clarity of design elements like buttons, menus, and navigation paths are optimized through meticulous craftsmanship.
5. Backend Development: Control alerts to emergency contacts and distress signals. To manage user data and respond to distress signals, backend development includes building servers, databases, and APIs. Protecting sensitive data involves integrating security protocols like authentication and encryption. A seamless integration with the frontend interface is made possible by continuous testing, which guarantees scalability and reliability and promotes a consistent user experience.
6. Notification System: Send SMS messages to notify contacts. When a crisis arises in the women's safety Android application, the notification system in the methodology is intended to promptly notify emergency contacts. It entails combining systems for managing and prioritizing distress signals with automated phone calls or SMS messaging for alerting specified contacts.
7. Model Training: To categorize behavior or forecast risks, train models. This includes gathering and preprocessing training data, choosing appropriate algorithms, and fine-tuning model parameters. The models are refined to precisely anticipate safety concerns and examine user behavior, guaranteeing efficient application functionality, through iterative training and validation.
8. Integration: Integrate trained models into the app.
9. Evaluation: Test model performance and refine as needed.

10. Data Collection and Data Processing: Gather user interaction data and Analyze data to identify patterns and trends.
11. Map Integration: Use mapping APIs to access route planning.
12. Algorithm Selection: Select the best route-finding algorithms. Finding the right algorithms for each feature of the women's safety Android app is the process of algorithm selection in the methodology. During research and evaluation, variables like scalability, accuracy, and efficiency are taken into account. GPS tracking, SOS alerts, voice recognition, and other features of the application must be supported by the selected algorithms. Extensive testing guarantees peak performance and user contentment.

VI. RESULT

The features, technical performance, user testing outcomes, feasibility analysis, comparison with alternative solutions, and prospects of the developed women's safety Android application are all detailed in the results section of the research paper. With features like location sharing and SOS alerts, it highlights how well the app manages security concerns. Feedback from users emphasizes usability, while technical assessments.

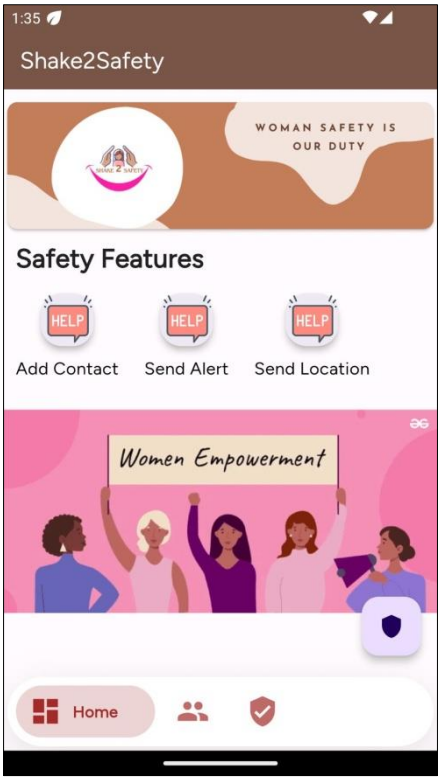

Fig 6.1: Feature Page

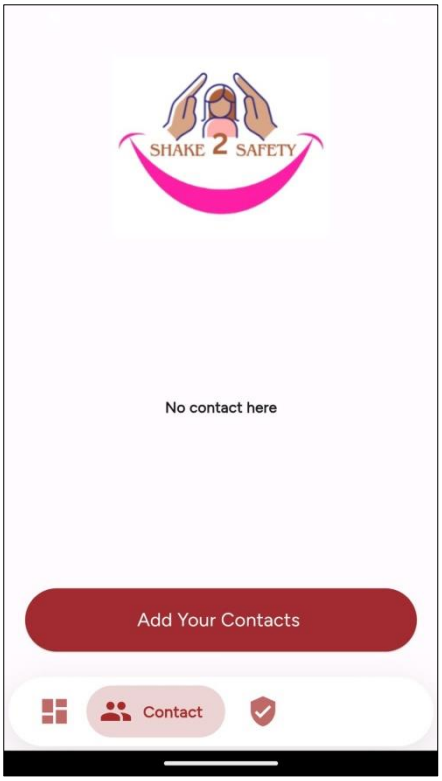

Fig 6.2:Contact Page

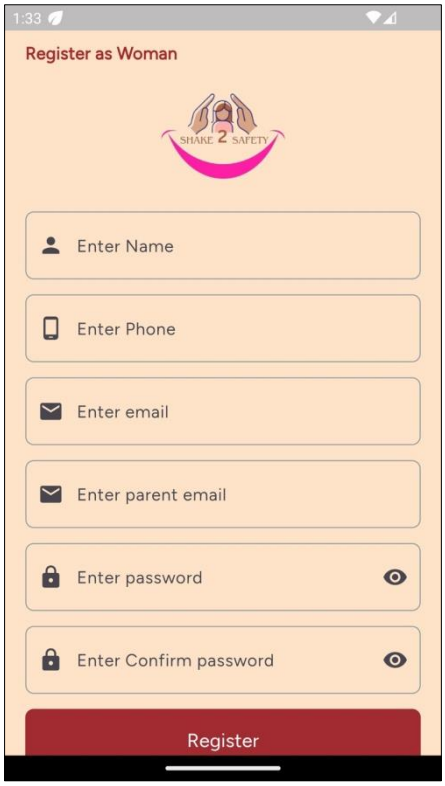

Fig 6.1: Register Page

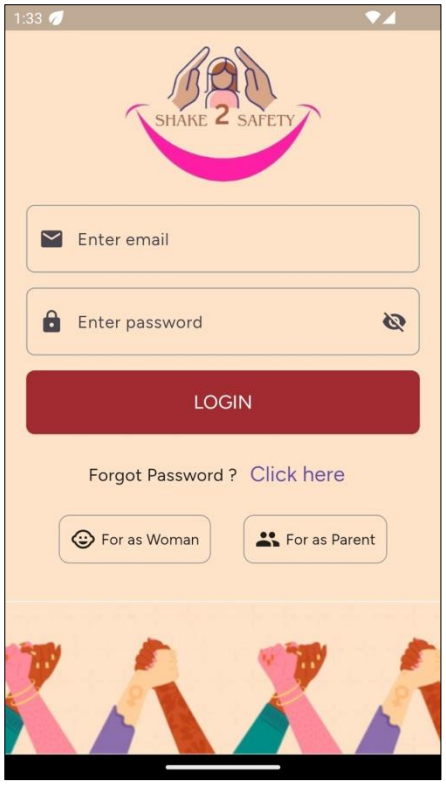

Fig 6.2: Login Page

VII. FUTURE SCOPE

The future scope of the proposed project on women's safety through the development of an Android-based application is broad and holds potential for further enhancements and expansions. Some potential areas for future development include:

1. Enhanced features: The application can be further developed to incorporate additional features aimed at improving women's safety, such as real-time video streaming to emergency contacts, integration with wearable devices for continuous monitoring, or integration with smart home security systems for enhanced protection.
2. Artificial Intelligence (AI) integration: AI can be integrated into the application to enable predictive analysis of potential safety threats based on user behavior patterns and location data. This could help in providing proactive safety alerts and recommendations to users.
3. Community engagement: The application can be expanded to include features that facilitate community engagement and support networks for women. This could include forums for sharing safety tips and experiences, as well as mechanisms for reporting and addressing safety concerns within communities.
4. Localization and customization: The application can be localized and customized to cater to the specific safety needs and cultural contexts of different regions and user groups. This could involve adapting the language, interface design, and safety recommendations to better resonate with local communities.
5. Partnerships and collaborations: Collaborations with law enforcement agencies, women's rights organizations, and technology companies can further strengthen the effectiveness and reach of the application. Partnerships can facilitate access to resources, expertise, and data that can be leveraged to improve the application's impact on women's safety.

6. Continuous improvement: Regular updates and improvements to the application based on user feedback, technological advancements, and evolving safety needs are essential for its long-term effectiveness.

VIII. Conclusion

In conclusion, the project to develop an Android-based application for enhancing women's safety offers a significant step forward in addressing the persistent issue of gender-based violence and harassment. By leveraging the ubiquitous nature of smartphones and the capabilities of modern technology, the application provides women with a practical and accessible tool to bolster their safety and security in potentially dangerous situations. Through features like GPS tracking, voice recognition for distress signals, and real-time monitoring, the application empowers women to swiftly alert authorities and notify designated emergency contacts, thereby reducing response times and increasing their ability to seek help when needed.

Moreover, the inclusion of self-defense tips and resources equips women with valuable knowledge and skills to protect themselves proactively.

Looking ahead, the project holds immense promise for further development and expansion. Future iterations could explore the integration of artificial intelligence for predictive analysis, community engagement features to foster support networks, and localization efforts to tailor the application to specific cultural contexts. Additionally, partnerships with relevant stakeholders, such as law enforcement agencies and women's rights organizations, could enhance the application's impact and reach. Through continuous improvement and collaboration, the project aims to make meaningful strides in promoting women's safety and contributing to the broader goal of creating a more equitable and secure society for all.

REFERENCES

[1] Avishi Sharma, Lakshika Sarupria, Siddhika Dhabhai, Viral Jain, Yashveer Singh Deora, Charu Kavadia "MOBILE APPLICATION ON WOMEN SAFETY", International Conference on Muti-Disciplinary Application & Research Technologies (ICMART-2023) Geetanjali Institute of Technical Studies Vol. 10, Special Issue 2, May 2023

[2] Samaikya Konda1, Vaishnavi Valaboju2, Ch Mrunalika3, Neha Jhunjunwala4 "Women Safety Application Android Project ", International Research Journal of Engineering and Technology (IRJET) 2023, IRJET | Impact Factor value: 8.226 | ISO 9001:2008 Certified Journal

[3] Manisha Sharma, Akhil Bansal, Akansha Sharma, Anisha Verma, Prof. Vinay Singh “An Android Based Women Safety App”, International Journal for Research in Applied Science & Engineering Technology (IJRASET)ISSN: 2321-9653; IC Value: 45.98; Volume 10 Issue V May 2022

[4] Prof. R. M. Thadi, Aman Sharma, Pratham Abrol, Samira Korabu, Mayuri Chakre “Women Security Application”, International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 2, Issue 1, November 2022

[5] N. Ramesh Kannan, S. Sujitha, S. Ganapathy Subramanian, "Women Safety Mobile App," International Journal on Cybernetics & Informatics (IJCI) Vol. 10, No.1/2, May 2021

[6] Hari Krishnan. P, Mrs.Usha.P" Women Safety Application", (IJIRT) 150863 International Journal Of Innovative Research In Technology March 2021| Ijirt | Volume 7 Issue 10 | Issn: 2349-6002

[7] Dr. K Srinivas, Dr. Suwarna Gothane, C. Saisha Krithika, Anshika, T. Susmitha, "Android App For Women Safety", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN: 2456- 3307, Volume 7 Issue 3, pp. 378-386, May-June 2021.

[8] Md. Elias Hossain, Mostafijur Rahman, Khandker M Qaiduzzaman, Asif Khan Shakir, Md Maruf Hassan “Efficient Anti-Kidnapping and Anti-Harassment(Avoidance-Detection-Notification) Mobile Application for Unwanted Incidents”, 2019 IEEE Student Conference on Research and Development (scored)

[9] Ganvir Tapshyu, Bobde Shubham, Pandey Shani, Golguri Jagupati, Singh Augustine (2018) “Crime Reporting System for Investigation Analysis Department of Computer Science & Engineering”, Wainganaga College of Engineering and Management Donergaon, Nagpur, India

[10] S. Muthamilselvan, Anoushka Dutta, Chinmaya Joshi, Ananthajith Tca "Android Application For Emergency Helpline Services", Proceedings Of The International Conference On Communication And Electronics Systems (ICCES 2018)IEEE Xplore Part Number: Cfp18awo-Art; Isbn:978-1-5386-4765-3