

# AI-Powered Health Monitoring System

## 1. Introduction

This project delivers an AI-Powered Health Monitoring System designed to track and analyze health vitals in real-time. The system identifies potential health anomalies and generates actionable recommendations through a user-friendly dashboard application.

## 2. Objectives

- Develop a functional AI-powered health monitoring system.
- Visualize health data via an intuitive application.
- Provide anomaly detection and health recommendations.
- Generate structured reports for health status monitoring.

## 3. System Overview

### 3.1 Technologies Used

- Python 3
- Streamlit (Dashboard)
- Scikit-learn (Machine Learning)
- Pandas & NumPy (Data Processing)
- Matplotlib & Seaborn (Data Visualization)

### 3.2 Architecture

- **Data Simulation:** Generates real-time simulated health data.
- **Preprocessing:** Scales and normalizes input features.
- **Anomaly Detection:** Uses Isolation Forest algorithm.
- **Recommendations Engine:** Applies rule-based logic.
- **Visualization Dashboard:** Interactive display using Streamlit.

## 4. Implementation Details

### 4.1 Data Simulation

Simulated parameters include: - Heart rate - Blood oxygen levels - Body temperature - Respiration rate - Activity level

Each parameter is randomly generated within realistic ranges to mimic live sensor data.

### 4.2 Preprocessing

Activity levels are converted to numeric values. Data is normalized using StandardScaler to prepare it for machine learning.

### 4.3 Anomaly Detection

Isolation Forest model detects health anomalies based on user-selected contamination rates.

### 4.4 Recommendations Engine

Simple rule-based checks provide health advice, such as: - High heart rate triggers rest advice. - Low oxygen level prompts medical attention. - Elevated temperature suggests monitoring.

### 4.5 Dashboard Application

Users interact with: - Configuration sliders (users, data length, contamination). - Tables showing raw and processed data. - Anomaly detection results. - Health recommendations. - Graphical visualization of anomalies. - Exportable CSV report.

## 5. Results

- Successfully detects simulated anomalies.
- Displays real-time graphs and data tables.
- Provides health status reports with recommendations.

## 6. Conclusion

This AI-Powered Health Monitoring System offers a scalable framework adaptable to real health data. Future expansions could incorporate: - Real-time IoT sensor integrations. - Deep learning models for improved detection. - Mobile app development for patient access.

## 7. References

- Scikit-learn documentation
- Streamlit documentation
- Medical standard thresholds for vitals (WHO guidelines)