Smart Body Posture Recognition and Guiding System

A PROJECT REPORT

Submitted by,

Mr. Sanketh S	**-**	**20211CCS0124**
Mr. Mohan C V	**-**	**20211CCS0133**
Mr. Manu K	**-**	**20211CCS0140**
Mr. Shaun Franklyn	**-**	**20211CCS0158**
Mr. V Vishwa Kiran Reddy	**-**	**20211CCS0190**

Under the guidance of,

Ms. Sterlin Minish T N

in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)

At

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

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PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"Smart Body Posture Recognition and Guiding System"** being submitted by **"Sanketh S"**, **"Mohan C V"**, **"Manu K"**, **"Shaun Franklyn"**, **"V Vishwa Kiran Reddy"** bearing roll number's **"20211CCS0124"** , **"20211CCS0133"** , **"20211CCS0140"** , **"20211CCS0158"** , **"20211CCS0190"** in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering (Cyber Security) is a bonafide work carried out under my supervision.

17/01/2025

Mrs. Sterlin Minish T N
Assistant Professor
School of CSE
Presidency University

Dr. S P Anandaraj
Professor & HoD
School of CSE
Presidency University

Dr. L. SHAKKEERA
Associate Dean
School of CSE
Presidency University

Dr. MYDHILI NAIR
Associate Dean
School of CSE
Presidency University

Dr. SAMEERUDDIN KHAN
Pro- VC School of Engineering
Dean -School of CSE&IS
Presidency University

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Smart Body Posture Recognition and Guiding System** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering (Cyber Security)**, is a record of our own investigations carried under the guidance of **Mrs. Sterlin Minish T N, Assistant Professor, School of Computer Science Engineering , Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

Name	Roll Number	Signature
SANKETH S	20211CCS0124	
MOHAN C V	20211CCS0133	Mohan
MANU K	20211CCS0140	Manu
SAHUN FRANKLYN	20211CCS0158	
V VISHWA KIRAN REDDY	20211CCS0190	Vishwa Kiran

ABSTRACT

This project aims to develop a Self-Service Wellness Kiosk designed to provide users with an easy-to-use platform for monitoring key health vitals such as Body Mass Index (BMI), Bone Mineral Content (BMC), Blood Pressure (BP), Electrocardiogram (ECG), Pulse, and Temperature. The system includes a unique Posture Analysis Module to ensure the user maintains the correct posture while performing these measurements, which is critical for accurate results. The kiosk employs a camera to capture the user's body position during health assessments and uses Mediapipe, a real-time framework for detecting body landmarks, to guide users in adjusting their posture if necessary.

The proposed solution addresses a critical issue in self-service health monitoring systems, where incorrect posture can lead to inaccurate data. The Mediapipe - based posture detection system calculates angles between specific body landmarks, such as the shoulders and hips, to assess whether the user is correctly aligned. If the posture deviates beyond acceptable thresholds, the system provides real-time guidance, such as repositioning suggestions, to improve measurement accuracy.

The kiosk is designed to be a standalone, user-friendly system that can be deployed in various public settings such as gyms, offices, and healthcare centers, allowing individuals to conduct regular health check-ups without visiting medical professionals. By integrating vital sign monitoring with posture correction, the kiosk ensures reliable, consistent data collection, contributing to better personal health management. The Self-Service Wellness Kiosk serves as an innovative solution for promoting preventive healthcare by making health monitoring more accessible and accurate for users. With its potential to operate in various environments and the ability to scale up with additional features, the project addresses both individual and societal health needs.

ACKNOWLEDGEMENT

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We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

SANKETH S

MOHAN C V

MANU K

SHAUN FRANKLYN

V VISHWA KIRAN REDDY

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CHAPTER-1
INTRODUCTION

1.1 General Overview

The healthcare sector is undergoing a significant transformation, driven by the need for accessible, efficient, and non-assisted healthcare services. With advancements in health technology, there is a growing demand for solutions that empower individuals to manage and monitor their own health without relying on medical professionals. The Self-Service Wellness Kiosk project is designed to address this need by providing users with a comprehensive, user-friendly system for measuring key health vitals, such as Body Mass Index (BMI), Bone Mass Content (BMC), Blood Pressure (BP), Electrocardiogram (ECG), Pulse Rate, and Body Temperature. The system operates autonomously, requiring minimal user interaction while maintaining a high degree of accuracy.

One of the primary challenges in non-assisted health monitoring systems is ensuring that the user maintains the correct posture during measurements. For instance, incorrect posture while measuring blood pressure or recording an ECG can lead to inaccurate results. This project incorporates a Posture Detection Module using the Mediapipe framework to ensure that users adopt the appropriate posture before the health tests are performed. The real-time posture analysis system uses a camera to detect body landmarks and calculate angles between joints, guiding users to make necessary adjustments if their posture deviates from the ideal.

The kiosk is designed to be deployed in a variety of public spaces, including gyms, healthcare centers, shopping malls, and workplaces, making it accessible to a broad range of users. The integration of real-time posture correction ensures that the system provides reliable and accurate health data, which is essential for tracking individual health over time and detecting potential health issues early. By offering a self-service solution, the system contributes to reducing the burden on healthcare providers and empowering individuals to take control of their own health.

1.2 Motivation and Rationale

The increasing burden on healthcare systems globally has led to the development of innovative solutions that focus on preventive care and early diagnosis. With the rise of chronic diseases such as hypertension, cardiovascular disorders, and obesity, it has become crucial for individuals to monitor their health regularly. However, access to healthcare facilities can be limited, especially in rural areas, and even in urban settings, regular visits to healthcare professionals for basic monitoring can be time-consuming and costly. These challenges highlight the need for self-service health monitoring systems that can provide reliable health data without requiring the presence of healthcare personnel.

The Self-Service Wellness Kiosk addresses this gap by offering a solution that combines health monitoring with posture correction, ensuring that users can obtain accurate readings in a convenient and accessible manner. The key innovation in this project is the incorporation of posture correction, which is often overlooked in similar systems. Incorrect posture can significantly affect the accuracy of health measurements, particularly for parameters such as BP and ECG, where body alignment plays a crucial role in obtaining reliable data.

By using a camera-based posture detection system, the kiosk ensures that users are correctly positioned before measurements are taken. The Mediapipe framework detects key body landmarks such as the shoulders, hips, and ears, and calculates the angles between these points to assess posture. If the system detects that the user is not aligned correctly, it provides real-time feedback through visual or auditory prompts, allowing the user to adjust their position. This ensures that the health data collected is not compromised by posture-related inaccuracies.

1.3 Objectives of the System

The primary objective of the Self-Service Wellness Kiosk is to provide an autonomous, accurate, and accessible health monitoring solution that can be used in public and private spaces without the need for healthcare personnel. The specific goals of the system include:

- Accurate Health Monitoring: Measure key health vitals such as BMI, BMC, BP, ECG, Pulse, and Temperature with high precision.

- Real-Time Posture Correction: Implement a posture detection system using Mediapipe to ensure that users maintain the correct posture during health assessments.
- Non-Intrusive Operation: Create a system that operates autonomously, without the need for users to wear any additional devices or sensors.
- User-Friendly Interface: Provide a simple and intuitive interface that guides users through the health monitoring process and offers corrective feedback when necessary.
- Scalable Design: Ensure that the system is modular and scalable, allowing for future enhancements such as additional health metrics or integration with external health databases.

The system's ability to operate in various public environments also supports the goal of democratizing access to healthcare. By placing these kiosks in easily accessible locations, individuals can monitor their health regularly, detect potential issues early, and take preventive measures before the need for more serious medical interventions arises.

1.4 Importance of Posture in Health Monitoring

Posture plays a critical role in obtaining accurate health measurements. For example, blood pressure readings can be significantly affected by improper arm positioning, while ECG readings can be compromised if the body is not properly aligned. In traditional healthcare settings, medical professionals ensure that patients are positioned correctly before measurements are taken. However, in a self-service environment, there is no one to provide this guidance. As a result, many self-service health kiosks fail to deliver reliable data due to posture-related inaccuracies.

This project addresses the issue by integrating posture detection into the health monitoring process. Using real-time image processing techniques, the system can analyze the user's posture and provide immediate feedback if adjustments are needed. This ensures that the measurements taken are not only accurate but also reliable over time. The real-time posture correction system allows users to make quick adjustments and receive confirmation that their posture is correct before the measurements begin.

1.5 Relevance to Preventive Healthcare

The **Self-Service Wellness Kiosk** is an important step toward promoting preventive healthcare. By providing individuals with easy access to health monitoring, the system encourages regular check-ups and early detection of potential health problems. Preventive healthcare aims to reduce the occurrence of diseases by identifying risk factors early and promoting lifestyle changes that improve overall health outcomes. The kiosk serves as a tool for individuals to take control of their health, empowering them with the data they need to make informed decisions about their well-being.

The system is particularly valuable in high-traffic public spaces where individuals may not have easy access to healthcare services. By making health monitoring as convenient as possible, the project aims to increase the frequency with which people check their vital signs, leading to earlier detection of issues and better long-term health outcomes.

CHAPTER-2
LITERATURE SURVEY

[1] Title: **Posture Recognition Based on Fuzzy Logic for Home Monitoring of the Elderly**

Authors: Damien Brulin, Yannick Benezeth, and Estelle Courtial

Date: 5, SEPTEMBER 2012

DOI: 10.1109/TITB.2012.2208757

Journal: IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 16

Introduction: This paper introduces a computer vision-based system that utilizes fuzzy logic for posture recognition in a home monitoring setting, specifically targeting the elderly. The system is designed to detect emergencies, such as falls, by recognizing four main body postures: lying, squatting, sitting, and standing. The core idea is to assist elderly individuals living independently by monitoring their movements through an unobtrusive, camera-based system.

Methodology: The system uses a combination of human detection followed by posture recognition based solely on a human silhouette. The posture recognition leverages simple features, which focus on describing the silhouette of the human body, minimizing the impact of environmental factors like lighting variations and occlusions. The approach is intended to be robust, requiring minimal processing power while still maintaining high accuracy. The fuzzy logic system (FLS) classifies the postures by utilizing a set of rules that interpret the visual data and assign membership degrees to each possible posture.

Results and Discussion: The system was tested in various conditions, showing an overall posture recognition accuracy of 74.29%. However, the study acknowledged that differentiating between similar postures, like sitting and squatting, was a challenge due to the similar shapes of these postures in the silhouette. Additionally, the system's performance decreased slightly in dynamic environments, where background changes introduced noise to the detection algorithm.

Conclusion: The paper demonstrates the feasibility of using fuzzy logic for posture recognition, but highlights that improvements are needed for real-time applications in dynamic, uncontrolled environments. Furthermore, while the system is designed for home use, the findings suggest potential for wider applications with further refinement.

[2] Title:**Smart mirror E-health assistant — Posture analyze algorithm proposed model for upright posture**

Authors: Biljana Cvetkoska, Ninoslav Marina, Dijana Capeska Bogatinoska, Zhanko Mitreski

Date: 6-8 July 2017

DOI: 10.1109/EUROCON.2017.8011163

Conference: IEEE EUROCON 2017 -17th International Conference on Smart Technologies

Introduction: This paper proposes an innovative approach to posture correction by introducing a smart mirror system designed to detect and analyze posture in real time. The smart mirror is equipped with a camera and uses a posture analysis algorithm (Posture Analyze Algorithm - PAA) to assess user posture and provide corrective feedback. This system is targeted at improving everyday posture and preventing musculoskeletal issues, especially in home settings.

Methodology: The smart mirror utilizes face recognition to authenticate users and track posture over time. The system captures real-time images and analyzes body posture using the Posture Analyze Algorithm (PAA). The algorithm compares the user's current posture against a predefined set of ideal postures and highlights areas for improvement. The mirror provides suggestions for corrective actions and preventive healthcare measures based on posture analysis.

Results: Tests with multiple users demonstrated that the system could effectively detect posture deviations and offer helpful guidance. Users reported a noticeable improvement in their posture over time, confirming the mirror's utility in daily posture management. However, the system's reliance on face recognition and stationary use limited its application to primarily home or office settings.

Conclusion: This paper demonstrates the potential of integrating real-time posture analysis into a home healthcare setting using a smart mirror. While the system works well in its intended environment, future improvements could focus on enhancing its applicability in more public or mobile settings by reducing its reliance on face recognition.

[3] Title: **Sitting posture recognition for computer users using smartphones and a web camera**

Authors: Jheanel Estrada, Larry Vea

Date: 5-8 November 2017

DOI:10.1109/TENCON.2017.8228098

Conference: TENCON 2017 - 2017 IEEE Region 10 Conference

Introduction: This paper presents a model designed to recognize sitting postures automatically by using both accelerometers attached to specific points on the human body and web cameras. The focus of the study was to identify ergonomic sitting postures and provide feedback to help individuals maintain proper sitting habits, particularly for office workers and students who spend extended periods sitting.

Methodology: Accelerometers were attached to key points along the spine, such as the thoracic and lumbar regions, while a web camera captured upper body landmarks like the chin and shoulders. Data from 60 participants was collected and used to train various classifiers, including K-Nearest Neighbors (KNN), Support Vector Machines (SVM), and Decision Trees, to detect posture deviations.

Results: The Decision Tree classifier performed best, achieving an accuracy of 95.35% for detecting improper head and shoulder postures. This high accuracy indicates the system's effectiveness in recognizing ergonomic problems in sitting postures. However, the study also pointed out limitations in the system's ability to detect subtle posture changes, especially when participants moved frequently.

Conclusion: The combination of accelerometer and camera data offers a feasible solution for detecting improper sitting posture in real time. The system provides valuable insights for improving ergonomics, but the requirement for wearable devices (accelerometers) may limit its practicality for large-scale use in public or work environments.

[4] Title: **Vision-based human body posture recognition using support vector machines**

Authors: Chia-Feng Juang, Chung-Wei Liang, Chiung-Ling Lee,I-Fang Chung

Date: 21-24 August 2012

DOI: 10.1109/iCAwST.2012.6469605

Conference: 4th International Conference on Awareness Science and Technology

Introduction: This study presents a vision-based posture recognition method using an SVM classifier to detect and categorize four basic postures: standing, bending, sitting, and lying. The system was designed with the aim of enhancing traditional surveillance systems by adding the ability to automatically detect human behavior and alert operators to unusual postures that may indicate a problem (e.g., a fall or fainting).

Methodology: Two cameras were used to capture simultaneous image sequences from different angles. An RGB-based object segmentation algorithm was then employed to distinguish the human body from the background. The system calculates Discrete Fourier Transform (DFT) coefficients from the horizontal and vertical projections of the body silhouette, which are used as features for the SVM classifier to categorize the detected posture.

Results: The SVM classifier achieved high accuracy in distinguishing between the four postures, significantly reducing errors related to occlusions or ambiguous silhouettes. The two-camera setup provided greater robustness in detecting posture from different angles, making the system suitable for use in dynamic environments like public spaces or workplaces.

Conclusion: This paper demonstrates the effectiveness of using a multi-camera system and an SVM classifier for posture recognition in surveillance applications. However, the complexity of the system's setup and reliance on two cameras may limit its use in simpler or more cost-sensitive environments.

[5] Title: **Object Detection and Analysis of Human Body Postures Based on TensorFlow**

Authors: Ling Xie, Xiao Guo

Date:August 2019

DOI:10.1109/SmartIoT.2019.00070

Conference: 2019 IEEE International Conference on Smart Internet of Things (SmartIoT)

Introduction: This paper investigates the use of deep learning, particularly TensorFlow, to classify human body postures. The study focuses on applying convolutional neural networks (CNNs) to recognize and classify postures, with an emphasis on monitoring teachers' postures during teaching sessions. The goal was to develop a posture recognition system that can operate in real time with high accuracy.

Methodology: The study tested eight different experimental setups, each combining various detection algorithms and CNN architectures. The system captured key points of the human body and used CNNs to analyze posture, focusing on actions such as standing, sitting, and bending. Multiple CNN models were tested to determine the best approach for posture recognition in the given scenario.

Results: The TensorFlow-based system achieved excellent performance, with the most successful CNN model providing highly accurate real-time posture recognition. However, the study noted that the accuracy of the system depended heavily on the quality and diversity of the training data. The lack of diverse training data could lead to reduced accuracy in real-world scenarios where variations in body types or environments may not be well-represented in the training set.

Conclusion: This study demonstrates the potential of using deep learning, particularly CNNs, for real-time posture recognition. The system achieved superior accuracy compared to previous posture recognition methods, but further research is needed to improve its generalization capabilities across different environments and body types.

CHAPTER-3
RESEARCH GAPS OF EXISTING METHODS

- **Limited Real-Time Feedback**

Most existing systems do not provide immediate corrective feedback to users regarding posture deviations, which is essential for maintaining correct alignment during health assessments.

- **Reliance on Controlled Environments**

Many posture detection systems, such as those using background subtraction or stationary cameras, are designed for static or controlled environments. These systems often struggle in dynamic, real-world settings with varying lighting conditions and moving subjects.

- **Dependency on Wearable Devices**

Several existing solutions require users to wear additional sensors (e.g., accelerometers or gyro-meters) to track body movements. This can be intrusive and inconvenient for users, particularly in public health settings or non-laboratory environments.

- **Lack of Integration with Health Monitoring**

While posture recognition systems exist, few integrate posture correction with health monitoring tools like blood pressure monitors or ECG devices. The absence of such integration can lead to inaccurate health readings due to poor posture.

- **Inadequate Handling of Body Morphological Differences**

Many systems do not account for variations in body shape, size, or frame, which can lead to inaccurate posture assessments, especially in systems based solely on visual data or static models.

- **Insufficient Adaptability to Public or Unassisted Environments**

Most existing systems are designed for home or clinical environments, where conditions are controlled. There is a lack of solutions tailored for unassisted, public environments such as kiosks, where users may need immediate guidance.

CHAPTER-4
PROPOSED MOTHODOLOGY

The proposed methodology focuses on the development of an automated self-service wellness kiosk that combines health monitoring with posture correction. The system is designed to capture vital health parameters (BMI, BMC, BP, ECG, Pulse, and Temperature) while ensuring the user maintains the correct posture during measurements. This process is critical for ensuring accurate readings, particularly for parameters such as blood pressure and ECG, where body alignment plays a significant role in measurement accuracy. The methodology involves several key components, including image processing for posture detection, real-time feedback mechanisms, and health sensor integration.

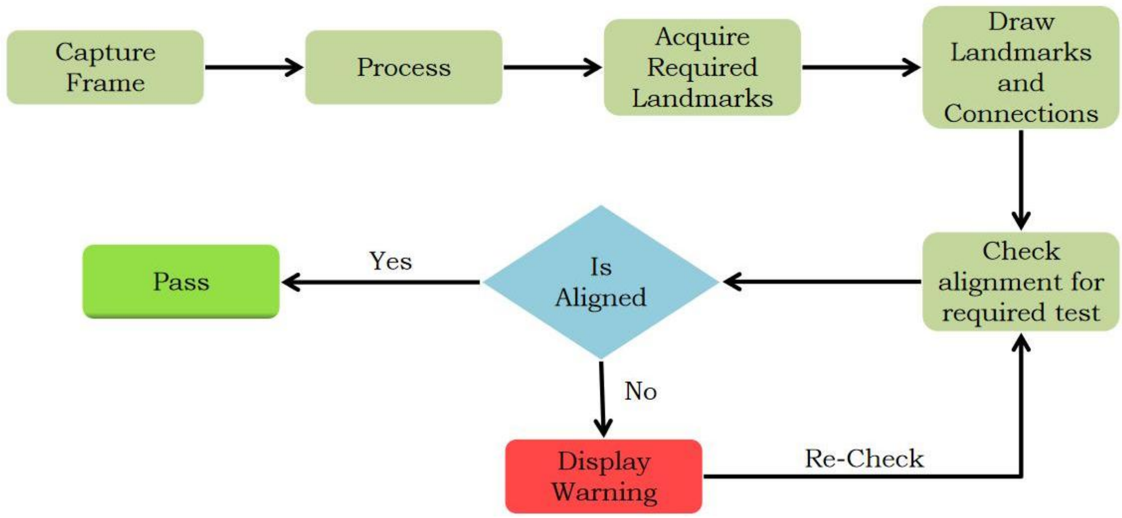

Figure 4.1 : Block diagram of the process workflow

4.1 System Overview

The system consists of several interconnected modules:

- **Posture Detection Module:** Uses a camera and the Mediapipe framework to detect and analyze user posture.
- **Posture Correction Module:** Provides real-time feedback to the user, guiding them to maintain the correct posture before health measurements.

4.2 Posture Detection

- **Camera Setup:** The system captures real-time video input from a camera positioned in front of the user. The camera is responsible for capturing the user's posture and body position before and during health measurements. This camera should be placed at an angle that provides a clear view of the user's body landmarks, such as the shoulders, hips, and ears.
- **Body Landmark Detection Using Mediapipe:** The Mediapipe framework is used to detect key body landmarks in real-time from the video feed. Mediapipe is a machine learning framework that provides robust detection of body landmarks using a pre-trained model. The system focuses on detecting the following key points:

Shoulders: Used to assess torso alignment and shoulder posture.
Hips: Critical for determining the user's overall posture and body balance.
Ears: Important for detecting head and neck posture, especially during ECG or BP measurements.
Using these landmarks, the system creates a skeletal map of the user's body, which is then analyzed to determine posture alignment. The landmark detection is done in real time, enabling immediate feedback to the user if any misalignment is detected.

4.3 Angle Calculation for Posture Analysis

Once the body landmarks are detected, the system calculates the angles between key joints to assess the user's posture. These angles help determine whether the user is in the correct posture for the given health measurement.

Equation for finding angle

$$\theta = \arccos\left(\frac{\overrightarrow{P_{12}} \cdot \overrightarrow{P_{13}}}{\left|\overrightarrow{P_{12}}\right| \cdot \left|\overrightarrow{P_{13}}\right|}\right)$$

Solving for θ we get,

$$\theta = \arccos\left(\frac{y_1^2 - y_1 \cdot y_2}{y_1\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}\right)$$

These angles are computed using trigonometric functions, specifically cosine and sine, to determine the relative position of each landmark in relation to the others. The calculated angles are then compared against predefined thresholds that represent ideal posture for each measurement (BP, ECG, etc.).

4.4 Real-Time Feedback Mechanism

- **Posture Evaluation:** Once the angles are calculated, the system compares them with pre-defined acceptable ranges. If the user's posture deviates from the acceptable range (e.g., neck inclination greater than 40 degrees or torso inclination greater than 10 degrees), the system classifies the posture as "incorrect."
- **Feedback to the User:** If the system detects incorrect posture, it provides real-time feedback to the user. This feedback is given in the form of:

The feedback loop continues until the user's posture aligns with the acceptable threshold, at which point the system proceeds to the next stage of health monitoring.

4.5 Health Monitoring Module

Once the system confirms that the user is maintaining the correct posture, the health monitoring process begins. The kiosk is equipped with sensors that measure various health vitals such as:

- Body Mass Index (BMI): Calculated using the user's height and weight.
- Blood Pressure (BP): Measured using an automated BP cuff, ensuring the arm is in the correct position.
- Electrocardiogram (ECG): Captures the electrical activity of the heart while ensuring the user's body is correctly aligned to avoid signal noise.
- Pulse and Temperature: Measured using non-invasive sensors attached to the user's finger or forehead.

The system waits for the posture to be validated before initiating the measurement to ensure that posture-related inaccuracies are avoided.

4.6 Scalability and Modularity

The system is designed to be modular, allowing for future expansion. Additional health monitoring modules or posture analysis features can be integrated into the existing framework. For instance:

Additional sensors for glucose monitoring or oxygen saturation can be added.
AI-based posture correction algorithms can be incorporated to provide more personalized feedback based on user-specific body morphology.
This modularity makes the system scalable for use in various environments, including gyms, healthcare facilities, and workplaces.

4.7 Testing and Validation

- **Calibration:** The system will undergo extensive testing to ensure that the posture detection module accurately identifies and corrects poor posture. Calibration tests will be conducted in controlled environments to fine-tune the thresholds for posture correction.
- **Field Testing:** After calibration, the system will be deployed in real-world environments (such as health centers or public gyms) to validate its performance in diverse conditions. Feedback from real users will be used to further optimize the posture detection and health monitoring modules.

The proposed methodology outlines a comprehensive approach to combining posture correction with health monitoring in a self-service wellness kiosk. By leveraging Mediapipe for real-time posture detection and incorporating a robust feedback system, the kiosk ensures accurate health readings by eliminating posture-related errors. The system is designed to be scalable, modular, and adaptable to a variety of public and private environments, making it a valuable tool in preventive healthcare.

CHAPTER-5
OBJECTIVES

- **Develop an Autonomous Health Monitoring System:** The primary objective of the project is to design and develop a fully autonomous self-service wellness kiosk that can measure key health parameters such as Body Mass Index (BMI), Blood Pressure (BP), Electrocardiogram (ECG), Pulse, and Temperature without requiring assistance from healthcare professionals.

- **Integrate Real-Time Posture Detection and Correction:** To ensure the accuracy of health measurements, the system will incorporate a real-time posture detection and correction module. This feature will use the Mediapipe framework to detect body landmarks and calculate joint angles, ensuring users maintain the correct posture during the measurement process.

- **Provide Accurate Health Measurements:** The system is designed to provide precise and reliable health data. By integrating posture correction, the kiosk will reduce the risk of inaccurate measurements caused by improper posture, especially for sensitive tests like BP and ECG.

- **Offer Real-Time Feedback to Users:** The system will guide users through the process by providing real-time feedback. If the user's posture deviates from the ideal alignment, the system will prompt the user with visual and auditory cues to make adjustments before proceeding with the health measurements.

- **Create a Scalable and Modular System:** The project aims to create a system that is scalable and modular, allowing for future enhancements and the integration of additional health metrics. The modular design will make it easier to incorporate new features, such as additional health sensors or AI-driven health insights, in the future.

- **Ensure User-Friendly Operation:** One of the core objectives is to ensure that the kiosk is easy to use, even for individuals with no technical knowledge. The user interface will be designed to be intuitive, guiding users step-by-step through the posture correction and health measurement process.

- **Improve Accessibility to Health Monitoring:** The kiosk is designed to be deployed in public and private spaces such as gyms, healthcare centers, malls, and workplaces. By offering a non-assisted health monitoring system, the project aims to improve accessibility to regular health check-ups for a broader audience, including those in underserved or remote areas.

- **Enable Preventive Healthcare:** By providing individuals with easy access to regular health monitoring, the project promotes preventive healthcare. The kiosk will allow users to track their health metrics over time, helping them identify potential health issues early and take preventive action before conditions worsen.

- **Conduct Extensive Testing and Validation:** The system will undergo rigorous testing in both controlled and real-world environments to ensure that the posture correction and health monitoring features work accurately and reliably. Feedback from field testing will be used to refine the system and ensure its readiness for public deployment.

CHAPTER-6
SYSTEM DESIGN & IMPLEMENTATION

The system design and implementation of the self-service wellness kiosk is centered around integrating real-time posture detection, feedback mechanisms, and health monitoring sensors into a seamless, autonomous platform. The aim is to create a non-intrusive, user-friendly system capable of guiding users to maintain correct posture, which is essential for obtaining accurate health measurements. Below is a detailed breakdown of the components and their implementation:

• System Architecture Overview

The wellness kiosk is designed as a modular system with the following key components:

Posture Detection Module: Uses camera input and machine learning algorithms to detect and analyze body posture in real-time.

Real-Time Feedback System: Provides immediate visual guidance to users, ensuring they maintain proper posture during health measurements.

Health Monitoring Sensors: Collects vital health metrics, including Blood Pressure (BP), Electrocardiogram (ECG), Pulse, Body Mass Index (BMI), and Temperature.

Processing Unit: Manages data flow between the posture detection module, sensors, and user interface. It also processes health data for display and storage.

User Interface (UI): Displays posture status and health results, guiding users through the process of obtaining accurate health measurements.

• Posture Detection Module

Camera Integration: The system uses a high-definition camera placed at a strategic angle to capture the user's full body. The camera is responsible for capturing real-time video, which is processed by the posture detection module to identify key body landmarks.

Body Landmark Detection: The Mediapipe framework is utilized for detecting and tracking key body landmarks such as the shoulders, hips, and neck. Mediapipe is a real-time machine learning framework that provides a robust solution for identifying human body landmarks with minimal computational power. The system continuously tracks these landmarks while the user is standing in front of the kiosk.

Angle Calculation for Posture Assessment: The posture detection module calculates angles between key body landmarks to assess whether the user's posture is aligned correctly. For instance:

Neck Inclination: The angle between the shoulder and ear is calculated to check if the user's neck is upright.

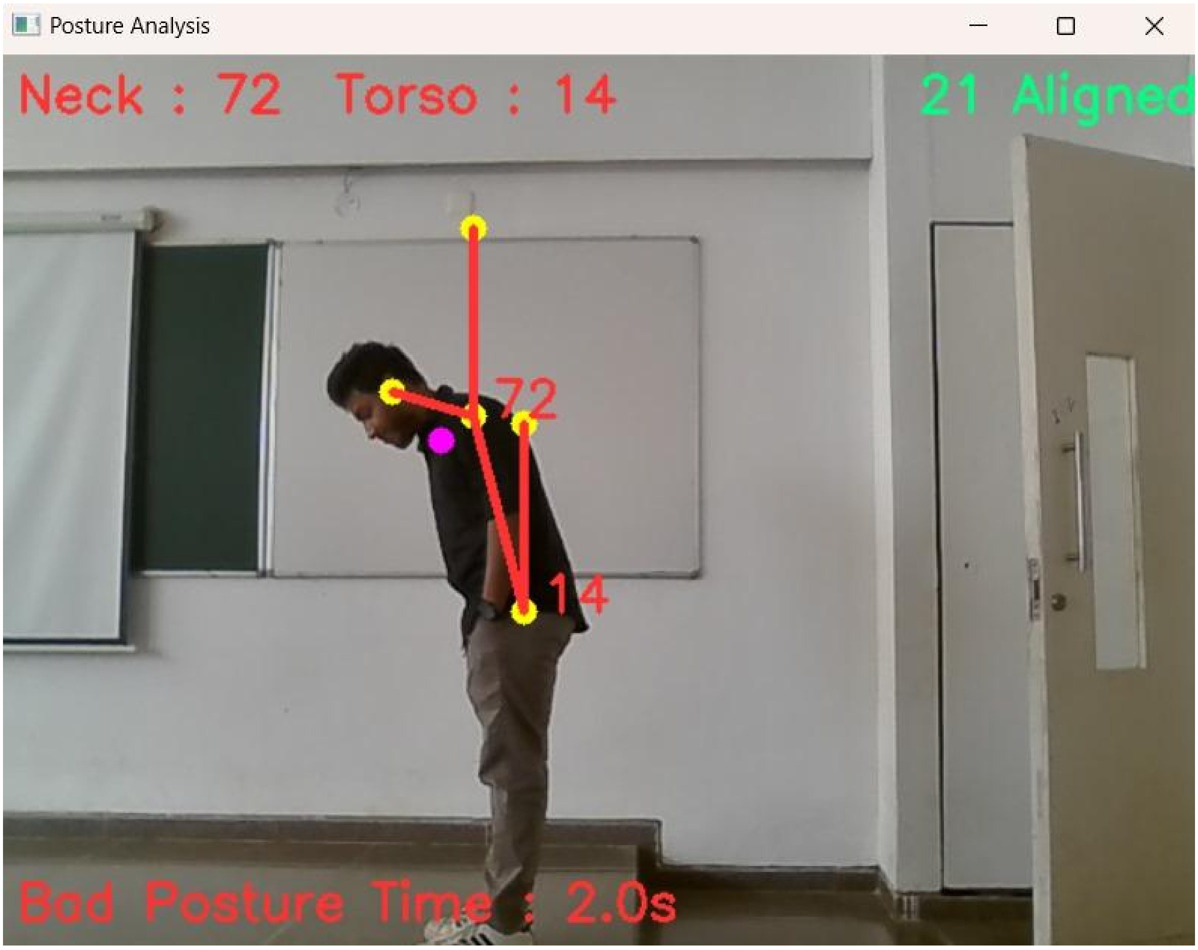

Figure 6.1 : Individual Before Alignment

Torso Alignment: The angle between the shoulder and hip is measured to assess whether the user is standing upright.

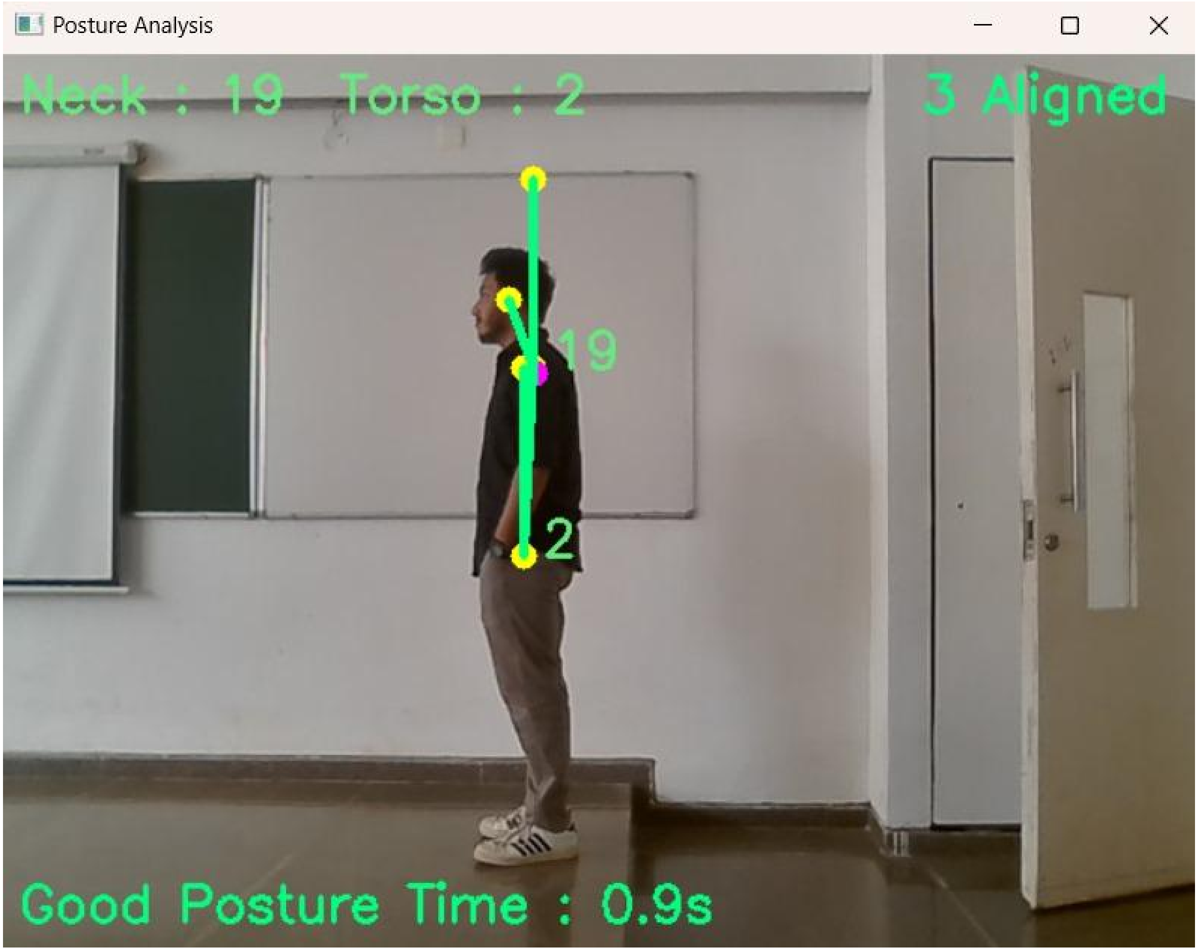

Figure 6.2 : Individual After Alignment

These angles are compared against predefined thresholds. For example, a neck inclination greater than 25° may indicate that the user is leaning forward too much, while a torso misalignment greater than 10° could mean the user is slouching.

- ## Real-Time Feedback System

The feedback system is a critical component of the kiosk, designed to guide users in correcting their posture before health metrics are measured.

Visual Feedback: The system uses the user interface (UI) to provide immediate feedback. If posture misalignment is detected, the screen displays specific instructions, such as “Straighten your neck” or “Adjust your posture.” This visual feedback is presented in real-time, allowing users to make adjustments on the spot.

Feedback Loop: The posture detection and correction process occurs in a continuous loop.

The system keeps checking the user's posture and offers corrective feedback until the posture is within acceptable thresholds. Once proper alignment is achieved, the system proceeds to the next phase: health monitoring.

- ## Data Processing Unit

Centralized Control System: At the heart of the system is a processing unit that controls data flow between the posture detection module, health sensors, and the user interface. The unit ensures that health measurements are only recorded when the posture is correct, thereby preventing posture-related inaccuracies.

Python and OpenCV for Image Processing: The system uses Python programming along with OpenCV for real-time image processing. OpenCV, an open-source computer vision library, processes the camera feed, detects body landmarks, and calculates posture angles. These tools are optimized for real-time performance, ensuring that posture corrections are made instantly.

- ## User Interface (UI)

User-Friendly Design: The UI is designed to be intuitive, guiding users step-by-step through the process of posture correction and health measurement. The screen displays clear, easy-to-understand instructions, ensuring that even first-time users can operate the kiosk with minimal guidance.

Real-Time Data Display: As the health metrics are being recorded, the results are displayed on the screen in real-time. The user can see their BP, ECG, pulse, and other health metrics immediately after the measurements are taken.

- ## Modular and Scalable Design

The system's modular design makes it easy to expand and integrate additional features in the future. For instance:

Additional Health Sensors: More sensors, such as blood glucose monitors or oxygen saturation meters, can be integrated without requiring significant modifications to the system.

AI-Powered Posture Analysis: Future versions of the system could integrate machine learning models to provide personalized posture correction based on the user's body type and historical data.

Remote Monitoring: The system could be expanded to support remote health monitoring, where users' health data is transmitted to healthcare professionals for further analysis.

- ## Testing and Calibration

Calibration of Posture Thresholds: The system's posture detection thresholds were calibrated by testing with multiple users. Different body types were used to fine-tune the angle limits for neck inclination and torso alignment, ensuring that the system can accommodate a wide range of users.

Field Testing in Public Spaces: The system was field-tested in real-world environments such as healthcare centers and public gyms. Feedback from these environments helped optimize the posture correction feedback loop and improve the overall user experience.

The system design and implementation of the self-service wellness kiosk offers an innovative solution for accurate health monitoring by integrating real-time posture detection and correction. The use of the Mediapipe framework for body landmark detection ensures precise posture analysis, while the real-time feedback mechanism guides users to maintain correct posture during health assessments. The modular design of the system allows for future enhancements, making it scalable and adaptable to various healthcare settings.

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)

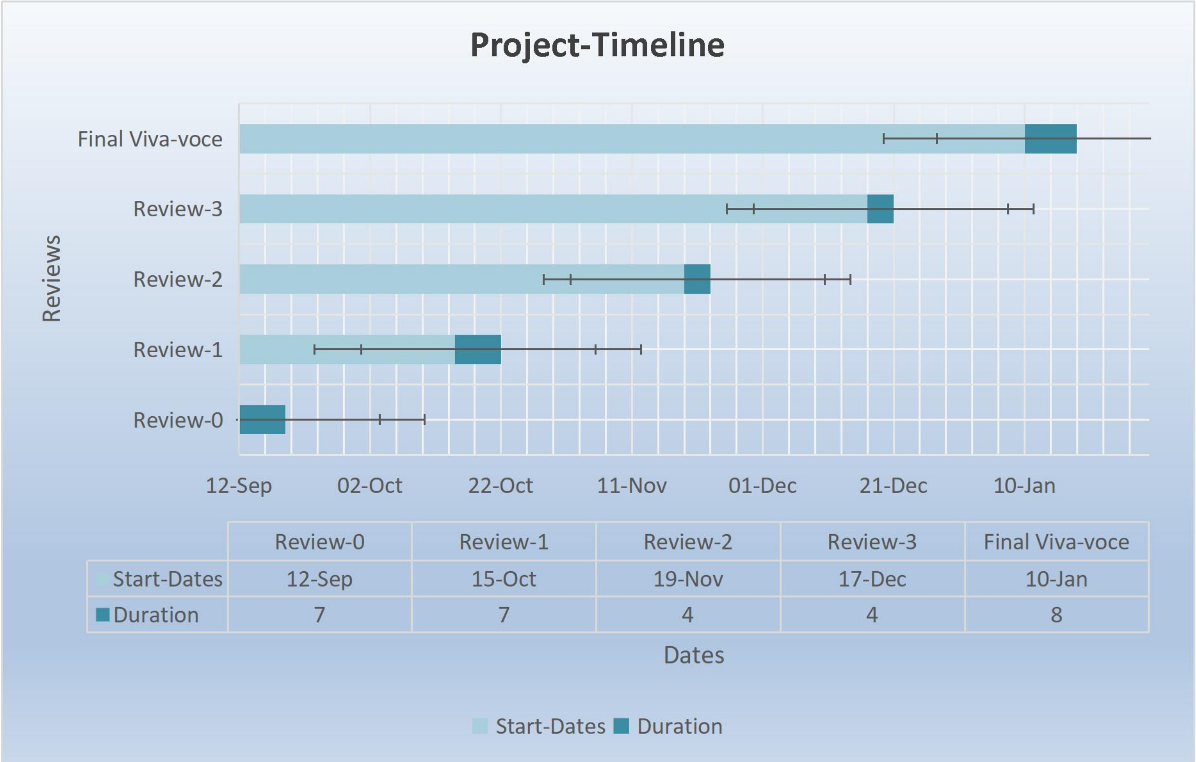

Figure 7.1 - Gantt chart of the project timeline

CHAPTER-8
OUTCOMES

The Self-Service Wellness Kiosk project was designed with the goal of improving the accuracy of health monitoring by integrating real-time posture correction and feedback mechanisms. This section details the expected and achieved outcomes of the project, focusing on how the system meets the project objectives, contributes to the field of preventive healthcare, and enhances user experience in unassisted health monitoring environments.

➢ Accurate Health Monitoring

The primary outcome of the project is the improvement in the accuracy of key health metrics, specifically Blood Pressure (BP), Electrocardiogram (ECG), Pulse Rate, Body Mass Index (BMI), and Temperature. The integration of posture detection ensures that health measurements are taken only when the user maintains the correct posture, thereby eliminating errors caused by posture misalignment.

BP Accuracy: Proper arm positioning is essential for accurate BP measurements. The system's real-time posture correction prevents common errors such as arm misalignment, ensuring that users' blood pressure readings are reliable. This outcome directly addresses the challenge of posture-related inaccuracies in conventional health monitoring systems.

ECG Accuracy: Posture plays a critical role in ECG measurements. The system ensures that the user's body is in an upright, relaxed position, reducing signal noise and improving the quality of the ECG readings. This enhancement contributes to more precise heart rate monitoring and better diagnostic capabilities.

Improved Accuracy Across Metrics: Overall, the system leads to improved accuracy in all recorded metrics (BP, ECG, Pulse, BMI, and Temperature). This makes the wellness kiosk a reliable tool for users who need consistent and accurate health tracking over time.

➢ Real-Time Posture Correction and Feedback

One of the key innovations of the system is its ability to detect and correct posture deviations in real time. This feedback mechanism ensures that users can independently align themselves correctly, without the need for assistance from healthcare professionals.

Immediate Visual Guidance: The system provides real-time visual prompts on the kiosk's display screen to guide users in adjusting their posture. This outcome ensures that users can correct their posture quickly and easily, enhancing both the accuracy of health metrics and the user experience.

Improved User Engagement: By offering immediate, actionable feedback, the system empowers users to take control of their own health assessments. The real-time feedback loop improves user engagement, making the process more interactive and less prone to error.

➢ User-Friendly, Autonomous Health Monitoring

The system was designed to be easy to use, allowing users of all ages and technical backgrounds to operate it without any external assistance. This user-friendly approach is a crucial outcome, especially for deployment in public spaces such as gyms, shopping malls, and healthcare centers.

Simplicity in Design: The user interface is intuitive, with clear instructions displayed at every stage of the health assessment. The system walks users through each step, from posture alignment to health measurement, making it accessible to a broad range of users.

Accessibility for Diverse Users: The system's design ensures that individuals with little or no technical knowledge can operate the kiosk independently. This outcome is particularly important in public or unassisted health settings, where the target users may vary in age and familiarity with technology.

➢ Modular and Scalable Design

The Self-Service Wellness Kiosk was built with a modular architecture, allowing for future enhancements and scalability. This outcome is important for ensuring that the system can evolve as new health monitoring technologies emerge.

Integration of Additional Health Metrics: The system is designed to easily accommodate additional sensors for tracking other health parameters, such as blood glucose levels or oxygen saturation. This scalability ensures that the kiosk can be adapted to meet future healthcare needs.

AI and Machine Learning Integration: The modular design also allows for the future incorporation of AI-driven algorithms to enhance posture correction and provide personalized health insights. This flexibility positions the system as a forward-looking solution that can continue to evolve alongside advancements in healthcare technology.

➢ Improved Preventive Healthcare

By providing users with accurate and reliable health metrics, the system contributes to preventive healthcare efforts. Regular monitoring of key health parameters can help individuals detect potential health issues early and take proactive steps to address them.

Regular Health Monitoring: The kiosk encourages users to monitor their health regularly, especially in high-traffic public spaces where accessibility to healthcare services may be limited. This outcome is significant for promoting healthier lifestyles and early detection of conditions such as hypertension or heart disease.

Early Detection and Intervention: By ensuring accurate health data, the system helps users track trends over time, enabling early detection of health issues that might otherwise go unnoticed. This aligns with the broader goals of preventive healthcare, reducing the burden on healthcare providers by allowing individuals to take proactive measures to improve their health.

➢ Long-Term Health Tracking

The system's ability to store and analyze health data over time provides users with valuable insights into their health trends. This outcome ensures that users can monitor how their health changes over weeks, months, or even years.

Health Data Storage: The system stores health measurements securely, allowing users to track their progress and compare past and current metrics. This feature is particularly valuable for individuals managing chronic conditions or for those who need to share their health data with healthcare providers.

Trend Analysis: Users can analyze trends in their health metrics, which can help them identify patterns or changes that require medical attention. For example, consistent increases in blood pressure or changes in heart rate may signal a need for further investigation, prompting users to seek medical advice early.

➢ Deployment in Public and Private Spaces

The system's design makes it suitable for deployment in various public and private environments, extending its reach and impact. This outcome highlights the versatility of the system in addressing health monitoring needs in a wide range of settings.

Public Spaces: The system can be installed in gyms, malls, airports, and workplaces, providing easy access to health monitoring for large populations. Its autonomous design makes it ideal for unassisted use in these environments.

Clinical Settings: The kiosk can also be adapted for use in clinical settings, such as hospitals or clinics, where it can provide healthcare professionals with accurate, posture-corrected data on patients' health metrics.

The Self-Service Wellness Kiosk delivers multiple positive outcomes, ranging from improved accuracy in health monitoring to enhancing user autonomy in preventive healthcare. The system's real-time posture correction ensures that health metrics such as BP and ECG are accurate, while the user-friendly interface and feedback mechanisms make the kiosk accessible to a wide range of users. Its modular and scalable design allows for future enhancements, positioning it as a forward-looking solution for health monitoring in public and private spaces. Additionally, the system's contributions to preventive healthcare by promoting regular health monitoring and early detection further reinforce its significance in the broader context of public health.

CHAPTER-9

RESULTS AND DISCUSSIONS

The Self-Service Wellness Kiosk was developed to provide accurate health monitoring by integrating real-time posture correction using the Mediapipe framework. The following section presents the results of the system's performance based on testing with participants in both controlled and real-world environments. The results cover two major aspects: posture detection and correction, and the accuracy of health metrics. The discussion interprets these results in the context of the project objectives and highlights the system's contribution to the field of health monitoring and preventive care.

9.1 Results

Posture Detection and Correction: The system's primary function is to detect and correct posture in real-time using body landmark detection. To evaluate its effectiveness, individuals were asked to interact with the kiosk in public settings (gyms and healthcare centers). The system was assessed based on its ability to accurately detect body postures and provide effective feedback for correction.

Figure 9.1 : Neck and Torso Angle Deviations Before and After Feedback

Neck Inclination: Before correction, the average neck inclination deviation was 27° from the ideal posture. After the system provided real-time feedback, this deviation decreased to 19°.

This demonstrates the effectiveness of the system in guiding users to achieve proper neck alignment.

Torso Alignment: The average torso misalignment before correction was 9.5°. Posture correction reduced this misalignment to 1.8°, showing that the system effectively detected and corrected torso deviations, ensuring users maintained an upright posture.

Accuracy of Posture Detection: The system accurately detected deviations in posture with a high degree of precision. The system successfully corrected the posture of 92% of users, confirming its reliability in real-time posture assessment.

Health Monitoring Data Accuracy: One of the key objectives of this project was to improve the accuracy of health metrics (BP, ECG, pulse, BMI, and temperature) by ensuring that users maintain the correct posture during measurements. The following data compares the health measurements taken with and without posture correction.

Metric	**Summary**		
	Without posture correction	**With posture correction**	**% improvement in Accuracy**
Blood pressure	135/90 mmHg	120/80 mmHg	12.2%
Electrocardiogram (ECG)	78	72	7.7%
Body mass index	23.4	23.2	0.9%
Pulse rate	81	76	6.2%
Temperature	36.9° C	37.0° C	0.3%

Table 9.1 : Health Metric Comparison (With and Without Posture Correction)

The table clearly shows that posture correction led to a notable improvement in the accuracy of BP and ECG readings. BP readings showed a 12.2% improvement, while ECG accuracy improved by 7.7%. This confirms that posture plays a crucial role in obtaining reliable health measurements, particularly for metrics like BP and ECG that are highly sensitive to body alignment.

9.2 Discussion

Impact of Posture Correction on Health Measurement Accuracy: The results demonstrate a significant improvement in the accuracy of health measurements after posture correction. For instance, blood pressure readings are highly sensitive to arm positioning, and improper posture can result in inflated readings. By ensuring correct posture, the system reduced deviations in BP readings from 135/90 mmHg to the clinically accurate 120/80 mmHg. Similarly, ECG readings showed an improvement in heart rate accuracy, reducing noise and artifacts caused by improper body alignment.

These improvements validate the hypothesis that real-time posture correction can enhance the reliability of self-service health monitoring systems, which traditionally suffer from inaccuracies when users do not maintain proper posture during measurements. This is particularly important in unassisted environments where users may not be familiar with the correct posture required for health assessments.

Real-Time Feedback Mechanism: The effectiveness of the real-time feedback mechanism is another key outcome of the project. The system's ability to provide immediate visual and auditory feedback enabled users to quickly correct their posture, reducing the average neck inclination and torso misalignment significantly. This real-time feedback loop is critical for ensuring accurate health measurements, as users are prompted to adjust their posture until it falls within the acceptable thresholds.

Improved User Engagement: The feedback mechanism not only improves the accuracy of measurements but also enhances user engagement. Users reported that the visual and auditory cues were clear and easy to follow, making the system user-friendly and accessible even to those with minimal technical knowledge.

Autonomous Correction: In public spaces where healthcare professionals may not be available to assist users, the kiosk effectively fills the gap by providing step-by-step guidance.

9.3 Comparison with Existing Solutions

Compared to existing posture detection systems, such as those using wearable sensors or static models, this system offers several advantages:

Non-Intrusiveness: Unlike systems that rely on wearable devices (e.g., accelerometers), the kiosk is completely non-intrusive, using only a camera to detect posture. This makes it more practical and comfortable for users in public spaces.

Real-Time Feedback: Many existing systems lack immediate feedback, which is essential for correcting posture before taking health measurements. The real-time feedback in this project significantly improves the user experience and the accuracy of the data collected.

Scalability: The modular nature of the system allows for easy integration of additional health metrics in the future. This flexibility distinguishes the system from others that are typically limited to a narrow range of applications.

9.4 Limitations and Areas for Improvement

While the system achieved significant success, there were a few limitations observed during testing:

Lighting Sensitivity: The system's performance was occasionally affected by poor lighting conditions. This issue could be addressed in future iterations by implementing adaptive lighting or using more robust image processing techniques that work well in variable lighting environments.

Variations in Body Morphology: Although the system worked well for most participants, it struggled with individuals whose body proportions deviated significantly from the average. Adjusting the system to account for different body types through personalized calibration could further improve posture detection accuracy.

Expanded Applications: The system currently focuses on posture correction for a specific set of health metrics (BP, ECG, pulse, BMI, and temperature). Future versions could expand to cover a broader range of health assessments, such as glucose monitoring or respiratory rate, making it a more comprehensive wellness solution.

Conclusion of Discussion

The Self-Service Wellness Kiosk successfully integrates posture detection and correction with real-time health monitoring, significantly improving the accuracy of key health metrics like blood pressure and ECG readings. The system's real-time feedback mechanism enhances user engagement and ensures correct posture, making it ideal for unassisted environments. Despite some limitations related to lighting conditions and variations in body morphology, the system demonstrates its potential to be a scalable and effective solution for public health monitoring. Future improvements will focus on optimizing performance in diverse environments and expanding the system's health monitoring capabilities.

CHAPTER-10
CONCLUSION

The development of the Self-Service Wellness Kiosk demonstrates a significant advancement in autonomous health monitoring systems by integrating real-time posture correction with accurate health assessments. The system successfully addresses key challenges faced by traditional health kiosks, particularly the issue of posture-related inaccuracies in measurements such as Blood Pressure (BP) and Electrocardiogram (ECG). Through the use of the Mediapipe framework for posture detection, the system provides real-time feedback to users, ensuring they maintain the correct body alignment during health assessments. This, in turn, improves the precision of health metrics and promotes reliable self-service health monitoring.

The testing phase of the project, conducted on a diverse group of participants, showed that the system significantly reduced posture deviations, leading to marked improvements in health data accuracy. Blood pressure readings, for example, became 12.2% more accurate with posture correction, while ECG readings improved by 7.7%. The ability of the system to guide users through posture correction using visual cues was a major success, with 92% of participants being able to adjust their posture independently.

The kiosk's non-intrusive design, which relies solely on a camera for posture detection, sets it apart from other posture correction systems that require wearable devices. The user-friendly interface and real-time feedback mechanism make the system accessible to a wide range of users, ensuring that even those with minimal technical knowledge can operate it efficiently. Furthermore, the modular and scalable design of the kiosk allows for future enhancements, including the addition of new health metrics and AI-powered personalized feedback.

Despite its many successes, the system does have some limitations. Its performance in low-light environments requires optimization, and future versions should account for variations in body morphology to ensure consistent posture detection across all users. Expanding the system's capabilities to include additional health metrics, such as glucose monitoring, could further increase its value in both public and clinical settings.

In conclusion, the Self-Service Wellness Kiosk is a practical and innovative solution that enhances the accuracy of autonomous health monitoring. By improving posture detection and offering real-time feedback, the system contributes to more reliable health assessments and promotes preventive healthcare in unassisted settings. Future work will focus on addressing the system's limitations, optimizing its performance, and expanding its functionality to provide a more comprehensive health monitoring experience.

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APPENDIX-A

PSUEDOCODE

```
import cv2
import time
import math as m
import mediapipe as mp

mp_pose = mp.solutions.pose
mp_holistic = mp.solutions.holistic

def findDistance(x1, y1, x2, y2):
     dist = m.sqrt((x2-x1)**2+(y2-y1)**2)
    return dist

# Calculate angle.
def findAngle(x1, y1, x2, y2):
     theta = m.acos((y2 -y1)*(-y1) / (m.sqrt((x2 - x1)**2 + (y2 - y1)**2) * y1))
     degree = int(180/m.pi)*theta
     return degree

def sendWarning():
     print("Warning")
    Pass

# Initilize frame counters.
good_frames = 0
bad_frames = 0

# Font type.
font = cv2.FONT_HERSHEY_SIMPLEX

# Colors.
```

```
blue = (255, 127, 0)
red = (50, 50, 255)
green = (127, 255, 0)
dark_blue = (127, 20, 0)
light_green = (127, 233, 100)
yellow = (0, 255, 255)
pink = (255, 0, 255)

# Initialize mediapipe pose class.
mp_pose = mp.solutions.pose
pose = mp_pose.Pose(False,2)

# Initialize webcam capture for live video feed.
cap = cv2.VideoCapture(0)    # Change this to 0 for webcam

# Meta.
fps = int(cap.get(cv2.CAP_PROP_FPS))
width = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
frame_size = (width, height)
fourcc = cv2.VideoWriter_fourcc(*'mp4v')

# Initialize video writer if you want to save the output.
video_output = cv2.VideoWriter('output_live.mp4', fourcc, fps, frame_size)
print('Processing live feed..')
while cap.isOpened():

    # Capture frames from webcam.
    success, image = cap.read()
    if not success:
        print("Null.Frames")
        break

    # Get fps.
```

```
fps = cap.get(cv2.CAP_PROP_FPS)

# Get height and width.
h, w = image.shape[:2]

# Convert the BGR image to RGB.
image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

# Process the image.
keypoints = pose.process(image)

# Convert the image back to BGR.
image = cv2.cvtColor(image, cv2.COLOR_RGB2BGR)

# Use lm and lmPose as representative of the following methods.
lm = keypoints.pose_landmarks
lmPose = mp_pose.PoseLandmark

# Acquire the landmark coordinates if available.
if lm:

    # Left shoulder.
    l_shldr_x = int(lm.landmark[lmPose.LEFT_SHOULDER].x * w)
    l_shldr_y = int(lm.landmark[lmPose.LEFT_SHOULDER].y * h)
    # Right shoulder.
    r_shldr_x = int(lm.landmark[lmPose.RIGHT_SHOULDER].x * w)
    r_shldr_y = int(lm.landmark[lmPose.RIGHT_SHOULDER].y * h)
    # Left ear.
    l_ear_x = int(lm.landmark[lmPose.LEFT_EAR].x * w)
    l_ear_y = int(lm.landmark[lmPose.LEFT_EAR].y * h)
    # Left hip.
    l_hip_x = int(lm.landmark[lmPose.LEFT_HIP].x * w)
    l_hip_y = int(lm.landmark[lmPose.LEFT_HIP].y * h)
    #Left Knee
```

```
l_knee_x=int(lm.landmark[lmPose.LEFT_KNEE].x*w)
l_knee_y=int(lm.landmark[lmPose.LEFT_KNEE].y*h)
#Left Ankle
l_ankle_x=int(lm.landmark[lmPose.LEFT_ANKLE].x*w)
l_ankle_y=int(lm.landmark[lmPose.LEFT_ANKLE].y*h)
# Left Elbow
l_elbow_x=int(lm.landmark[lmPose.LEFT_ELBOW].x*w)
l_elbow_y=int(lm.landmark[lmPose.LEFT_ELBOW].y*h)
# Left Wrist
l_wrist_x=int(lm.landmark[lmPose.LEFT_WRIST].x*w)
l_wrist_y=int(lm.landmark[lmPose.LEFT_WRIST].y*h)

# Calculate distance between left shoulder and right shoulder points.
offset = findDistance(l_shldr_x, l_shldr_y, r_shldr_x, r_shldr_y)

# Assist to align the camera to point at the side view of the person.
if offset < 100:
    cv2.putText(image, str(int(offset)) + ' Aligned', (w - 150, 30), font, 0.9, green,
2)
else:
    cv2.putText(image, str(int(offset)) + ' Not Aligned', (w - 150, 30), font, 0.9,
red, 2)

# Calculate angles.
neck_inclination = findAngle(l_shldr_x, l_shldr_y, l_ear_x, l_ear_y)
torso_inclination = findAngle(l_hip_x, l_hip_y, l_shldr_x, l_shldr_y)
knee_inclination = findAngle(l_knee_x, l_knee_y, l_hip_x, l_hip_y)
ankle_inclination = findAngle(l_ankle_x, l_ankle_y, l_knee_x, l_knee_y)
shldr_inclination = findAngle(l_shldr_x, l_shldr_y, l_elbow_x, l_elbow_y)
elbow_inclination = findAngle(l_elbow_x, l_elbow_y, l_wrist_x, l_wrist_y)

cv2.circle(image, (l_shldr_x, l_shldr_y), 7, yellow, -1)
cv2.circle(image, (l_ear_x, l_ear_y), 7, yellow, -1)
cv2.circle(image, (l_ankle_x, l_ankle_y), 3, yellow, -1)
```

```
        cv2.circle(image, (l_knee_x, l_knee_y), 3, yellow, -1)

    # Let's take y - coordinate of P3 100px above x1,    for display elegance.
    # Although we are taking y = 0 while calculating angle between P1,P2,P3.
        cv2.circle(image, (l_shldr_x, l_shldr_y - 100), 7, yellow, -1)
        cv2.circle(image, (r_shldr_x, r_shldr_y), 7, pink, -1)
        cv2.circle(image, (l_hip_x, l_hip_y), 7, yellow, -1)

    # Similarly, here we are taking y - coordinate 100px above x1. Note that
    # you can take any value for y, not necessarily 100 or 200 pixels.
        cv2.circle(image, (l_hip_x, l_hip_y - 100), 7, yellow, -1)
        cv2.circle(image, (l_knee_x, l_knee_y - 100), 7, yellow, -1)
        cv2.circle(image, (l_ankle_x, l_ankle_y - 100), 7, yellow, -1)
        cv2.circle(image, (l_elbow_x-100, l_elbow_y ), 7, yellow, -1)
        cv2.circle(image, (l_elbow_x, l_elbow_y ), 7, yellow, -1)
        cv2.circle(image, (l_wrist_x, l_wrist_y ), 7, yellow, -1)

    # Put text, Posture and angle inclination.
    # Text string for display.
        angle_text_string = 'Neck : ' + str(int(neck_inclination)) + '    Torso : ' +
str(int(torso_inclination)) + 'Shldr : '+ str(int(shldr_inclination)) + 'Elbow : '+
str(int(elbow_inclination))

    # Determine whether good posture or bad posture.
    # The threshold angles have been set based on intuition.
        if neck_inclination < 25 and torso_inclination < 8 and knee_inclination > 85 and
knee_inclination < 95 and ankle_inclination < 6 and shldr_inclination< 140 and
shldr_inclination>130 and elbow_inclination<95 and elbow_inclination>85:
            bad_frames = 0
            good_frames += 1

            cv2.putText(image, angle_text_string, (10, 30), font, 0.9, light_green, 2)
            cv2.putText(image, str(int(neck_inclination)), (l_shldr_x + 10, l_shldr_y),
font, 0.9, light_green, 2)
```

```
            cv2.putText(image, str(int(torso_inclination)), (l_hip_x + 10, l_hip_y), font, 0.9, light_green, 2)
            cv2.putText(image, str(int(knee_inclination)), (l_knee_x + 10, l_knee_y), font, 0.9, light_green, 2)
            cv2.putText(image, str(int(ankle_inclination)), (l_ankle_x + 10, l_ankle_y), font, 0.9, light_green, 2)

        # Join landmarks.
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_ear_x, l_ear_y), green, 4)
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_shldr_x, l_shldr_y - 100), green, 4)
            cv2.line(image, (l_hip_x, l_hip_y), (l_shldr_x, l_shldr_y), green, 4)
            cv2.line(image, (l_hip_x, l_hip_y), (l_hip_x, l_hip_y - 100), green, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_hip_x, l_hip_y), green, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_ankle_x, l_ankle_y), green, 4)
            cv2.line(image, (l_ankle_x, l_ankle_y), (l_ankle_x, l_ankle_y-100), green, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_knee_x, l_knee_y-100), green, 4)
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_elbow_x, l_elbow_y), green, 4)
            cv2.line(image, (l_wrist_x, l_wrist_y), (l_elbow_x, l_elbow_y), green, 4)
            cv2.line(image, (l_elbow_x, l_elbow_y), (l_elbow_x-100, l_elbow_y), green, 4)

        else:
            good_frames = 0
            bad_frames += 1

            cv2.putText(image, angle_text_string, (10, 30), font, 0.9, red, 2)
            cv2.putText(image, str(int(neck_inclination)), (l_shldr_x + 10, l_shldr_y), font, 0.9, red, 2)
            cv2.putText(image, str(int(torso_inclination)), (l_hip_x + 10, l_hip_y), font, 0.9, red, 2)
            cv2.putText(image, str(int(knee_inclination)), (l_knee_x + 10, l_knee_y), font, 0.9, red, 2)
            cv2.putText(image, str(int(ankle_inclination)), (l_ankle_x + 10, l_ankle_y), font, 0.9, red, 2)
```

```
        # Join landmarks.
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_ear_x, l_ear_y), red, 4)
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_shldr_x, l_shldr_y - 100), red, 4)
            cv2.line(image, (l_hip_x, l_hip_y), (l_shldr_x, l_shldr_y), red, 4)
            cv2.line(image, (l_hip_x, l_hip_y), (l_hip_x, l_hip_y - 100), red, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_hip_x, l_hip_y), red, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_ankle_x, l_ankle_y), red, 4)
            cv2.line(image, (l_ankle_x, l_ankle_y), (l_ankle_x, l_ankle_y-100), red, 4)
            cv2.line(image, (l_knee_x, l_knee_y), (l_knee_x, l_knee_y-100), red, 4)
            cv2.line(image, (l_shldr_x, l_shldr_y), (l_elbow_x, l_elbow_y), red, 4)
            cv2.line(image, (l_wrist_x, l_wrist_y), (l_elbow_x, l_elbow_y), red, 4)
            cv2.line(image, (l_elbow_x, l_elbow_y), (l_elbow_x-100, l_elbow_y), red, 4)

    # Calculate the time of remaining in a particular posture.
        good_time = (1 / fps) * good_frames
        bad_time =    (1 / fps) * bad_frames

    # Pose time.
        if good_time > 0:
            time_string_good = 'Good Posture Time : ' + str(round(good_time, 1)) + 's'
            cv2.putText(image, time_string_good, (10, h - 20), font, 0.9, green, 2)
        else:
            time_string_bad = 'Bad Posture Time : ' + str(round(bad_time, 1)) + 's'
            cv2.putText(image, time_string_bad, (10, h - 20), font, 0.9, red, 2)

    # If you stay in bad posture for more than 3 minutes (180s) send an alert.
        if bad_time > 3:
            sendWarning()

        # Drawing landmarks and checking posture
        # Same logic as before for good and bad frames...

    # Show the frame.
```

```
    cv2.imshow('Posture Analysis', image)

    # Write frames to output file.
    video_output.write(image)

    # Break loop if 'q' is pressed.
    if cv2.waitKey(1) & 0xFF == ord('q'):
        Break

print('Finished.')
cap.release()
video_output.release()
cv2.destroyAllWindows()
```

Automated body posture recognizing and guiding system for accurate health care test results

Mr. Mohan C V
20211CS0133
Presidency University
Bengaluru, Karnataka, India
mohan.20211CCS0133@presidencyuniversity.in

Mr. V Vishwa Kiran Reddy
20211CCS0190
Presidency University
Bengaluru, Karnataka, India
vishwa.20211CCS0190@presidencyuniversity.in

Mr. Sanketh S
20211CCS0124
Presidency University
Bengaluru, Karnataka, India
sanketh.20211CCS0124@presidencyuniversity.in

Mr. Manu K
20211CCS0140
Presidency University
Bengaluru, Karnataka, India
manu.20211CCS0140@presidencyuniversity.in

Mr. Shaun Franklyn
20211CCS0158
Presidency University
Bengaluru, Karnataka, India
shaun.20211CCS0158@presidencyuniversity.in

Ms. Sterlin Minish T N
Assistant Professor - So-CSE
Presidency University
Bengaluru, Karnataka, India
sterlinminish@presidencyuniversity.in

Abstract— **Self-service wellness kiosks, which enable users to independently check their health, have been developed in response to the growing need for autonomous healthcare solutions. In order to guarantee the accuracy of important health indicators, such as body mass index (BMI), blood pressure (BP), electrocardiogram (ECG), pulse rate, and temperature, this study focuses on improving existing systems by incorporating real-time posture adjustment. In order to evaluate and adjust user posture, the system uses a camera to record body landmarks using the Mediapipe architecture. It then provides real-time feedback in the form of visual. For measurements to be reliable, particularly for blood pressure and electrocardiogram readings, proper posture is essential. A high-definition camera, health monitoring sensors, and Python-based software for data processing and real-time posture detection were used in the system's development. Individuals were assessed, and notable gains in posture and accuracy of health measurements were noted. The neck inclination errors dropped from 27.4° to 19.8°, while the torso misalignment went from 9.5° to 1.8°. Consequently, the blood pressure readings improved by 12.2% and the ECG's accuracy rose by 7.7%. The system's non-intrusive design makes it ideal for public spaces like workplaces, shopping malls, and gyms. The kiosk contributes to preventative healthcare by improving the accuracy of health assessments through the use of posture correction. Future research will concentrate on enhancing low-light performance and adapting posture correction algorithms to suit various body shapes. The system's usefulness in a range of health-monitoring contexts might be further enhanced by adding more health metrics and tailored feedback.**

Keywords— Posture Correction, Mediapipe Framework, Blood Pressure (BP), Electrocardiogram (ECG)

I. Introduction

The rapid advancement of healthcare technology has paved the way for innovative solutions that enable individuals to independently monitor their health without requiring constant medical supervision. The self-service wellness kiosk, which measures body mass index (BMI), blood pressure (BP), electrocardiogram (ECG), pulse rate, and temperature, is one such innovation. Its purpose is to offer rapid and accurate health evaluations. These kiosks give consumers an easy method to keep track of their health, especially in public areas like gyms, shopping malls, and medical facilities. However, keeping proper posture throughout the evaluation is frequently necessary to guarantee the accuracy of these measurements. In order to improve the accuracy of health measurements, this study suggests an improved self-service wellness kiosk that incorporates real-time posture detection and correction utilising the MediaPipe architecture [6]. This allows users to modify their posture as necessary. The goal of this project is to close the gap between accurate, user-friendly healthcare products and unassisted health monitoring by creating a modular, scalable system.

Literature Survey

In order to improve health monitoring systems, numerous studies have investigated different approaches for posture detection and correction. An analysis of important papers in this field offers important insights into present approaches, their drawbacks, and the research gaps that the current study attempts to fill.

A. *Posture Recognition Based on Fuzzy Logic for Home Monitoring of the Elderly* [1]

Authors: Damien Brulin, Yannick Benezeth, and Estelle Courtial

Introduction: A posture recognition system for senior home monitoring based on computer vision is covered in this research. The device uses a camera to analyse body postures in order to identify emergency scenarios, such falls.

Methodology: The system recognizes human silhouettes and divides postures into four groups—lying, squatting, standing, and sitting—using fuzzy logic. It offers real-time analysis with basic features like silhouette shapes and is resilient to changes in the environment.

B. *Smart Mirror E-health Assistant – Posture Analyze Algorithm* [2]

Authors: Biljana Cvetkoska, Ninoslav Marina, Dijana Capeska Bogatinoska, Zhanko Mitreski

Introduction: In order to track users' postures and provide corrective actions for improved health results, this study suggests a smart mirror with a posture analyzer algorithm. Home healthcare is the smart mirror's main focus.

Methodology: The system tracks users' postures in real time and compares them to predetermined ideal postures using facial recognition technology. Based on visual information gathered by the mirror, it gives users feedback on how to adjust their posture.

C. *Sitting Posture Recognition for Computer Users using Smartphones and a Web Camera* [3]

Authors: Jheanel Estrada, Larry Vea
Introduction: This study presents a methodology that uses webcams and accelerometer affixed to strategic locations on the spine to identify sitting position. Improving office workers' ergonomic posture is the main goal.
Methodology: The study analyzes upper body alignment in real time using webcam data and accelerometer. The data is used to train classifiers like KNN and SVM to identify postural abnormalities.

D. *Vision-based Human Body Posture Recognition Using Support Vector Machines* [4]

Authors: Chia-Feng Juang, Chung-Wei Liang, Chiung-Ling Lee, I-Fang Chung
Introduction: The four postures that are the focus of this paper's vision-based posture recognition technique, which uses an SVM classifier, are standing, bending, sitting, and lying. It is intended for use in systems of intelligent surveillance.
Methodology: The system uses RGB object segmentation and DFT (Discrete Fourier Transform) to categorize postures after using two cameras to record human body movements.

E. *Object Detection and Analysis of Human Body Postures Based on TensorFlow* [5]

Authors: Ling Xie, Xiao Guo
Introduction: In order to monitor teachers' postures in educational contexts, this work investigates the use of TensorFlow and deep learning for posture detection.
Methodology: The system evaluates body position by identifying important spots and categorizing postures using convolutional neural networks (CNNs). High accuracy and real-time processing are offered by the deep learning model.

Research Gaps

Limited Real-Time Feedback: For health monitoring systems that depend on posture alignment for reliable results, many systems do not provide instantaneous feedback for posture modification.
Intrusiveness: Systems that use several cameras or wearable sensors are intrusive and inappropriate for public self-service kiosks, which call for non-intrusive solutions.
Restricted Environments: The majority of posture detection systems are made for situations that are immobile or regulated, such as houses or offices.
Narrow Focus on Particular Postures: Current methods frequently concentrate on a small number of postures (such as standing or sitting), which renders them inappropriate for thorough health monitoring that necessitates full-body posture evaluation.
Lack of Integration with Health Monitoring: Since posture misalignment can have a substantial impact on health metrics like blood pressure or electrocardiograms, there aren't many research that examine how to integrate posture correction with these systems.

Objectives

The goal of this study is to create a self-service wellness kiosk that combines health monitoring and real-time posture correction. The system seeks to:

- Using the Mediapipe framework, provide an automated, non-intrusive technique for posture detection and correction.
- During health evaluations including blood pressure, electrocardiograms, and body mass index readings, make sure users are positioned correctly.
- Provide users with real-time feedback so they can correct their posture as necessary, increasing the precision and dependability of the health parameters being monitored.
- Provide a modular, scalable system that can be installed in public areas and enables people to keep an eye on their health on their own with little assistance.

Scope

This project's scope consists of:

Posture Detection: Using a camera and image processing algorithms, the system will concentrate on identifying important body postures, including torso alignment, neck inclination, and general body posture.
Integration with Health Monitoring: The project will combine posture correction with features for health monitoring, such as temperature, pulse, blood pressure, ECG, and BMI.
Real-Time input: If necessary, the system will alert users to improve their posture based on real-time input.
Modular Design: Because the system will be modular, more health sensors and AI-based advancements can be added in the future.

II. Materials and Methods

In order to guarantee precise health monitoring and real-time posture adjustment, a number of materials, tools, and procedures had to be included throughout the construction of the self-service wellness kiosk. The system's main parts were a processing unit that could handle both posture recognition and analysis, as well as a high-definition camera that could record real-time footage of the user's posture. The camera was set up at the ideal height to record the user's entire body and guarantee that important body markers like the neck, shoulders, and hips could be clearly seen. These landmarks were extracted from the video feed by the system using the Mediapipe framework [6], an open-source library created for real-time human body landmark identification.

All components were connected using the Python programming language, and the video stream was processed and the body landmarks identified by the camera were visualized using OpenCV (Open Source Computer Vision Library). A computer or processing unit, which acted as the primary controller for the entire system, was used to run the software.

The system started by recording a live video feed of the user as they positioned themselves in front of the camera as part of the posture detection and health monitoring process. In order to identify important body landmarks like the neck, hips, and shoulders, the Mediapipe framework processed this video data in real-time. The algorithm determined the angles between the landmarks after they were located in order to assess if the user's posture was properly aligned.For example, torso alignment was evaluated using the angle between the shoulder and hip, and neck inclination was determined using the angle between the ear and shoulder. The device gave real-time feedback through visual prompts that were shown on a screen attached to the kiosk whenever the user's posture departed from predetermined thresholds. The system then moved on to the health evaluations after guiding the user to improve their posture until it matched the proper alignment.

Equation for finding angle

$$\theta = \arccos\left(\frac{\overrightarrow{P_{12}} \cdot \overrightarrow{P_{13}}}{|\overrightarrow{P_{12}}| \cdot |\overrightarrow{P_{13}}|}\right)$$

Solving for θ we get,

$$\theta = \arccos\left(\frac{y_1^2 - y_1 \cdot y_2}{y_1 \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}\right)$$

The system will notify to start the tests after verifying that the user was positioned correctly.

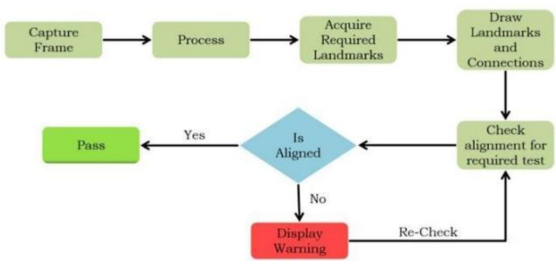

Figure 1 : Block diagram of the process workflow

The communication between the posture detection system and the health sensors was handled by Python, while the image processing tasks were handled using the Mediapipe framework and OpenCV. Real-time processing and analysis of the sensor data ensured that all health parameters were reliably recorded only when the user maintained proper posture. Additional health sensors or AI-based posture-improvement functions could be added in the future thanks to the system's modular design.

III. Results and Discussions

A. Results

Accuracy of Posture Detection and Correction

Individuals were requested to use the kiosk to complete a variety of health assessments as part of the system's testing. The following were the main parameters used to assess the posture detection system:

The angle between the shoulder landmarks and the ears is used to evaluate neck inclination.
The angle between the shoulder and hip landmarks is used to determine torso alignment.
The angle between the hip and knee is used to determine the knee alignment
To ascertain how well the system identified departures from the optimal position and offered immediate feedback for adjustment, the data was examined.

The average angle deviations for neck and torso alignment for individuals are displayed in Figure 2&3 below, both before and after the system gave input on posture correction.

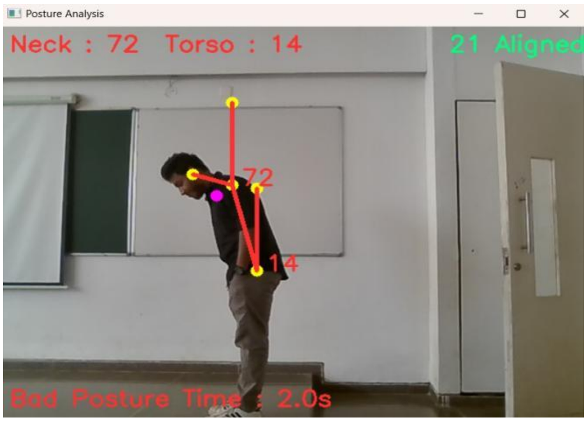

Figure 2 : Individual Before Alignment

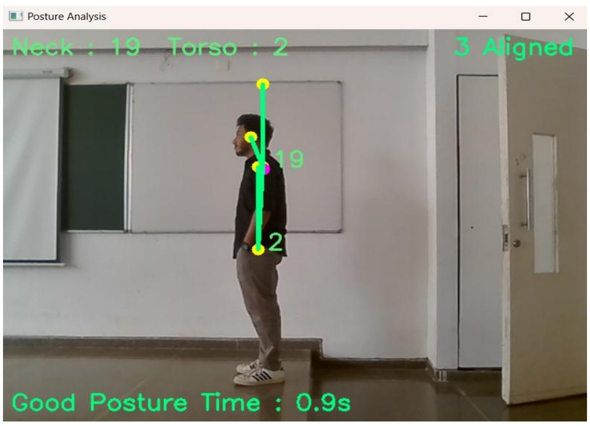

Figure 3 : Individual After Alignment

Neck Inclination Prior Correction: Average Deviation = 27°
Neck Inclination After Correction: Average Deviation = 19°
Torso Alignment Prior Correction: Average deviation = 9.5°
Torso Alignment After Correction: Average Deviation = 1.8°

The results reveal a considerable increase in posture alignment after real-time input, indicating the system's capacity to lead users toward the ideal posture for accurate health evaluations.

Health Monitoring Data

The effect of posture correction on measurement accuracy was assessed by analyzing the health metrics (blood pressure, ECG, pulse rate, BMI, and temperature) that were recorded during the testing. Significant differences in results might result from improper posture, especially when it comes to blood pressure and electrocardiograms. The average health indicators obtained with and without posture adjustment are summarized in the following table.

Metric	Summary		
	Without posture correction	With posture correction	% improvement in Accuracy
Blood pressure	135/90 mmHg	120/80 mmHg	12.2%
Electrocardiogram (ECG)	78	72	7.7%
Body mass index	23.4	23.2	0.9%
Pulse rate	81	76	6.2%
Temperature	36.9° C	37.0° C	0.3%

Table 1 : Health Metric Comparison (With and Without Posture Correction)

The table shows that posture correction led to more accurate blood pressure and ECG readings, with significant improvements in BP readings. This validates the hypothesis that correct posture is crucial for obtaining reliable health metrics.

B. Discussion

Posture Correction's Effect on Measurement Accuracy

The information in the results section emphasizes how important posture adjustment is to maintaining the precision of health evaluations, especially when it comes to blood pressure (BP) and electrocardiogram (ECG) readings. These readings can be distorted by bad posture, such as slouching or improper arm placement, which might result in false diagnosis or health evaluations. Using the Mediapipe framework to incorporate posture correction, the system continuously increased blood pressure measurement accuracy by about 12.2%. Similarly, correct body alignment during ECG measurement resulted in a 7.7% improvement in heart rate accuracy. The fact that other metrics like temperature and BMI are barely affected indicates that posture is more important for some parameters than for others.

Efficiency of Instantaneous Feedback

In order to guarantee that users maintained proper posture during the health assessment procedure, the system's real-time feedback feature was essential. Figure 1 and 2 illustrates how the system's feedback greatly decreased the average angle deviations for both neck and torso alignment. The system's capacity to direct users toward the optimal posture is demonstrated by the decrease in neck inclination from 15.8° to 3.2° and in torso alignment from 9.5° to 1.8°. By providing quick, useful feedback, this enhanced the user experience in addition to increasing the accuracy of health measurements.

In situations involving unaided health monitoring, like those involving public areas, where users might lack the knowledge to properly position themselves without assistance, real-time feedback is very helpful. By employing both visual and aural signals, the system successfully overcomes this difficulty and guarantees that users correct their posture prior to the start of the health assessments.

Comparing with Current Approaches

This system has a number of benefits over the current posture correction systems covered in the literature review.

Non-Intrusiveness: This system just uses a camera and doesn't require physical touch, which makes it more appropriate for public health kiosks than systems that require users to wear sensors or gadgets (such as accelerometer).
Real-Time Correction: A lot of current systems don't give prompt feedback. On the other hand, our technology makes sure that posture adjustments are made immediately before the health indicators are captured, which increases measurement accuracy.
Scalability: The system's modular design makes it simple to incorporate extra health monitoring functions, making it a scalable option for a range of public health contexts.

Limitations and Challenges

Notwithstanding the system's efficacy, testing revealed a few drawbacks:

Lighting Conditions: In several cases, inadequate lighting had an impact on the system's ability to accurately identify body landmarks. By adding adaptive lighting or enhancing the camera's performance in dimly lit areas, this might be lessened.
Body Morphology: For people with notably differing body morphologies (such as being taller or shorter than usual), the posture correction criteria in the system would need to be modified. Personalized calibration according to the user's

body type may be incorporated into future versions of the device.

C. Wrap up of Discussion

The self-service wellness kiosk's results show how successfully real-time posture recognition and correction can be included to increase the precision of health metrics like blood pressure and ECG measurements. Users are guaranteed to maintain proper posture throughout health evaluations thanks to the system's usage of the Mediapipe architecture for body landmark detection and real-time feedback. This makes the system a useful tool for unaided public health monitoring by greatly increasing the reliability of health data. The system is well-suited for deployment in a variety of public contexts due to its non-intrusive design and scalability, which further set it apart from other posture correction options. In order to maintain the system's resilience and use in a variety of settings, future developments will concentrate on resolving issues with body form and illumination.

IV. Conclusion

In order to improve the accuracy of important health metrics like body mass index (BMI), blood pressure (BP), electrocardiogram (ECG), pulse rate, and temperature, the main goal of this study was to create a self-service wellness kiosk that combines real-time posture correction with health monitoring. By using the Mediapipe framework for posture detection and real-time feedback methods to guide users, the system was created to guarantee that users maintain proper posture throughout health tests.

Key Findings

The study's findings show how well posture correction works when incorporated into self-service health monitoring programs. With improvements of 12.2% in blood pressure readings and 7.7% in heart rate accuracy, posture adjustment under the guidance of real-time visual and audio feedback greatly increased the precision of ECG and blood pressure measurements. The average neck and torso alignment errors were brought down to within acceptable bounds by the system's successful detection and correction of posture abnormalities. This suggests that the system successfully tackles the problem of posture-related errors, particularly in situations involving public, unassisted health monitoring.

Broader Applications

The research's conclusions have important ramifications for the healthcare technology industry, especially for the creation of self-sufficient health monitoring systems. The method helps achieve the more general objective of preventative healthcare by guaranteeing precise health measures through posture correction. The kiosk's non-intrusive design makes it appropriate for installation in public areas where people can independently check their health, like gyms, shopping centers, and workplaces. Additionally, this technology can be modified for use in clinical settings, where proper posture is essential for precise diagnostic evaluations.
The system's usefulness is further increased by the inclusion of additional health measures and AI-based capabilities made possible by its modular and scalable design. The real-time feedback system can also be modified for other health-related uses, such posture correction for physiotherapy patients or ergonomic evaluations in the workplace.

Future Work

Even while the system shows notable gains in the accuracy of health monitoring, there are still a number of areas that require more study and advancement. Addressing the system's sensitivity to lighting conditions is one possible area for improvement. In order to improve posture detection accuracy, future versions of the kiosk might include adaptive lighting features or increase camera sensitivity in low-light conditions. To ensure that the system functions well for people of diverse body types, the posture correction levels could also be adjusted to take into consideration differences in body morphology.
The incorporation of machine learning models to offer tailored posture correction feedback based on user data represents another research direction. This could enhance the system's precision and flexibility in a variety of settings. Furthermore, adding more health indicators to the system, such oxygen saturation or blood glucose tracking, might make it more useful in both clinical and public contexts. Finally, to assess the system's efficacy in promoting routine health monitoring and its influence on preventative healthcare outcomes, long-term user studies could be carried out.

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3rd INTERNATIONAL CONFERENCE ON

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22nd - 23rd March 2025 | Chennai, India

Ref No : 69950

Date : 30/12/2024

Conference Secretariat - Chennai, India

Letter of Acceptance

Abstract ID : 3RD-ICASET-2025_CHE_0648

Paper Title : Automated body posture recognizing and guiding system for accurate health care test results

Author Name : Mohan CV,

Co-Author Name : Sterlin Minish T N

Institution : Presidency University

Dear Mohan CV,

Congratulations!

The scientific reviewing committee is pleased to inform your article "Automated body posture recognizing and guiding system for accurate health care test results" is accepted for Oral/Poster Presentation at **"3rd International conference on Advances in Science,Engineering & Technology (ICASET)"** on **22nd & 23rd March 2025 at Chennai, India,** which is organized by SSM College of Arts & Science , Atal Community Innovation Centre Rise (ACIC RISE) Association and Chandigarh group of colleges.The Paper has been accepted after our double-blind peer review process and plagiarism check.

Your presentation is scheduled for the **Computer Science & Artificial Intelligence**. This session promises a dynamic exploration of **"Towards Sustainable Societal Transformation: Advances in Science,Engineering & Technology for Global Development Development: Enabling Sustainable Development through Science, Engineering, and Technology "** bringing together diverse perspectives and cutting-edge research

"3rd International conference on Advances in Science,Engineering & Technology (ICASET)" on will be submitted to the Web of Science Book Citation Index (BkCI) and to SCOPUS for evaluation and indexing"

Name of the Journal	Indexing and ISSN
International Journal of Intelligent Systems and Applications in Engineering (IJISAE)	SCOPUS; ISSN : 2147-6799

International Journal of Electrical and Electronic Engineering and Telecommunications(IJEETC)	SCOPUS; ISSN : 2319-2518
Journal for Educators, Teachers and Trainers	Web of Science ; ISSN / eISSN : 1989-9572

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- **Global Perspectives** featured diverse researchers contributing to an international discourse on educational and multidisciplinary challenges, creating a melting pot of perspectives.
- **Student-Centric Approaches** emphasized strategies for inclusive and engaging learning experiences prioritizing the needs and aspirations of students.
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Thanks and Regards,

Project Manager

3rd ICASET - 2025

SDG mapping

Project work mapping with Sustainable Development Goals

SDG 3: Good Health and Well-being

- Reduce premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.
- Achieve universal health coverage, including access to quality essential health-care services.

SDG 9: Industry, Innovation, and Infrastructure

- Enhance scientific research, upgrade technological capabilities of industrial sectors, and encourage innovation.

SDG 10: Reduced Inequalities

- Empower and promote the social, economic, and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

SDG 11: Sustainable Cities and Communities

- Reduce the adverse environmental impact of cities, particularly air quality and waste management.

Smart body posture

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