HER WATCH

A Report

Submitted in partial fulfilment of the Requirements for the completion

Of

THEME BASED PROJECT

BACHELOR OF ENGINEERING
IN
INFORMATION TECHNOLOGY
By

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Under the guidance of
Ms.DRL Prasanna, Assistant Professor

Department of Information Technology
Vasavi College of Engineering (Autonomous)
ACCREDITED BY NAAC WITH 'A++' GRADE.
(Affiliated to Osmania University and Approved by AICTE)
Ibrahim Bagh, Hyderabad-31

2025

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DECLARATION BY CANDIDATES

We, **AKSHAY VARDHAN,P MAHARSHI REVANTH,R VINOOTHNA,** bearing hall ticket number, **1602-22-737-067,1602-22-737-087,1602-22-727-128,** hereby declare that the project report entitled **"HER WATCH"** under the guidance of Ms.DRL Prasanna, Assistant Professor, Department of Information Technology, Vasavi College of Engineering, Hyderabad, is submitted in partial fulfillment of the requirement for the completion of Theme-based project , VI semester, Bachelor of Engineering in Information Technology.

This is a record of bonafide work carried out by us and the results embodied in this project report have not been submitted to any other institutes.

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BONAFIDE CERTIFICATE

This is to certify that the project entitled "HER WATCH" being submitted by **AKSHAY VARDHAN,P.MAHARSHI REVANTH,R.VINOOTHNA,** bearing **1602-22-737-067,1602-22-737-087,1602-22-727-128,** in partial fulfillment of the requirements for the completion of Theme-based project of Bachelor of Engineering in Information Technology is a record of bonafide work carried out by them under my guidance.

Internal Guide Name **Designation**	**External Examiner**	**Dr. K. Ram Mohan Rao** **Professor, HOD IT**

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ABSTRACT

Her Watch is an advanced real-time surveillance and analytics system designed to enhance women's safety in urban areas by addressing rising crime rates through AI and computer vision, offering functionalities like gender-classified person detection, real-time gender distribution analysis, lone-woman detection at night, identification of women surrounded by groups of men, SOS gesture recognition, and hotspot mapping based on historical alerts. By continuously monitoring public spaces and enabling early threat detection, the system empowers law enforcement to respond swiftly, prevent incidents, and strategically deploy resources, fostering safer environments for women and advancing the development of smarter, crime-resilient cities.

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1.INTRODUCTION

1.1 Overview

Her Watch is a smart safety system designed to protect women in public places using AI, computer vision, and real-time video monitoring. It helps prevent crimes by watching for threats and sending instant alerts to authorities.The system can detect people and identify their gender, count how many men and women are in an area, and recognize risky situations—like a woman alone at night, being surrounded by men, or making SOS gestures. It also tracks unsafe areas over time using past data.By giving early warnings and useful safety insights, Her Watch supports faster police response and better city planning. It's a modern step toward making cities safer and more secure for women.

1.2 Problem Statement

The growing concern for the safety of women and the increase in crimes against women in various cities, highlight the need for advanced surveillance and analytical solutions to protect women from various possible threats. We need a promising approach to address these issues through real-time threat detection software. Detailed Description: By leveraging advanced analytics through real-time monitoring, Women Safety Analytics should create safer environments for women and assist law enforcement in effectively addressing and preventing crimes against women. The proactive approach of detecting anomalies and generating alerts can play a crucial role in enhancing public safety and fostering a secure atmosphere for women. Women safety analytics software should continuously monitor the scene to count the number of men and women present, offering insights into gender distribution in specific locations and times. It should identify unusual patterns, such as a lone woman at night, unusual gestures and generates alerts to pre-empt potential incidents. Advantages of the system: ? By providing real-time monitoring and alerts, the system helps to create a safer environment for women. ? Early detection enables law enforcement to intervene before situations escalate. ? Continuous analysis provides valuable data to identify hotspots and trends, aiding in strategic planning for city safety Expected Solution: Women safety analytics should include the following functionalities 1. Person detection along with Gender Classification 2. Gender Distribution : Count the number of men and women present in the scene 3. Identifying a Lone Woman at Night time 4. Detection of a Woman Surrounded by Men 5. Recognizing SOS situation through gesture analytics 6. Identifying hotspots where incidents are more likely to occur, based on the past alerts

1.3 Motivation of Theme & Title

Title: Her Watch

Motivation:

With the rise in crimes against women, especially in urban areas, ensuring their safety has become a major concern. Many incidents happen in public spaces where timely help is not available due to a lack of real-time monitoring or awareness. Traditional surveillance systems often fail to detect suspicious patterns or alert authorities in time. This gap inspired the creation of Her Watch—an intelligent, real-time women safety analytics system.

The motivation behind Her Watch is to empower public safety through technology by detecting potential threats before they escalate. By using AI to monitor surroundings, analyze gender presence, recognize SOS gestures, and identify unsafe patterns, the system aims to protect women, prevent incidents, and support law enforcement in responding quickly and efficiently**.**

2. LITERATURE SURVEY

Literature Survey for the Project – Her Watch

The rising concerns over women's safety have driven the development of AI-powered surveillance systems capable of real-time threat detection. Her Watch, a proposed safety analytics platform, integrates key technologies from existing research. Human detection and gender classification using models like YOLO, SSD, VGGNet, and ResNet enable accurate identification in public areas. Crowd and behavior analysis helps detect anomalies such as a lone woman in an isolated space or being surrounded by multiple men. Gesture recognition tools like MediaPipe[1] and OpenPose allow predefined emergency gestures to trigger SOS alerts. Anomaly detection algorithms further enhance surveillance by identifying unusual activities, while hotspot mapping using crime data guides proactive safety measures. Combining these with smart surveillance features—such as real-time video analysis and alerts—Her Watch aims to offer a comprehensive, AI-driven solution for women's safety.

3. EXISTING SYSTEM

Currently, no single system offers all the integrated features of Her Watch, though several partial solutions exist. The Himmat App by Delhi Police enables manual SOS alerts and location sharing but lacks automation. AI-based smart CCTV systems in some smart cities can detect crowds or suspicious activity, yet they don't address women-specific threats like lone woman detection or gesture-based alerts. Mobile apps like bSafe and Raksha offer tracking and emergency contact features but fall short on real-time AI analysis and gesture recognition. Tools like OpenPose and MediaPipe[1] have been used in gesture detection research, though they haven't been widely applied to women's safety. In conclusion, existing solutions cover isolated aspects such as SOS alerts or crowd monitoring, but none combine real-time gender detection, gesture-based SOS, lone woman identification, and hotspot mapping as comprehensively as Her Watch aims to do. Conclusion:

Existing systems offer bits and pieces—like SOS buttons, location sharing, or crowd detection—but none combine all the smart, real-time features that Her Watch aims to provide, such as gender analysis, gesture-based SOS, lone woman detection, and hotspot mapping.

4. PROPOSED SOLUTION

Her Watch is an AI-powered women's safety system designed to enhance public safety through real-time surveillance and proactive threat detection. It features person detection and gender classification to monitor gender distribution in public areas, lone woman detection to identify women in potentially dangerous situations, especially at night, and analysis of crowd behavior to detect if a woman is surrounded by multiple men. The system also incorporates SOS gesture recognition to trigger immediate alerts, gender distribution analysis to identify imbalances that may signal risks, hotspot mapping and trend analysis to pinpoint crime-prone areas using historical data, and real-time alerts to notify emergency contacts or authorities. These features collectively enable proactive threat prevention, improved safety through live monitoring, and data-driven insights for law enforcement and urban planning.

4.1.1 System Design

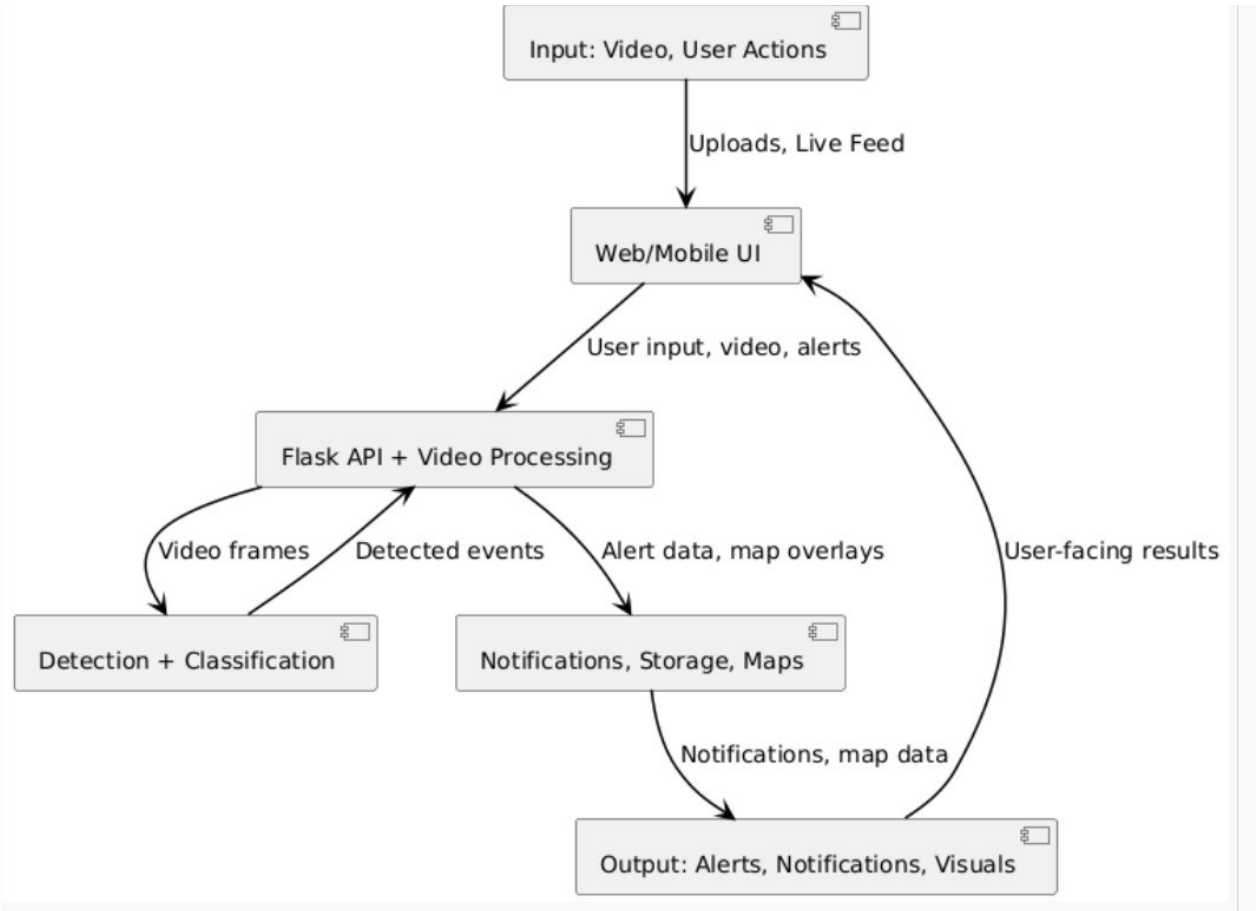

Figure 4.1.1 System design

The fig 4.1.1 *System design* illustrates a system architecture for video input processing and alert generation. It

begins with user actions and video inputs, either through uploads or live feeds, which are handled by a Web/Mobile User Interface (UI). This UI collects user inputs, videos, and alerts, which are then passed to a backend service powered by a Flask API combined with video processing capabilities. The video frames are directed to a detection and classification module, where events are analyzed and identified. The results of these detections are routed back through the Flask API to generate event data and visual overlays.

The detected events and processed alert data are managed by a notifications, storage, and mapping module, which prepares notifications and relevant map information for output. This processed data flows into the final output stage, where users receive alerts, notifications, and visual feedback. Additionally, the Web/Mobile UI also receives user-facing results directly from the Flask API, ensuring real-time interactivity and feedback. This cyclical flow ensures a continuous and dynamic interaction between user inputs, system processing, and output visualization.

4.1.2 Architecture Diagram

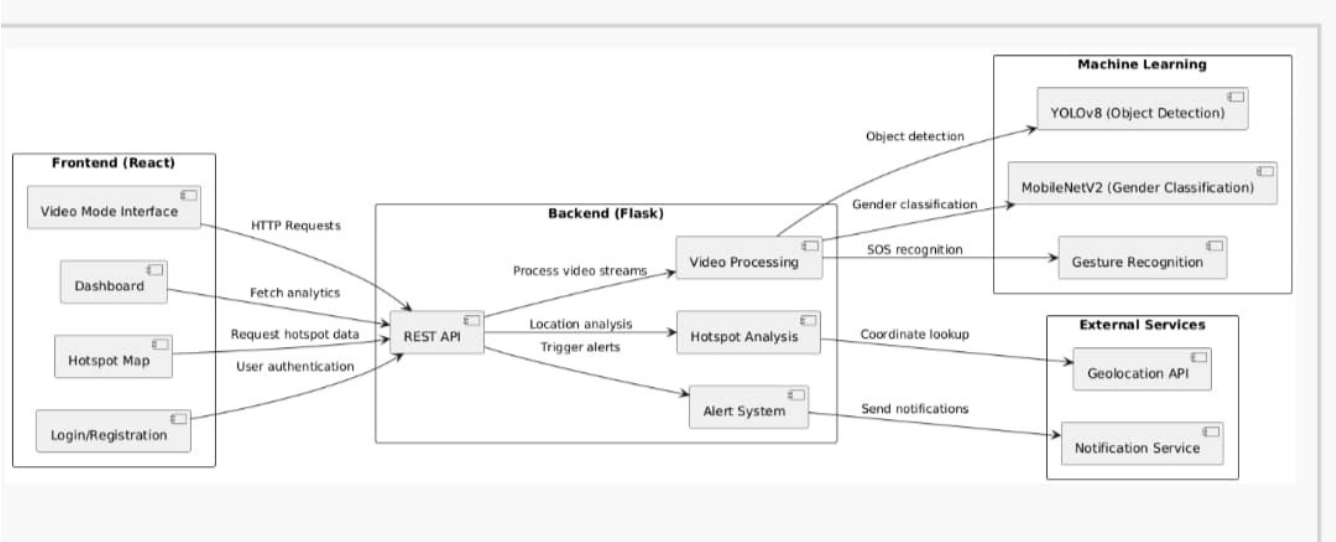

Figure 4.1.2 Architecture Diagram

The fig 4.1.2 architecture diagram outlines a Women Safety Analytics Platform integrating a React.js frontend, a Flask backend, Machine Learning models, and External Services. The frontend includes modules like Video Mode Interface, Dashboard, Hotspot Map, and Login/Registration, which communicate with the backend through HTTP requests. The backend, built with Flask, handles these requests via a REST API and manages core functionalities such as video stream processing, hotspot analysis, and alert generation. Video streams are processed to detect objects, classify gender, and recognize SOS gestures using integrated

machine learning models.

The Machine Learning block includes YOLOv8[2] for object detection, MobileNetV2[3] for gender classification, and a gesture recognition model. The backend also interacts with external services like a Geolocation API for location analysis and a Notification Service to send alerts when needed. This architecture ensures real-time monitoring, location-based hotspot detection[4], and quick alert notifications to improve personal safety and assist in emergency situations effectively

4.1.3 Use-Case Diagram

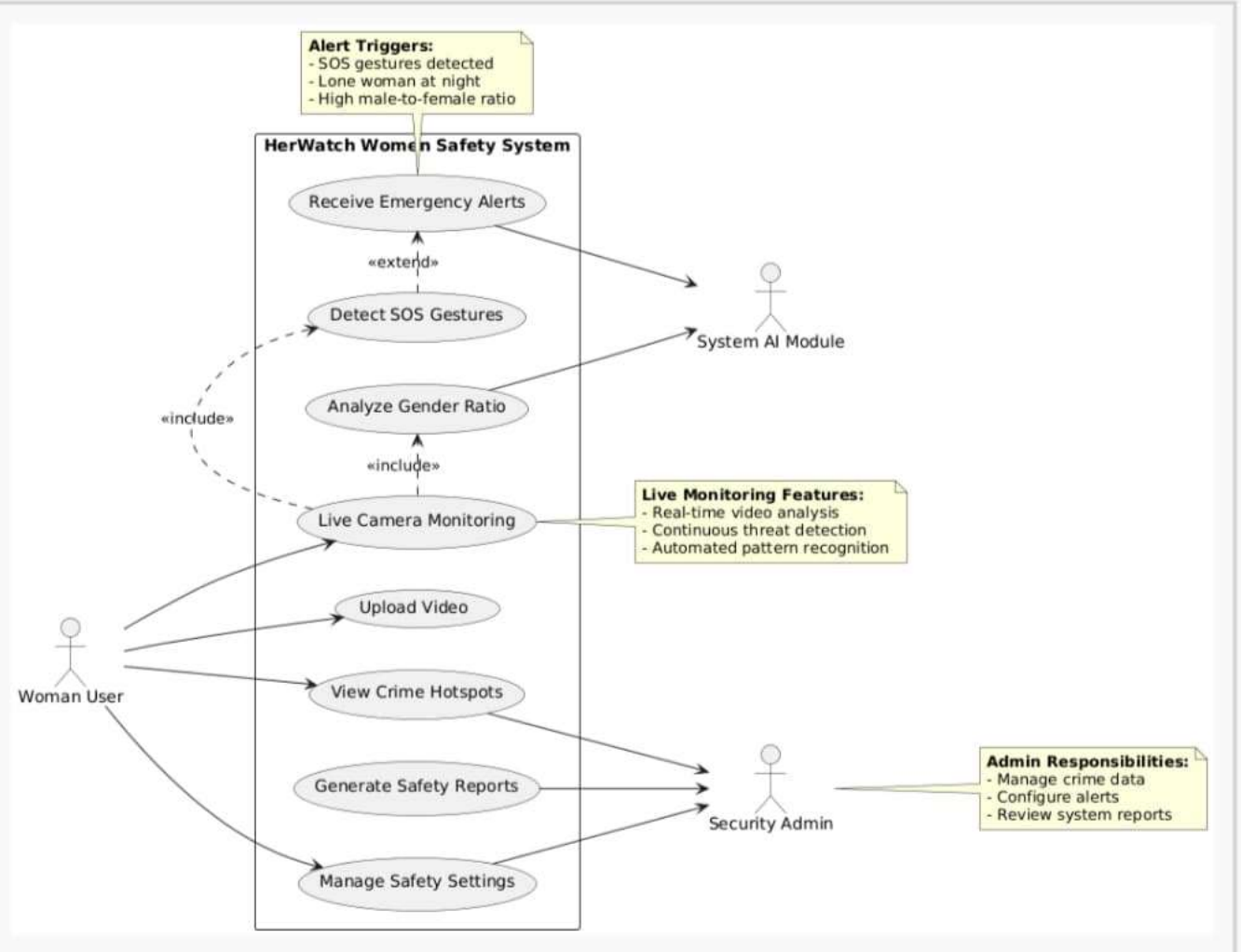

Figure 4.1.3 use-case diagram

4.1.2.1 Use-case descriptions

Her Watch leverages a real-time hybrid detection system combining YOLO and MediaPipe[1] to enhance women's safety through intelligent surveillance and context-aware safety triggers. It detects persons in video feeds using the YOLO model with a confidence threshold above 0.2 and draws bounding boxes around them. Gender is classified by analyzing face regions with MobileNetV2[3], labeling individuals as Male, Female, or Unknown based on a 0.1 confidence threshold. SOS gestures such as waving (2+ repetitions), a single

raised hand, or both hands raised are recognized as emergency signals. Enhanced nighttime detection is activated from 7 PM to 6 AM, optimizing sensitivity for low-light conditions. Alerts are triggered when a lone woman is detected at night, more men than women are present, or an SOS gesture is identified, with a 5-second cooldown between alerts. Security administrators can access detection logs, including event history, gender statistics, and alert timestamps, and configure system settings such as confidence thresholds, cooldown duration, and alert types. The system also includes forced test detections every 30 or 45 frames to ensure continuous functionality.

4.2 Functional Modules

The Her Watch system is built on a modular architecture ensuring scalability and maintainability, with each functional module performing a dedicated role. The Person Detection Module processes live or recorded video using the YOLOv8[2] model to detect humans with a confidence threshold of 0.2, outputting bounding box coordinates. Detected face regions are passed to the Gender Classification Module, which resizes them to 224x224 pixels and uses MobileNetV2[3] to classify gender with a 0.1 confidence threshold. The SOS Gesture Recognition Module leverages MediaPipe[1] Holistic to identify emergency gestures like waving or raised hands, applying cooldowns to prevent repeated alerts. The Nighttime Monitoring Module activates enhanced sensitivity between 7 PM and 6 AM and prioritizes lone-woman detection, outputting a binary day/night flag. Alerts from gender imbalance, SOS gestures, or night-time threats are handled by the Alert System Module, which generates visual/audio alerts, logs events, and enforces a 5-second cooldown. The Admin Dashboard Module provides access to logs, system settings, and test mode (forcing detections every 30/45 frames), while the Data Logging Module persistently stores all event data including timestamps, gender statistics, and alert triggers in CSV/JSON format. The inter-module workflow flows seamlessly, with person detection feeding gender classification, gesture recognition and night mode triggering alerts, the admin dashboard managing all configurations, and data logging capturing outputs from every module.

4.2.1 Screenshots & Pseudocode

1. Initialization

- Load YOLOv8[2] lightweight model for person detection: model = YOLO("yolov8n
- Load MobileNetV2[3] model for gender classification: gende MobileNetV2(weights="imagenet")
- Initialize MediaPipe[1] Holistic for gesture recognition: mp_holistic = mp.solutions.h
- Set last_alert_time = 0

2. For each frame in the video stream:

Step 2.1: Detect Persons

1.Call detect_persons(frame)

- Use YOLO to detect objects in the frame.
- Filter objects by class = "person".
- Store bounding box coordinates of detected persons.

Step 2.2: Classify Gender

2.For each detected person:

- Crop face using bounding box.
- Resize face to 224x224.
- Use MobileNetV2[3] to predict gender and confidence.
- If confidence > 0.1, log and store gender.

Step 2.3: Detect Gestures

3.Call detect_gesture(frame)

- Use MediaPipe[1] Holistic to extract hand and shoulder landmarks.
- If both hands detected:
- Check if waving (≥2 horizontal motions within 1 second) → trigger_alert("WAVINC
- Check if both wrists above shoulders → trigger_alert("BOTH_HANDS_UP"

Step 2.4: Context-Aware Rule Enforcement

4.Calculate counts:

- male_count = count of "male" in genders
- female_count = count of "female" in genders

5.If time is between 7 PM and 6 AM and a lone female is detected:

- Call trigger_alert("LONE_WOMAN_NIGHT")

6.If male_count > female_count + 1:

- Call trigger_alert("GENDER_IMBALANCE")

3.Trigger Alert

- When trigger_alert(type) is called:
- Check cooldown via time_since_last_alert()
- If passed:
  - Play sound, flash red screen, log event
  - Print alert type

4.Helper Functions

- crop_face(): Extract face region from bounding box
- resize(): Resize image to match model input size
- log_gender(), log_event(): Logging functions
- play_sound(), flash_screen_red(): UI feedback

5. EXPERIMENTAL SETUP & IMPLEMENTATION

5.1 System Specifications

Type: Hybrid Al-powered surveillance system with real-time threat detection

Pattern: Client-Server architecture with ML microservices

Deployment:

Frontend: React.js web app (PWA compatible)

Backend: Flask REST API + MediaPipe[1]/YOLO inference servers

Database: SQLite (for detection logs) + CSV-based crime dataset

Hardware Requirements:

Processor (CPU): A minimum of an Intel i5 or AMD Ryzen 5 with at least 4 cores. For better performance, especially during video processing, an Intel i7 or Ryzen 7 is recommended.

RAM: At least 8 GB of RAM is required. For smoother performance, especially when running multiple models like YOLO and MediaPipe[1] together, 16 GB is recommended.

Graphics Card (GPU): A dedicated GPU is optional but highly recommended. Something like an NVIDIA GTX 1050 or higher with CUDA support will accelerate PyTorch and YOLO model inference.

Storage: At least 5 GB of free space to accommodate the models (YOLOv8[2], MobileNet), dependencies, video files, and logs.

Camera/Webcam: Only required if you're using live video input instead of processing pre-recorded videos.

Audio Output: A working speaker system or headphone is needed to play the alert sounds using the winsound module.

Software Requirements:

Operating System: The project uses the winsound module, which is specific to Windows. So, Windows 10 or Windows 11 is required.

Python Version: Python 3.8 or higher.

Libraries/Packages Required:

opencv-python (OpenCV) for video processing and image operations.

torch (PyTorch) for running the gender classification model.

torchvision for accessing pretrained models like MobileNetV2[3].

ultralytics to use the YOLOv8[2] model.

mediapipe[1] for detecting hand gestures (like SOS signals).

numpy for numerical operations and array handling.

winsound (comes built-in with Windows, no installation needed).

Optional Tools for Development:

Anaconda: To manage Python environments easily.

Jupyter Notebook: Helpful for testing code blocks interactively.

FFmpeg: Useful for video format conversion or preprocessing (optional).

NVIDIA GPU Drivers and CUDA Toolkit: If using GPU acceleration with PyTorch.

5.2 Datasets

1. Gender classification uses the UTKFace dataset with over 24,000 facial images labeled as male or female, and images are preprocessed to 224x224 resolution in grayscale.

2. Person detection is based on the COCO dataset containing more than 200,000 images, and it utilizes the pre-trained YOLOv8[2] model for identifying people in video frames.

3. SOS gesture recognition is trained on a combination of a custom dataset and the MSR Action3D dataset, which includes over 5,000 video clips annotated with 33 skeletal keypoints and covers gestures like waving, raised hands, and crossed arms.

4. District-wise crimes committed against Women | Open Government Data (OGD) Platform India

data.gov.in

5. Challenges include gender bias in datasets due to the prevalence of daytime images, missing coordinates in

about 30% of the crime records, and variability in how gestures are performed across individuals.

5.3 Methodology/Algorithm

Chapter 2 Methodology Overview:

1. Problem-Driven Approach: Detects lone women at night, gender imbalance, and SOS gestures.
2. Hybrid AI Pipeline: Combines YOLO and MediaPipe[1] (computer vision), MobileNetV2[3] (deep learning), and rule-based logic (time/context checks).

Chapter 3 Step-by-Step Algorithm:

1. Person Detection
2. Algorithm: YOLOv8[2]
3. Purpose: Fast, real-time human detection
4. Process: Takes video input, detects people per frame, applies 0.2 confidence threshold, and outputs bounding boxes.

6. RESULTS

The "Her Watch" system delivers real-time detection of distress gestures (such as waving and raised hands), accurately identifies lone women in nighttime settings, and visualizes high-risk crime zones on interactive maps. It also automates alerts for gender-imbalanced scenarios, offering robust processing of live video feeds and recordings. The system enhances situational awareness through AI-powered threat detection, provides proactive safety alerts, and offers a user-friendly interface for monitoring and analysis, making it a scalable solution adaptable to both urban and semi-urban environments.

6.1 Home Page

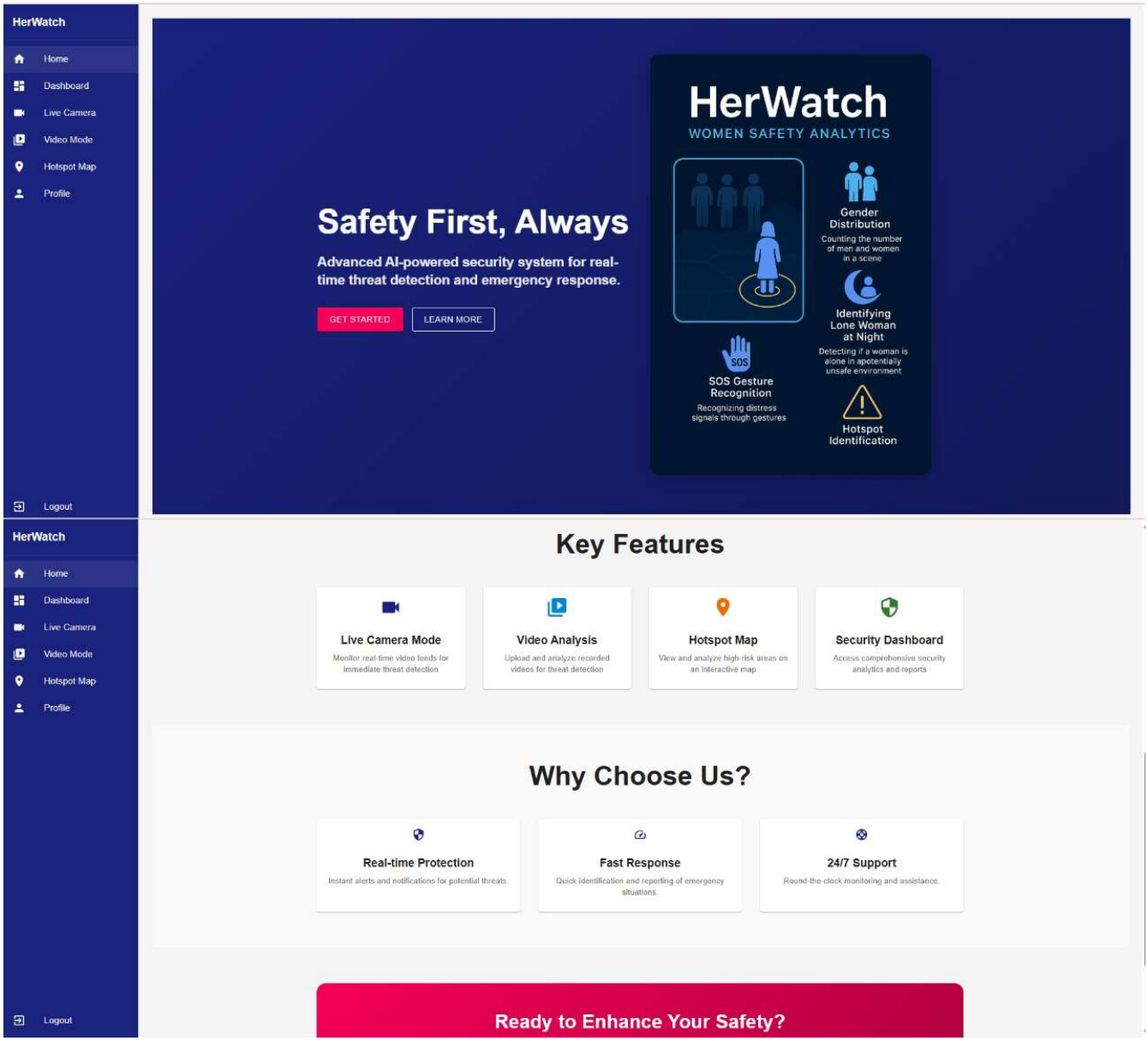

Figure 6.1 Home page

- The Fig 6.1 is the **Home Page** of the HerWatch application.
- It displays **overall safety features and user status**.
- It shows different sections such as: Key Features ,Why Choose Us ,Registration

6.2 HotSpot Map

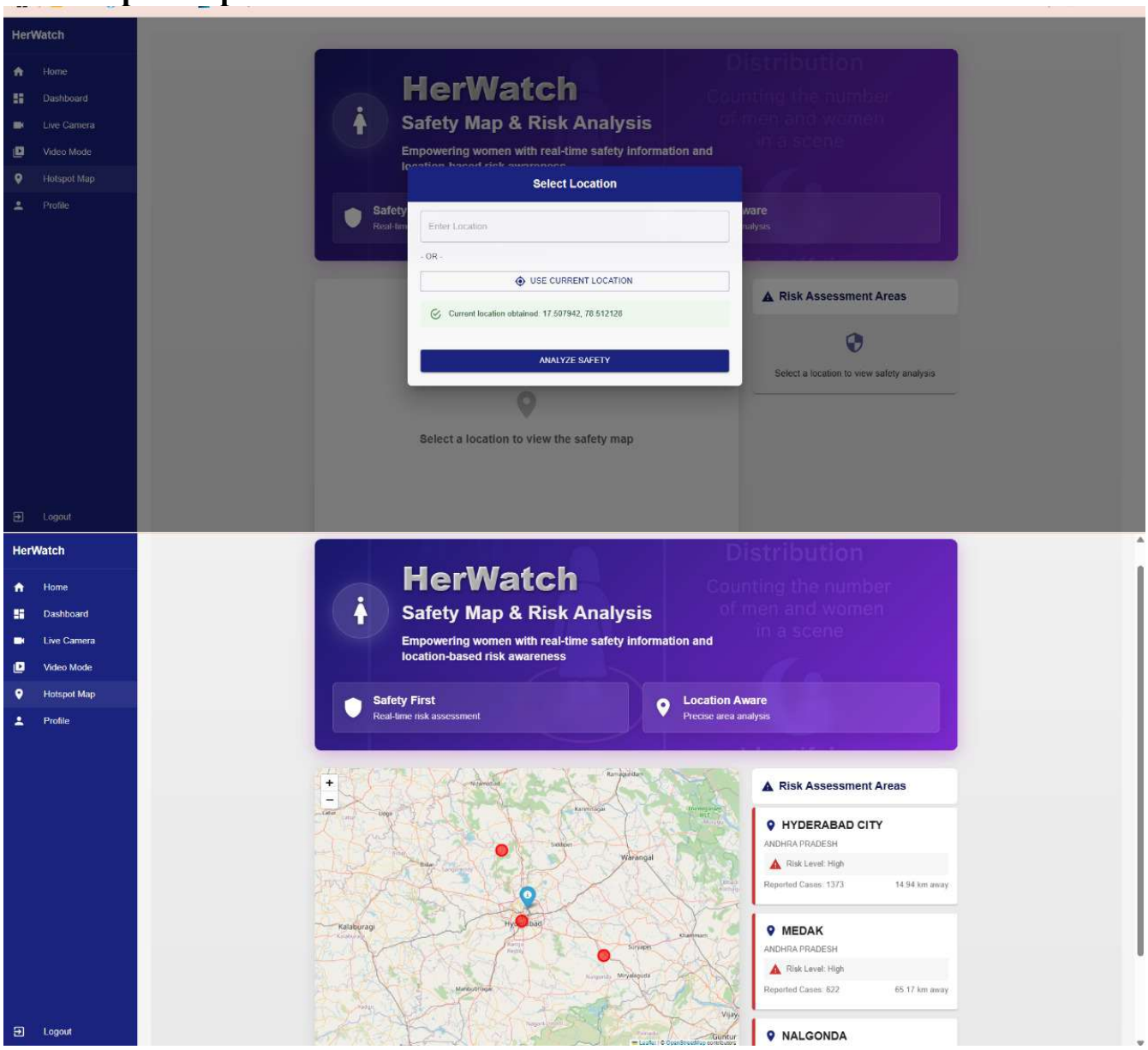

Figure 6.2 HotSpot Map

- This page shows the **Safety Map & Risk Analysis** feature of HerWatch.
- At the top, it has the title "HerWatch" and highlights two important points:

  Safety First: Real-time risk assessment.

  Location Aware: Precise area analysis.

- In the middle, there's an **interactive map** displaying several locations with red markers indicating high-risk areas.
- On the right side, there is a **Risk Assessment Areas** panel listing cities such as:

  Hyderabad City (Risk Level: High, 1373 cases)

  Medak (Risk Level: High, 622 cases)

  Nalgonda (Risk Level: High, 129 cases)

- Each city entry also shows the distance from the user's current location.
- The side navigation bar includes options like Home, Dashboard, Live Camera, Video Mode, Hotspot Map (highlighted), and Profile. There's also a Logout button at the bottom.

7. CONCLUSION & FUTURE SCOPE

The "Her Watch" system combines real-time gesture detection, gender analysis, and crime mapping to create an AI-driven safety solution, effectively identifying threats such as lone women, SOS gestures, and gender imbalances. It provides actionable insights through intuitive visualizations and alerts. Future developments include expanding the gesture library to include panic signs specific to regional or cultural contexts, integrating mobile alerts with local authorities and security networks, implementing predictive crime analytics using historical data, enhancing low-light performance with IR/night vision, developing a lightweight version for edge devices like smartphones and CCTV systems, and addressing dataset biases through diversified data collection.

Future Scope:

The future scope of the "Her Watch" project includes expanding the gesture recognition library to incorporate panic signs relevant to regional and cultural contexts, enhancing its effectiveness across diverse environments. Additionally, the system could integrate mobile alerts with local authorities and security networks, enabling faster responses to threats. Implementing predictive crime analytics based on historical data will help in proactively identifying high-risk areas. To improve performance in low-light conditions, integrating infrared or night vision capabilities is planned. Furthermore, developing a lightweight version for deployment on edge devices like smartphones and CCTV systems will ensure wider accessibility and real-time monitoring. Finally, addressing dataset biases by diversifying data collection will improve the accuracy and reliability of the system across various demographics

8. REFERENCES

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