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STUDENT BRANCH

ImpactThon @KSV

2025 - 2026

Track Number: 03

Track Title: Technology for Social Good & Sustainable Progress

PROBLEM STATEMENT:

The rising elderly population faces challenges in health management, emotional well-being, and timely support, while current fragmented elder-care systems hinder usability. A unified, user-friendly platform is needed to ensure safety, independence, and continuous support.

Video Link:

https://drive.google.com/file/d/1Ye6ZOEtAlA9Fjl3nDeZA9UMmdQpFrrhT/view?usp=drive_link

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Team Name: GREENSYNC

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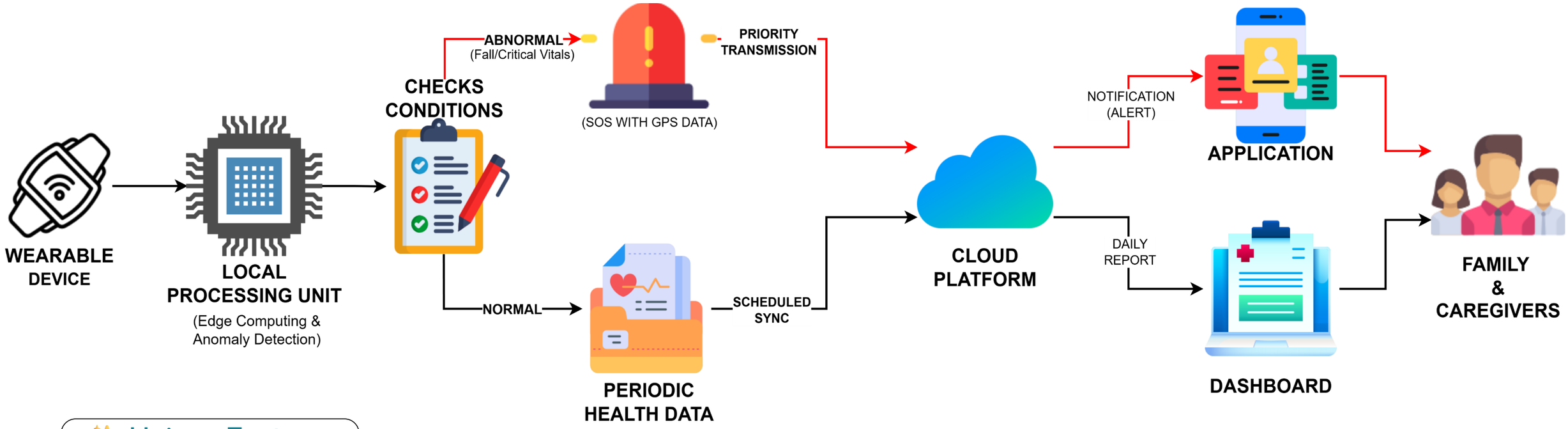
IDEA DETAILS

Proposed Solution: Vrudhseva Work-Flow

- Vrudhseva is a wearable IoT-based system designed to monitor elderly health and activity while providing instant alerts during emergencies.

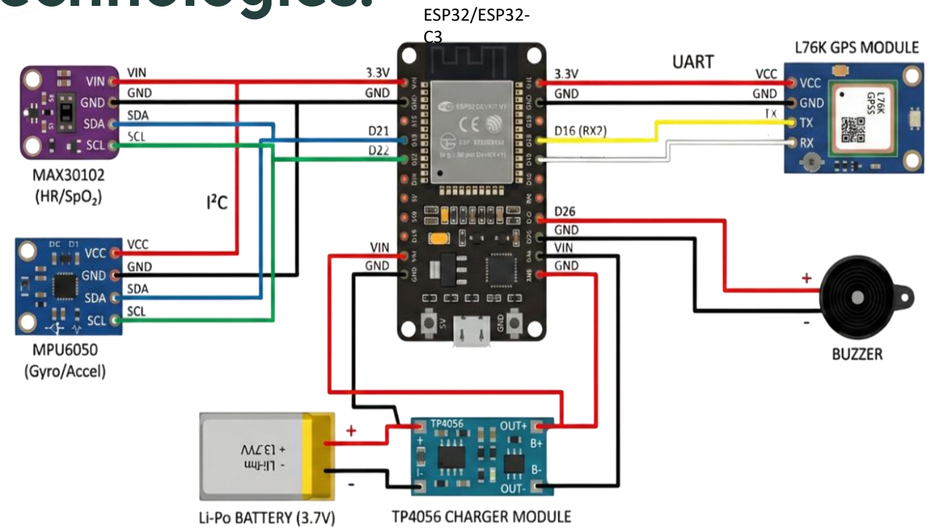


✨ Unique Features

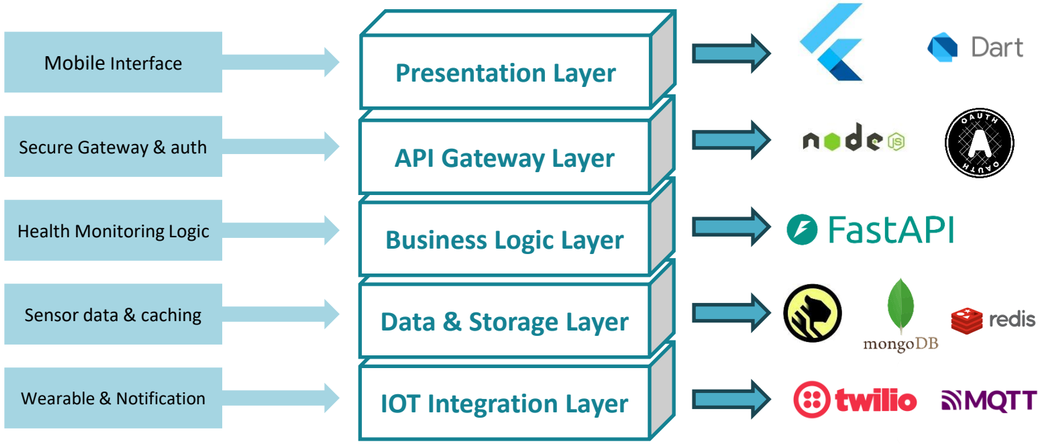
- **Automatic Emergency Detection** (Hands-Free SOS).
- **Priority-Based Alert Mechanism** (SOS).
- **Real-Time Location Sharing During Emergencies.**
- **Virtual Assistant** (as a companion for Elders).
- **Elder Emotion Reassurance Notifications.**
- **Family centric by design.**
- **Elderly-Friendly Wearable Design** (Lightweight & soft-strap for sensitive skin).

TECHNICAL APPROACH

Technologies:



Tech Stack:



Component	Model	Function	Parameters	Reason for Selection
Microcontroller	ESP32/ ESP32-C3	Central controller	Wi-Fi + BLE, low power modes	Handles sensor fusion, alerts & cloud communication
Heart Rate & SpO_2 Sensor	MAX30102	Measures heart rate & blood oxygen	HR (30–240 BPM), SpO_2 (70–100%)	Non-invasive, Industry-accepted PPG sensor
Motion Sensor (IMU)	MPU6050	Fall detection & activity tracking	3-axis accelerometer + gyroscope	Reliable fall detection & motion analysis
GPS Module	L76K	Location tracking during emergencies	2.5–5 m accuracy, ultra-low power	Wearable-optimized GPS for SOS
Battery	Li-Po (500–1000 mAh)	Power supply	Rechargeable, compact	Long battery life for continuous monitoring
Buzzer / Vibration Motor	Mini Buzzer / Motor	Audio / haptic alerts	Low power	Provides immediate user feedback
Enclosure Material	Medical-grade Silicone	Wearable casing	Hypoallergenic, soft	Safe & comfortable for elderly skin

ARCHITECTURE

Vrudhseva – Elderly Care Platform

Sensing Layer

IOT Layer

- ESP32-C3
- MPU6050 [Fall Detection]
- L76k GPS
- MAX30105 [HR & SpO2]

No final decision is made here

Raw Data

Backend Layer

Edge Processing

- Stabilizes Sensor drift
- Pattern validation
- Threshold logic

If emergency detected

→ SOS flag is generated immediately

→ Data is marked as high priority

BLE

Mobile gateway

- Acts as temporary storage
- Secure transmission
- Emergency shortcut

BACKEND SERVICES (SYSTEM BRAIN)

TLS/HTTPS → API

- Authentication & Permissions
- "decision-making brain" Rules Engine & Intelligence
- Notification Service
- Audit & Action Log
- Health Data Ingestion
- Alert & Escalation Logic

This loop runs all the time, even without new alerts.

Emergency SOS steps

Step 1 [0 sec] :

Wearable device detect fall detection.
Notification to elder " ARE YOU OKAY ? "

Step 2 [30 sec, no response] :

Family member are notified.
System call's elders phone automatically.

Step 3 [2 min, no response] :

Family receives an call about elder fall detection.
Location shared to family member.

Step 4 [5 min, final call] :

Emergency SOS system starts working to nearby ambulances, polices...

DATA STORAGE (MEMORY, NOT DECISION MAKER)

- mongoDB.
- Time-Series DB
- redis

Used for fast access to live alerts, session states, and temporary data during emergencies.

It only supports backend decisions

Emergency

In serious emergencies, the system does not wait for confirmation and directly sends an SOS alert to family members.

SOS escalation is coordinated by Backend Services

Output Layer

USER APPLICATIONS

Elder App

- Shows reassurance
- Minimal interaction
- SOS feedback only

Family App

- Alerts
- Health overview
- Trends & peace of mind

Caretaker App

- Task-based actions
- Accountability logs
- No blind trust

FEASIBILITY AND VIABILITY

Feasibility

Technical:

- System uses readily available **IoT components** usings protocols like **I²C and UART**.
- **Automatic emergency detection** logic implemented using **sensor thresholds and activity patterns.**

Operational:

- **Designed** for users with **limited mobility, cognitive decline, or motor disabilities.**
- **Wearable form factor** ensures continuous monitoring **without daily setup**.

Financial:

- Uses **low-cost, mass-produced electronic components ,hence making it cost effective.**
- **Scalable cloud infrastructure** ensures costs grow proportionally with user adoption.

Challenges

Sensor accuracy variations due to improper wearing, loose contact, or sensitive elderly skin conditions.

Motion noise and signal artifacts affecting heart rate and SpO_2 readings during movement.

False emergency alerts caused by sudden but non-critical movements such as sitting quickly or tremors

Limited GPS accuracy indoors and **adaptation Challenges for Elderly Users**

Elderly users with **vision** or **digital limitations** struggle to **use technology, manage reminders, and stay emotionally supported.**

Mitigation Steps

The system uses a **secure wrist-worn design** with **automatic calibration** to ensure **reliable sensor contact**.

Motion data is used to **reduce noise** in heart rate and SpO_2 readings during movement.

The system **verifies emergencies** by analyzing **falls, vital signs, and inactivity** before sending alerts.

Emergency location is shared using **assisted positioning**, with the system operating **automatically for elderly users**.

A **voice-based virtual assistant delivering guidance, reminders, health updates, and companionship** to support **independent aging.**

IMPACT AND BENEFITS

Impact

Impacts on elders

- Enables **independent living** without constant supervision
- Reduces **social isolation anxiety** by ensuring someone is always reachable
- Elders benefit from technology **without needing to learn or adapt to complex systems**.

Impact on Family Members

- Provides **real-time alerts** during emergencies and Improves **response time** in critical situations
- Enables **remote monitoring** of elderly well-being also Reduces stress due to physical distance.
- Helps family members manage **professional responsibilities and caregiving** more effectively.

Impact on Caregivers

- Supports **timely intervention** during abnormal events
- Enables **better coordination** with family members
- Simplifies monitoring of **multiple elderly users simultaneously**
- Reduces Caregiver Stress and Burnout

Benefits

Social benefits

- Improves the **quality of life index** for senior citizens.
- **Reduces burden on hospitals and emergency services** through early detection
- Encourages a **preventive healthcare culture** over reactive treatment

Economic Benefits

- **Reduces Financial Burden on Families** by Preventing **unexpected emergency expenses** through early intervention.
- **Optimized** use of **healthcare resources and infrastructure**.
- **Reduced hospitalization** and **emergency treatment costs**.

Market Opportunity & Adoption Benefits:

- India will have 150+ million elderly citizens by 2030, creating strong and sustained demand.
- India is among the top 3 countries globally in wearable & digital health adoption, ensuring readiness.
- Rising chronic illnesses and independent living among elders create high need for continuous monitoring.

COMPARISON WITH EXISTING SYSTEM

Why Vrudhseva Is Fundamentally Different

Existing elder-care platforms solve isolated problems such as fall alerts, emergency calling, or service coordination.
However, **real-life elder emergencies are unpredictable, silent, and often unattended**.

Vrudhseva's Core Philosophy: -

- Designed as an **invisible safety layer**, not an app that demands attention.
- Assumes the **elder may be unconscious, confused, or unable to respond**.
- Decisions are **system-driven**, not user-driven.

Intelligence Over Interaction: -

- Health signals are **continuously evaluated**, not checked on demand.
- The system understands **severity, trend, and urgency**, not just thresholds.
- Critical conditions can **override normal verification flows** to save time.

Family-Centric by Design: -

- Built around **Indian family dynamics**, where multiple stakeholders are involved.
- Clear separation of **family visibility** and **caretaker responsibility**.
- Prevents emotional burden on elders by **reducing unnecessary alerts**.

Trust, Accountability & Continuity: -

- Every action in the system is **traceable and auditable**.
- Works even in **low-connectivity or offline conditions**.
- Privacy and consent are treated as **system rules, not optional settings**.

Reference: -

- *Stavropoulos et al., IoT Wearable Sensors and Devices in Elderly Care, Sensors, 2020.*
- Durán-Vega et al., *IoT System for Remote Health Monitoring in Elderly Adults*, Sensors, 2019.

To know more in detail, please visit the given drive link and refer to the complete PRD document.
Link: - https://drive.google.com/drive/folders/1Yif75c6HXB7Bj48IkXc1G9QEZXrq-ffI?usp=sharing

Feature / Capability	Philips Lifeline	CarePredict	Anvayaa (India)	Vrudhseva
Works without elder interaction	✓	✓	✗	✓
Automatic fall detection	✗	✗	✗	✓
Context-aware Emergency SOS	✗	✗	✗	✓
Skips verification in critical cases	✗	✗	✗	✓
Continuous health monitoring	✗	✓	✗	✓
Backend decision intelligence	✗	✓	✗	✓
Family + caretaker role control	✗	✗	✓	✓
Caretaker accountability tracking	✗	✗	✗	✓
Designed for Indian family dynamics	✗	✗	✓	✓
Elder dignity-first design	✗	✗	✗	✓
Offline / low-connectivity handling	✗	✗	✗	✓
Privacy & consent transparency	✗	✗	✗	✓