

# Wear Your Confidence: Final Report on IoT Concept

## Abstract:

The "Wear Your Confidence" system is an innovative smart clothing solution designed to address poor posture and empower users' overall well-being. It is a system that lies at the intersection of posture management, well-being enhancement, and personal style empowerment, tackling poor posture issues, which has significant implications for physical health, comfort, and confidence.

Starting with the architecture, "Wear Your Confidence" is built on a scalable design to accommodate diverse functionalities and ensure seamless connectivity. Each of the key components/"things" of the architecture are equipped with specific sensors tailored to its functionality.

Firstly, the **Smart Undershirts/Vests**, for posture monitoring, contains posture monitoring sensors (including accelerometers, gyroscopes, and magnetometers to track body orientation, movement, and alignment), and vibration mechanism/vibration motor or actuator (to provide feedback to the user when posture deviations are detected). Secondly, the **Smart Insoles**, for foot health monitoring, contain pressure sensors (to measure the pressure distribution across the foot, identifying discomfort points and areas of high pressure), and motion sensors (like in the smart vests, to track foot movement and gait patterns).

Nextly, **Adaptive Clothing** for comfort optimization, contains temperature sensors (to monitor the temperature around the body or within the clothing, allowing for adaptive temperature control), and motion sensors (to detect changes in posture or movement). Lastly, the **Smart Mirror Integration**, for personalized recommendations, contain body analysis sensors (including cameras or depth sensors for body scanning and analysis, determining body type, and RGB sensors for skin tone, and other characteristics), and light sensors (to adjust the mirror's lighting based on ambient light conditions for accurate body analysis).

All four of these "things" contain connectivity sensors and communication modules/interfaces (like Bluetooth or Wi-Fi modules). This will help transfer data to the smartphone app and other connected devices, and to access the online database for outfit recommendations and style suggestions.

Another crucial role in enhancing user experience and system functionality is played by the context widgets. The key context widgets that the "Wear Your Confidence" system incorporates are the **Posture Feedback Widget** (for real-time feedback on posture deviations and suggests corrective actions), **Foot Health Widget** (to display pressure distribution maps, discomfort points, and recommendations for improved foot health), **Adaptive Comfort Widget** (to adjust clothing settings for optimal comfort based on activity and environmental conditions), and the **Style Recommendation Widget** (to displays curated outfit recommendations based on body characteristics and personal style preferences), among many others, which will be discussed later.

The "Wear Your Confidence" smart clothing system leverages a modular architecture, W3-defined "things," diverse functionalities, and context widgets to revolutionize posture management and well-being. Each of the components play a crucial role to provide users with utmost comfort, by working together to provide real-time posture monitoring, feedback delivery, foot-health analysis, adaptive comfort management, and personalized style recommendations. By combining technical feasibility, personalized insights, and inclusivity, the system offers a comprehensive solution accessible to all users.

### **Application domain and problem:**

As mentioned earlier, "Wear Your Confidence" tackles the pervasive issue of poor posture, which affects individuals of all demographics and has severe long-term effects on health, comfort, and self-esteem. Poor posture is a common problem exacerbated by modern lifestyles characterized by sedentary activities, prolonged sitting, and lack of awareness about proper posture maintenance. The need to address poor posture is crucial for several reasons. Some of them being immediate health impact, long-term health impact, daily comfort, confidence and self-esteem.

Poor posture contributes to musculoskeletal disorders (such as back pain, neck strain, and reduced mobility), leading to discomfort, pain, and reduced quality of life. Addressing poor posture early can prevent chronic conditions and improve long-term health outcomes. Proper posture promotes comfort during daily activities such as sitting, standing, and moving, enhancing overall productivity and engagement. Good posture is also linked to increased confidence, positive body image, and higher self-esteem, influencing social interactions and psychological well-being. Apart from poor posture, "Wear Your Confidence" also addresses the following problem domains:

### **Personal Style Empowerment:**

Personal style is a crucial aspect of self-expression and confidence, as it reflects one's individuality and personality. However, without proper guidance or understanding of fashion, individuals may experience dissatisfaction and encounter challenges in managing their wardrobe effectively. Furthermore, fashion choices can greatly influence how others perceive us in social settings, impacting our confidence levels and overall interactions with others.

### **Comfort Management:**

Adaptive clothing offers comfort by seamlessly adjusting to body movements and environmental changes. This promotes a sense of well-being, which plays an important role in enhancing productivity and overall performance. By prioritizing comfort through adaptive clothing, in professional settings, individuals can experience improved workplace ergonomics, for an increased efficiency and productivity rate throughout their daily activities.

### **Confidence and Self-esteem Enhancement:**

Enhancing confidence and self-esteem is a process that involves addressing posture, style, and comfort. This approach not only fosters a sense of control and empowerment but also helps to

create a positive self-image and overall well-being. By focusing on improving posture, refining personal style, and ensuring comfort, individuals can experience a transformative journey towards greater self-assurance and a positive outlook on themselves and their lives.

The "Wear Your Confidence" system benefits several stakeholders:

1. **Users (Common People):** Individuals of all demographics who seek improved posture, enhanced comfort, personalized style recommendations, and increased confidence.
2. **Healthcare Professionals:** Doctors, physiotherapists, and ergonomics experts benefit from data-driven insights to provide targeted posture correction strategies and preventive care.
3. **Fashion Industry:** Designers, retailers, and manufacturers benefit from promoting inclusivity, offering adaptive clothing options, and personalized fashion recommendations.
4. **Employers and Workplace Productivity Experts:** Companies benefit from improved workplace ergonomics, reduced absenteeism due to posture-related issues, and increased employee productivity and satisfaction.
5. **Insurance Companies:** Reduced musculoskeletal disorders and associated healthcare costs lead to potential savings for insurance providers.
6. **Educational Institutions:** Teachers and educators benefit from promoting healthy posture habits among students and addressing posture-related discomfort in educational settings.
7. **Fitness and Wellness Professionals:** Trainers, coaches, and wellness experts benefit from integrating posture correction strategies into fitness routines and promoting overall well-being.
8. **Technology Providers:** Companies offering smart sensors, AI algorithms, and connectivity solutions benefit from integrating their technologies into the "Wear Your Confidence" system.
9. **Social Media Platforms:** Platforms benefit from user engagement related to style empowerment, well-being enhancement, and sharing achievements related to posture improvement.
10. **Community and Support Groups:** Groups focusing on health, well-being, and self-improvement benefit from promoting posture awareness and providing support for individuals using the system.
11. **Government and Public Health Authorities:** Agencies benefit from promoting initiatives related to posture management, well-being enhancement, and public health education.
12. **Research and Development Institutions:** Researchers and developers benefit from studying the effectiveness of the system, improving its functionalities, and advancing posture management technologies.
13. **Accessibility Advocates:** Advocates benefit from promoting inclusive design principles, accessibility features, and adaptive technologies for diverse user groups.
14. **Media and Influencers:** Media outlets and influencers benefit from showcasing the system's features, promoting posture awareness, and highlighting user success stories.

- 15. Economic Sectors:** Industries such as retail, healthcare, technology, and wellness benefit from the system's impact on consumer behavior, market trends, and industry innovation.

Compared to traditional approaches, the "Wear Your Confidence" system combines providing comfort and confidence. Most of the existing solutions provide only confidence management in terms of apps that require users to allow access to health data and ask users to enter their feelings (like a journal), to understand their mental health. Alternatively, they only focus on comfort management, by providing insights on the user's daily activities.

For example, apps like "Stitch Fix" is an online personal styling service that uses algorithms and human stylists to curate clothing items based on user preferences and style profile. But it does only the style curating. It does not focus on any of the other aspects that we focus on. Another example is the "Fabulous - Daily Self Care", which focuses on self-improvement and well-being through habit-building techniques, including aspects related to confidence and self-care. This app helps users with their mental health, however, it does not address their physical health.

Similarly, for physical health, apps in the market currently focus only on generic exercises that users should do to improve their posture, instead of personalized exercises based on the user itself (like the "Posture Corrector - Back & Shoulder Fitness" application). "Wear Your Confidence" integrates the need for both physical and mental health, thereby ensuring that it is superior to the other applications that follow a more traditional approach.

"Wear Your Confidence" offers several advantages, when compared to traditional methods, such as:

- 1. Real-time Feedback and Personalized Coaching:** The system provides immediate and personalized feedback on posture deviations, fostering continuous awareness and correction, unlike traditional methods that rely on occasional assessments or manual corrections. It addresses specific posture issues and provides targeted exercises, whereas traditional approaches may offer generic posture advice.
- 2. Adaptive Clothing and Empowerment Through Style Recommendations:** The inclusion of adaptive clothing with adjustable features ensures optimal comfort across different situations, promoting freedom of movement and addressing comfort challenges that traditional clothing may not accommodate. Similarly, the smart mirror provides personalized style recommendations based on body characteristics and fashion preferences, empowering users to make confident and stylish choices, unlike traditional methods that may not consider individual style preferences.
- 3. Inclusivity and Integration of Technology:** The system caters to diverse body types, genders, and age groups, promoting inclusivity and accessibility, unlike traditional approaches that may not consider individual differences and needs. This is done by integrating smart sensors, AI algorithms, and connectivity features, the system offers seamless user experience and functionality, allowing for continuous monitoring and adjustments, which traditional methods may lack.

4. **Preventive Care and Long-term Health:** By addressing posture issues early and providing preventive care strategies, the system promotes long-term health outcomes and reduces the risk of chronic conditions, which traditional approaches do not emphasize.
5. **Comprehensive Data Insights:** The system collects and analyzes comprehensive data on posture trends, health correlations, and progress tracking, enabling users and healthcare professionals to make informed decisions and monitor improvements over time, which is not possible with traditional methods.
6. **Enhanced User Engagement:** The system fosters user engagement through gamification elements, rewards for achievements, and community support, encouraging consistent use and adherence to posture improvement strategies, unlike traditional methods that may lack motivation and sustained engagement.
7. **Scalability and Future Integration:** The modular design and integration of established technologies allow for scalability and future integration with advanced features like AI-powered coaching and health data analysis, providing a roadmap for continuous improvement and innovation beyond what traditional approaches can offer.

By addressing several aspects of poor posture and offering a holistic solution encompassing health, comfort, confidence, and style, all at once, the "Wear Your Confidence" system presents a superior approach to posture management compared to traditional methods.

## **Context Widgets:**

Below is a list of context widgets used by the "Wear Your Confidence" system, along with the data each widget requires, and the widget's attributes and methods/callbacks.

### **1. Posture Feedback Widget:**

Data Required:

- Posture data from sensors (e.g., alignment angles, curvature measurements)
- Real-time movement data (e.g., acceleration, orientation)
- User profile data (e.g., age, height)

PostureFeedbackWidget	
□	postureData: object
□	movementData: object
□	userData: object
●	monitorPosture(): void
●	analyseMovementData(movementData: object): void
●	assessPostureAlignment(): void

### **2. Foot Health Widget:**

Data Required:

- Pressure distribution data from smart insoles (e.g., pressure points, weight distribution)
- Gait analysis data (e.g., stride length, foot strike patterns)
- User feedback data (e.g., comfort ratings, pain levels)

<b>C</b>	<b>FootHealthWidget</b>
□	pressureDistributionData: object
□	gaitAnalysisData: object
□	userFeedbackData: object
●	monitorPressureDistribution(): void
●	analyseGaitData(gaitData: object): void
●	provideFootHealthRecommendations(): void

### 3. Adaptive Comfort Widget:

Data Required:

- Environmental data (e.g., temperature, body temperature, humidity)
- User comfort preferences (e.g., fabric type, clothing fit)
- Motion data (e.g., sitting vs. standing)

<b>C</b>	<b>AdaptiveComfortWidget</b>
□	environmentalData: object
□	userPreferences: object
□	motionData: object
●	adjustClothingSettings(environmentData: object, userPreferences: object): void
●	analyseMotionData(motionData: object): void
●	optimizeClothingComfort(): void

### 4. Style Recommendation Widget:

Data Required:

- Body characteristics data (e.g., body type, skin tone)
- User fashion preferences (e.g., style preferences, clothing size) Weather data (e.g., temperature, forecast)

<b>C</b>	<b>StyleRecommendationWidget</b>
□	bodyCharacteristicsData: object
□	userPreferences: object
□	weatherData: object
●	analyseBodyCharacteristics(bodyData: object): void
●	recommendOutfits(weatherData: object, userPreferences: object): void
●	adaptStyleBasedOnWeather(): void

### 5. Activity Tracker Widget:

Data Required:

- Motion sensor data (e.g., step count, activity intensity)
- Posture data during activities (e.g., posture deviations during exercise)
- User goals and targets (e.g., daily steps, active hours)

<b>C</b>	<b>ActivityTrackerWidget</b>
□	motionSensorData: object
□	postureDataDuringActivity: object
□	userGoalsAndTargets: object
●	trackActivity(motionData: object, postureData: object): void
●	setActivityGoals(userGoals: object): void
●	monitorPostureDuringActivities(): void

## 6. Health Insights Widget:

Data Required:

- Comprehensive health data (e.g., posture history, activity levels, sleep quality)
- User input data (e.g., health goals, medical conditions)
- External health data sources (e.g., fitness tracker data, health assessments)

C HealthInsightsWidget	
□ comprehensiveHealthData: object	
□ userInputData: object	
□ externalHealthData: object	
● analyseHealthData(comprehensiveHealthData: object): void	
● generateHealthReports(userInputData: object, externalData: object): void	
● offerHealthRecommendations(): void	

## 7. Personalized Coaching Widget:

Data Required:

- User profile and preferences (e.g., age, fitness level, goals)
- Posture and activity data (e.g., posture deviations, activity trends)
- Coaching content and exercises (e.g., posture correction techniques, fitness routines)

C PersonalizedCoachingWidget	
□ userProfileAndPreferences: object	
□ postureAndActivityData: object	
□ coachingContentAndExercises: object	
● createPersonalizedCoachingProgram(userProfile: object, activityData: object): void	
● deliverCoachingSessions(coachingContent: object): void	
● trackProgressAndFeedback(): void	

## 8. Weather Adaptation Widget:

Data Required:

- Real-time weather data (e.g., temperature, humidity, precipitation)
- User location and travel plans (e.g., GPS coordinates, destination)
- Clothing material properties (e.g., breathability, water resistance)

C WeatherAdaptationWidget	
□ realTimeWeatherData: object	
□ userLocationAndTravelPlans: object	
□ clothingMaterialProperties: object	
● fetchWeatherData(locationData: object): void	
● adjustClothingBasedOnWeather(weatherData: object, clothingProperties: object): void	
● offerWeatherOptimizedOutfits(): void	

## 9. Posture History Widget:

Data Required:

- Historical posture data (e.g., posture trends over days/weeks/months)
- Posture improvement milestones (e.g., achievements, setbacks)
- User feedback and annotations (e.g., pain levels, posture notes)

C PostureHistoryWidget	
□ historicalPostureData: object	
□ postureImprovementMilestones: object	
□ userFeedbackAndAnnotations: object	
● retrievePostureHistoryData(historyData: object): void	
● analysePostureTrends(): void	
● trackProgressAndMilestones(): void	

## 10. Daily Activity Summary Widget:

Data Required:

- Daily activity logs (e.g., steps taken, active hours, sedentary time)
- Posture adherence metrics (e.g., posture correction frequency, duration)
- User preferences for summary content (e.g., key metrics, trends)

C DailyActivitySummaryWidget	
□	dailyActivityLogs: object
□	postureAdherenceMetrics: object
□	summaryContentPreferences: object
●	generateDailyActivitySummary(activityLogs: object, postureMetrics: object): void
●	visualiseActivityTrends(): void
●	offerActivityInsights(): void

## 11. User Preferences Widget:

Data Required:

- User-defined settings and thresholds (e.g., vibration intensity for posture feedback)
- Personal comfort preferences (e.g., preferred clothing adjustments, style choices)
- Privacy settings (e.g., data sharing preferences, consent for feedback collection)

C UserPreferencesWidget	
□	userSettings: object
□	comfortPreferences: object
□	privacySettings: object
●	manageUserPreferences(userSettings: object): void
●	customiseFeedbackThresholds(): void
●	ensurePrivacyAndDataProtection(): void

## 12. Social Integration Widget:

Data Required:

- User social media profiles (e.g., friends, followers, community memberships)
- Achievements and progress data (e.g., posture improvement milestones, challenges completed)
- Social engagement metrics (e.g., likes, shares, comments)

C SocialIntegrationWidget	
□	socialMediaProfiles: object
□	achievementsAndProgressData: object
□	socialEngagementMetrics: object
●	integrateWithSocialPlatforms(socialData: object): void
●	shareAchievementsAndChallenges(): void
●	fosterCommunityEngagement(): void

### 13. Relaxation Techniques Widget:

Data Required:

- Relaxation exercise content (e.g., guided breathing techniques, posture relaxation exercises)
- User stress levels and relaxation preferences (e.g., stress indicators, preferred relaxation methods)
- Biofeedback data (e.g., heart rate variability, stress response)

C RelaxationTechniquesWidget	
□	exerciseContent: object
□	stressLevelsAndPreferences: object
□	biofeedbackData: object
●	offerGuidedRelaxationSessions(exerciseContent: object): void
●	monitorBiofeedbackDuringRelaxation(): void
●	trackStressReductionProgress(): void

### 14. Sleep Quality Monitor Widget:

Data Required:

- Sleep tracking data (e.g., sleep stages, sleep duration, sleep interruptions)
- Posture during sleep (e.g., sleep position, pillow support)
- User sleep goals and sleep hygiene habits (e.g., bedtime routines, sleep environment)

C SleepQualityMonitorWidget	
□	sleepTrackingData: object
□	postureDuringSleep: object
□	sleepGoalsAndHabits: object
●	analyseSleepQuality(sleepData: object): void
●	suggestSleepPostureAdjustments(): void
●	promoteHealthySleepHabits(): void

### 15. Gait Analysis Widget:

Data Required:

- Gait analysis metrics (e.g., stride length, cadence, foot strike patterns)
- Footwear data (e.g., shoe type, cushioning level)
- User mobility challenges or requirements (e.g., orthopedic considerations, mobility aids)

C GaitAnalysisWidget	
□	gaitAnalysisMetrics: object
□	footwearData: object
□	mobilityChallengesAndRequirements: object
●	conductGaitAnalysis(gaitMetrics: object): void
●	recommendFootwearAdjustments(): void
●	supportMobilityNeeds(): void

## 16. Energy Conservation Widget:

Data Required:

- Energy expenditure data (e.g., calorie burn, exertion levels)
- Posture-related energy efficiency metrics (e.g., energy-saving postures, movement patterns)
- User productivity goals and work demands (e.g., work hours, task intensity)

C EnergyConservationWidget	
□	energyExpenditureData: object
□	energyEfficiencyMetrics: object
□	productivityGoalsAndDemands: object
●	optimiseEnergyExpenditure(activityData: object): void
●	suggestEnergySavingPostures(): void
●	enhanceProductivityAndEnergyManagement(): void

## 17. Emergency Assistance Widget:

Data Required:

- Emergency contact information (e.g., phone numbers, medical contacts)
- Posture-related emergency triggers (e.g., prolonged pain signals, sudden discomfort)
- Location data and user safety settings (e.g., GPS coordinates, emergency mode activation)

C EmergencyAssistanceWidget	
□	emergencyContactInfo: object
□	emergencyTriggers: object
□	locationDataAndSafetySettings: object
●	configureEmergencyContacts(emergencyData: object): void
●	triggerEmergencyAssistance(emergencySignals: object): void
●	ensureUserSafetyInEmergencySituations(): void

## 18. Nutritional Guidance Widget:

Data Required:

- Nutritional data (e.g., calorie intake, macronutrient ratios)
- Posture-friendly nutrition tips (e.g., foods that support musculoskeletal health)
- User dietary preferences and restrictions (e.g., allergies, dietary preferences)

C NutritionalGuidanceWidget	
□	nutritionalData: object
□	postureFriendlyNutritionTips: object
□	dietaryPreferencesAndRestrictions: object
●	offerNutritionalRecommendations(nutritionalData: object): void
●	promotePostureSupportiveDietaryChoices(): void
●	trackNutritionalGoalsAndProgress(): void

## 19. Productivity Boost Widget:

Data Required:

- Work environment data (e.g., workstation setup, ergonomic considerations)
- Posture-friendly work practices (e.g., ergonomics, posture breaks)
- User productivity metrics and goals (e.g., task completion rates, productivity challenges)

C	ProductivityBoostWidget
□	workEnvironmentData: object □ postureFriendlyWorkPractices: object □ productivityMetricsAndGoals: object
●	suggestProductivityEnhancements(workEnvironmentData: object): void ● promoteErgonomicWorkPractices(): void ● trackWorkProductivityAndPostureEfficiency(): void

## 20. Posture Gamification Widget:

Data Required:

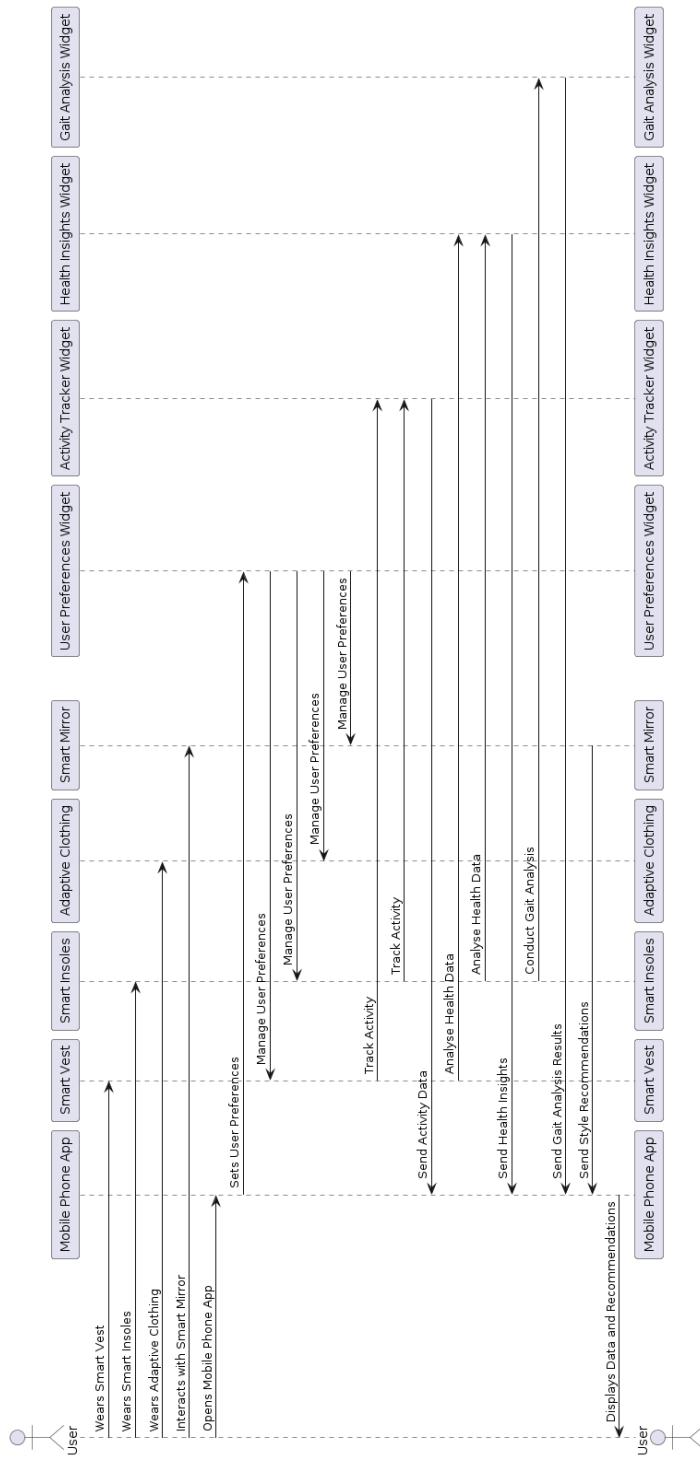
- Gamification elements (e.g., challenges, rewards, leaderboards)
- Posture improvement milestones and progress data (e.g., achievements, posture streaks)
- User engagement metrics (e.g., participation levels, gamified activity completion)

C	PostureGamificationWidget
□	gamificationElements: object □ postureMilestonesAndProgressData: object □ userEngagementMetrics: object
●	gamifyPostureImprovement(challenges: object): void ● rewardPostureAchievements(): void ● fosterUserEngagementThroughGamification(): void

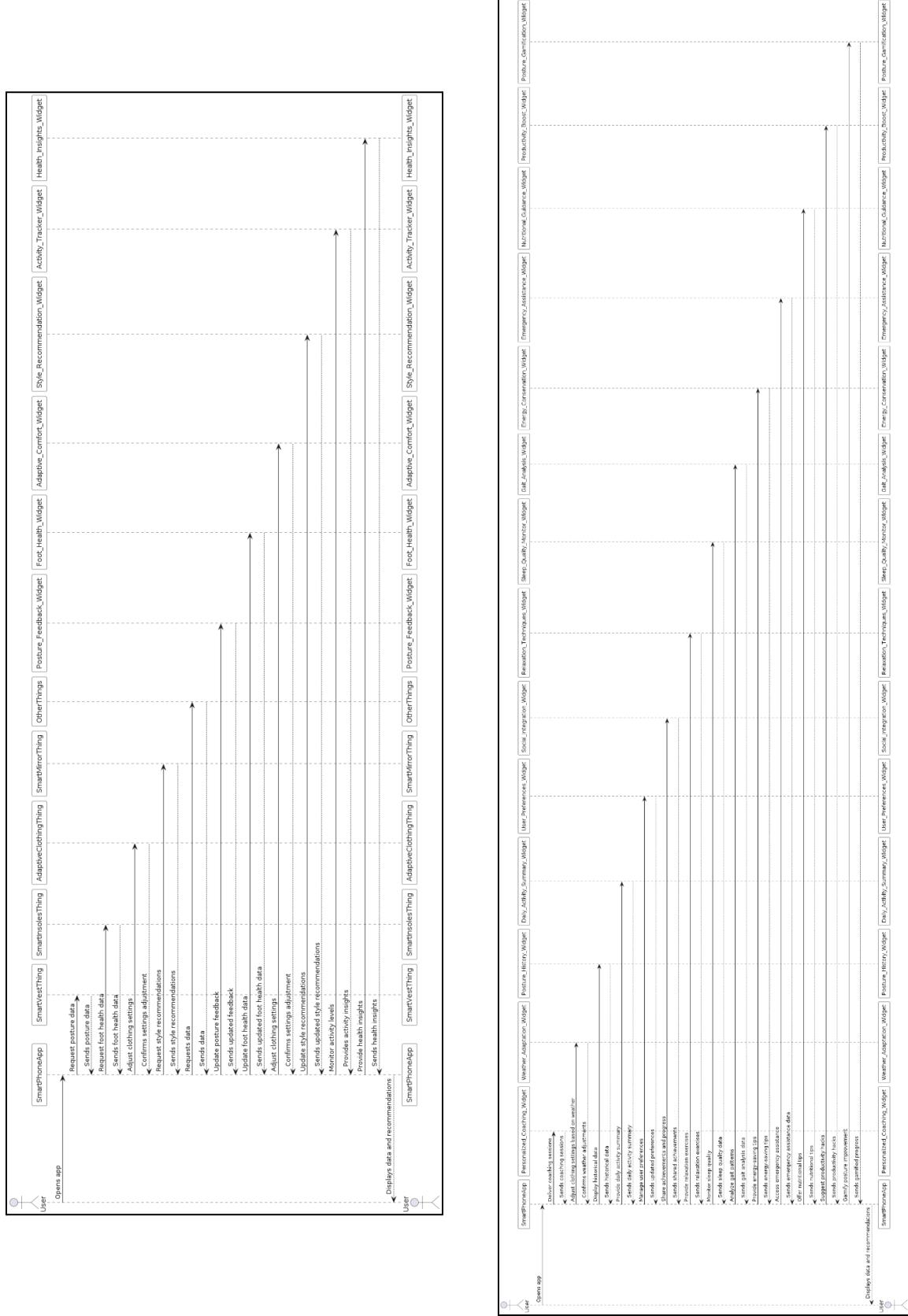
Note that some of the widgets mentioned here are part of the scope of the application, however in the MVP (minimum viable product), some of these features might not be available. For example, the “Social Media Integration Widget” and the “Posture Gamification Widget” will not be seen in the MVP of the app UI. The main widgets will be discussed based on the MVP of the smartphone app UI.

Out of these 20 widgets, 14 of them are **informative widgets** (Posture Feedback Widget, Foot Health Widget, Style Recommendation Widget, Health Insights Widget, Posture History Widget, Daily Activity Summary Widget, Relaxation Techniques Widget, Sleep Quality Monitor Widget, Gait Analysis Widget, Energy Conservation Widget, Emergency Assistance Widget, Nutritional Guidance Widget, Productivity Boost Widget, and Posture Gamification Widget), 4 of them are **collection widgets** (Activity Tracker Widget, Weather Adaptation Widget, User Preferences Widget, Social Integration Widget), and 2 of them are **control widgets** (Adaptive Comfort Widget, and Personalized Coaching Widget). None of these widgets fit into the hybrid category as they primarily fall into one of the other three categories (informative, collection, or control).

To better understand how the widgets work, below is a simple sequence diagram. This shows how the context widgets interact with each other within the “Wear Your Confidence” system to provide users with a comprehensive analysis of their posture, gait, etc.



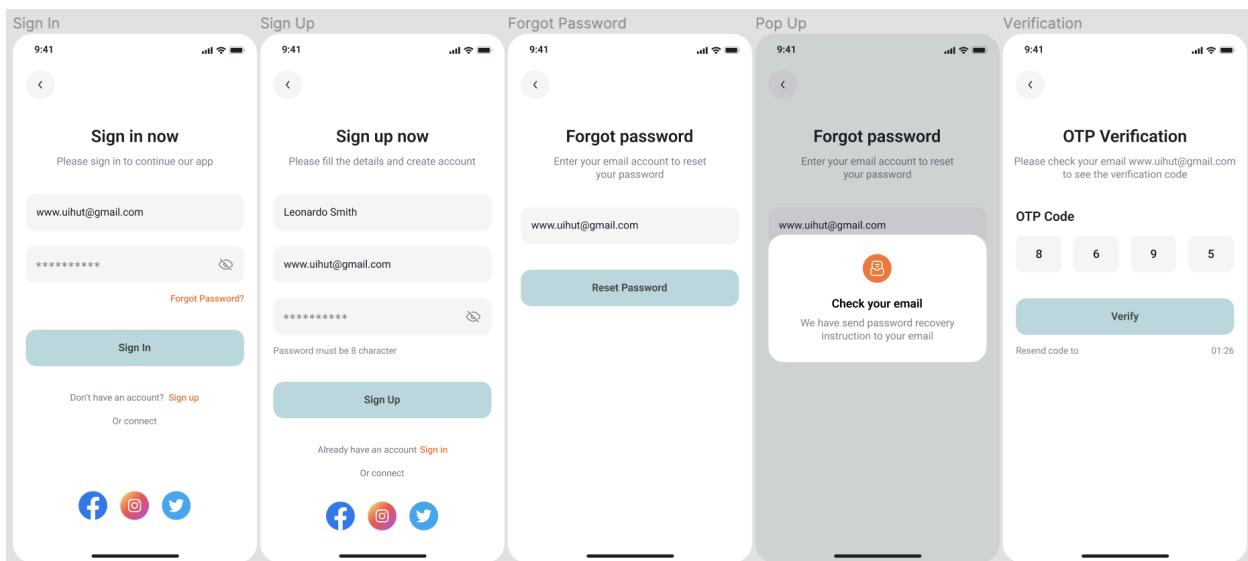
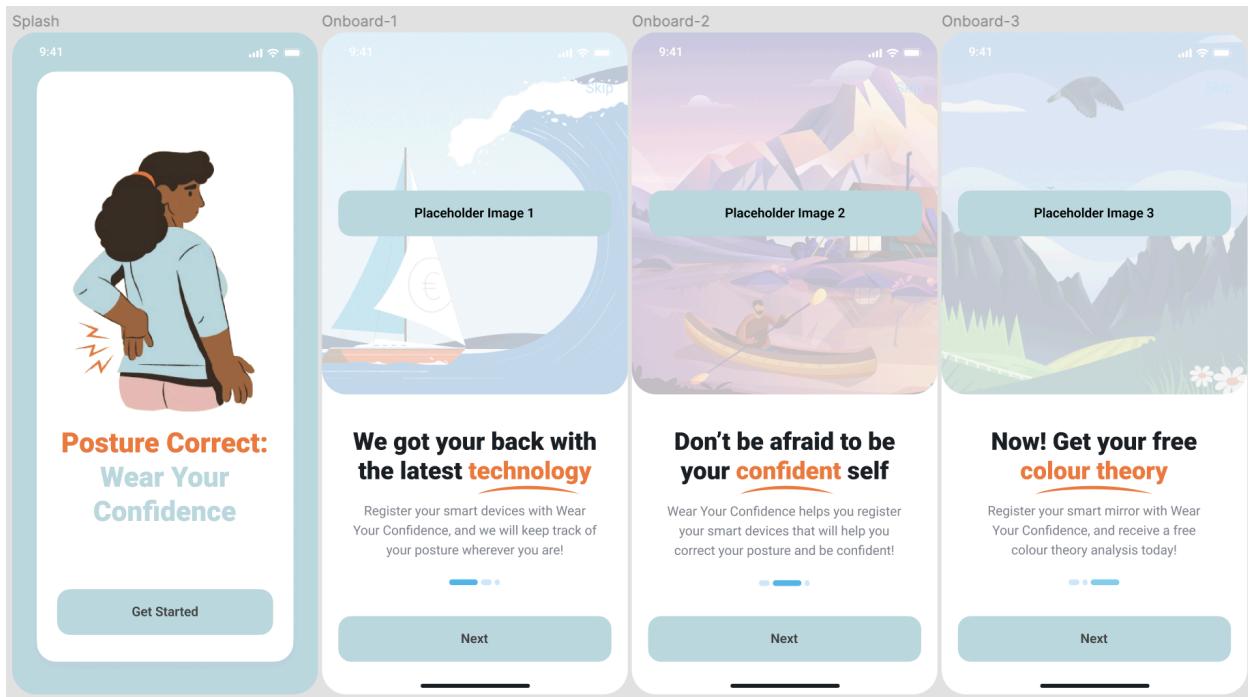
The below sequence diagrams are a much more detailed version of the sequence diagram above. It shows all of the different widgets and how they interact with the smartphone app, which in turn, interacts with the user.



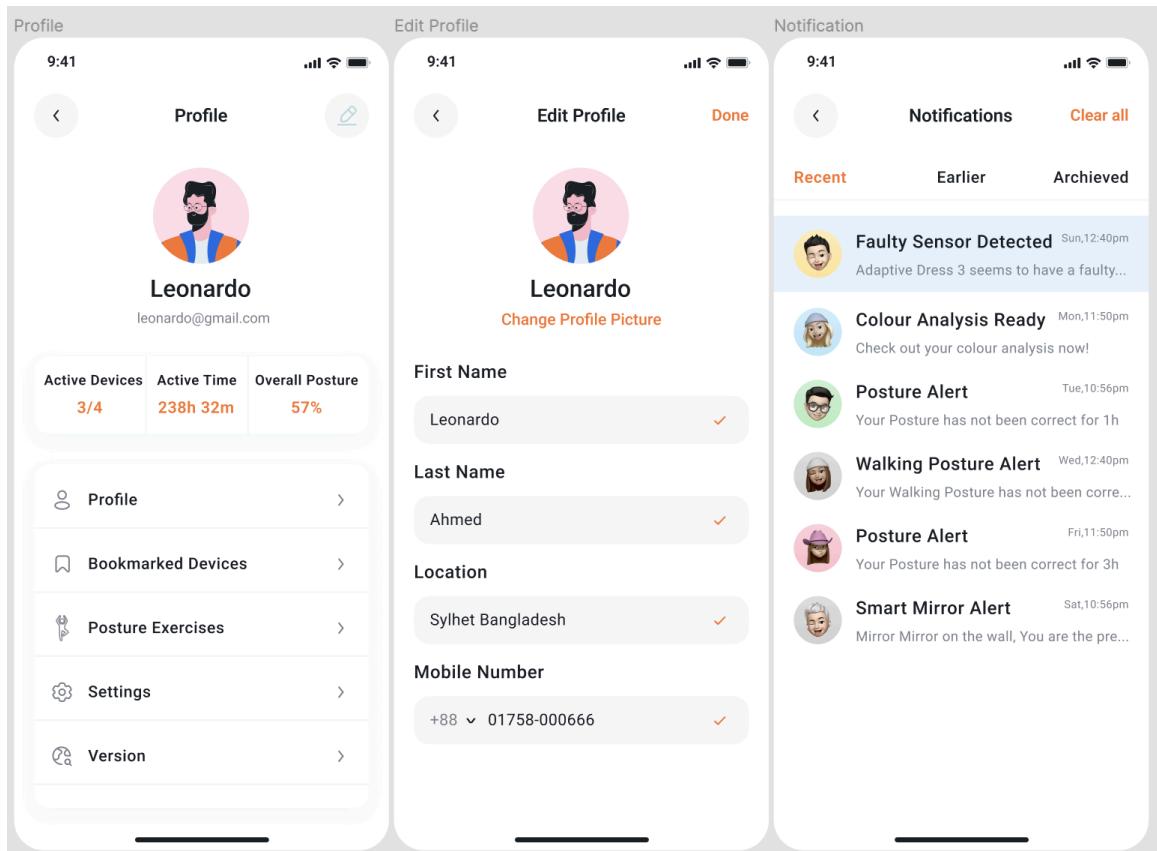
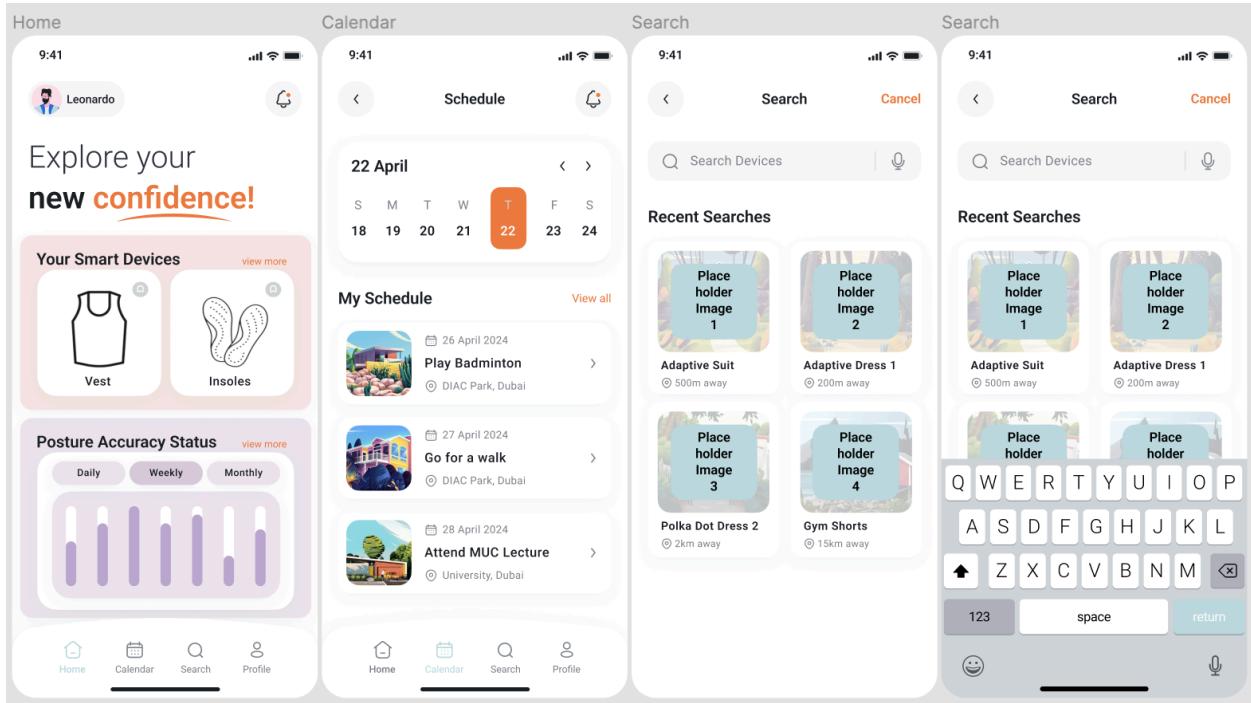
## Smartphone App

Below is the app UI for the smartphone app. Note that it does not include all the functionalities yet, as it is just a minimum viable product. The “Wear Your Confidence” app has a minimalistic design with a minimal learning curve.

The first set of images contains the splash screen and three onboarding pages that the user will see when they first download the app. Followed by the “Sign In” and “Sign Up” pages, the “Forgot Password” pages (the pop up page after the Forgot Password page will only be displayed once the user clicks “Reset Password”), and the “OTP Verification page” (which will be displayed whether a user signs in or signs up, to verify if the email ID that the user has entered is valid or not).



The “Home” Page is scrollable, and would contain another section for possible exercises that users can do based on their activity and posture accuracy, to better their posture, and thereby physical health. That page with the exercises would also be accessible from the “Profile” page.



The smartphone app for “Wear Your Confidence” aims to provide a user-friendly interface to interact with IoT-enabled smart devices like smart vests, adaptive clothing, smart mirrors, and smart insoles. The mobile application will offer features such as managing preferences, receiving recommendations, monitoring device statuses, and adjusting settings.

### **Home Screen**

The home screen will serve as the central hub, displaying a list of connected smart devices. Each device will have an icon, name, and status indicator (online/offline). Tapping on a device will navigate to its specific control panel. Each device will have its control panel for managing settings and viewing device-specific information. For example, the adaptive clothing control panel will display options for adjusting comfort settings, viewing health insights, and managing user preferences.

The home screen is constructed to show a graph with the weekly posture accuracy status. This can be customized and the user can view their daily or monthly posture accuracy status. This graph will display the ratio of the amount of time the user had an accurate posture to the amount of time the user used the smart device, in terms of a percentage. This percentage will vary from user to user. This graph will show the user how long they have an accurate posture throughout the day.

The complete flutter code of the home page can be found in the appendix section of this report.

### **Profile Screen**

The profile page is where users can view and manage their personal information, preferences, and account settings. It is constructed using the user profile card, the edit profile button, the bookmarked devices button, posture exercises button, the settings button and the version button.

The user profile card displays the user's profile picture, name, and email ID. The edit profile button (“Profile”) allows users to edit their profile details, such as updating their profile picture, changing their name, or their modifying contact information. The bookmarked devices button allows users to view their bookmarked devices, which could be their favorite adaptive clothing, or smart vests, or any other favorite smart device, that is linked with the “Wear Your Confidence” system. The settings button includes options for changing passwords, managing two-factor authentication, and other security-related features. There is also a preferences section within the settings section, to provide the users with options to set preferences related to notifications, device settings, and app theme. Lastly, the version button displays the version of the application that the users currently have and details about any future updates.

### **Search Screen**

The search page enables users to search for specific devices, products, or content within the app. It is designed with the search bar at the top of the page for users to enter keywords or phrases and a recent search results list, that displays the recently searched search results with

each item showing how far it is from the user's current location. Clicking on the recent searches will take the user to the page about the selected smart device.

## Notifications Screen

The notifications page shows users a list of recent notifications and alerts from their smart devices or the app itself. This page is designed with a list of notifications displayed in a chronological order, with the latest notifications at the top, notification cards, with each notification card including information such as the notification type, timestamp, and a brief description. Lastly it has the "Clear All" feature, that provides an option to clear all of the notifications from the list.

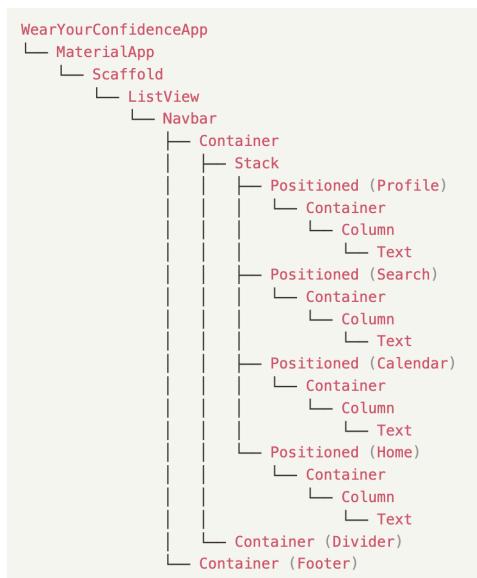
## Calendar Screen

The calendar page integrates a calendar view to help users manage schedules, appointments, and reminders related to their smart devices or daily activities. It is designed with a weekly calendar view to view events and appointments, and an events list to show a list of scheduled events, tasks, or reminders for the selected date. Clicking the date on the calendar allows users to add new events directly onto the calendar page. The events list also displays information about each event, including date and location. The calendar is also designed in such a way that when the users swipe left or right on the event, users will be able to edit or delete the events on the calendar.

## Flutter Widget Trees

### 1. Flutter Widget Tree for Bottom Navigation Bar

The bottom navigation bar has widgets that are recurring on a lot of the screens.

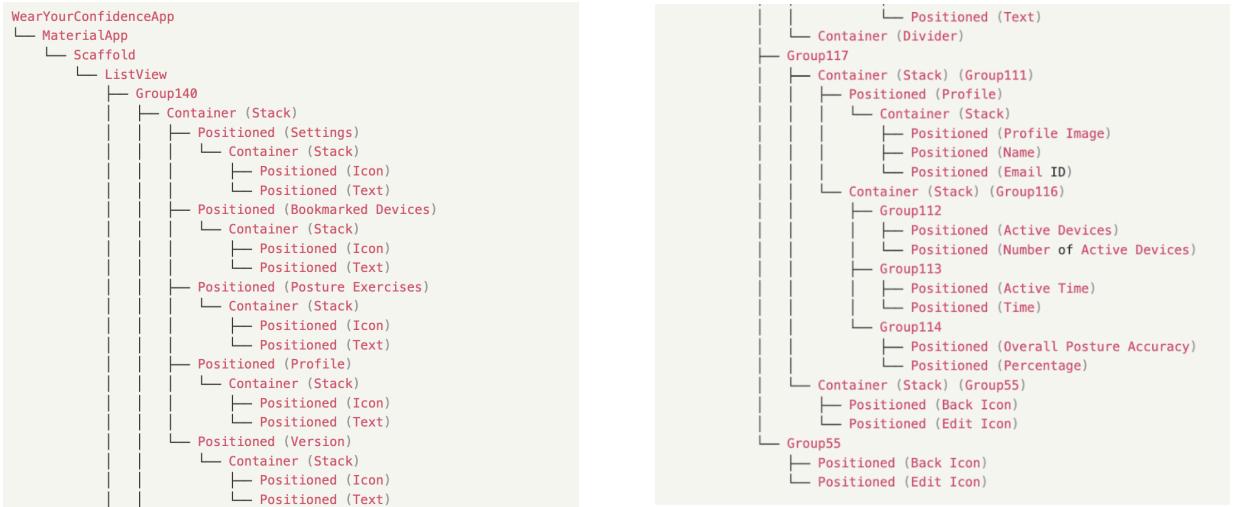


## Full Flutter Code for the Bottom Navigation Bar

```

1   // Don't forget to add this line to help you code faster:
2   import 'package:flutter/material.dart';
3
4   void main() {
5     runApp(const FigmaToCodeApp());
6   }
7
8   // Generated by: https://www.figma.com/community/plugin/842128343887142055/
9   class FigmaToCodeApp extends StatelessWidget {
10   const FigmaToCodeApp({super.key});
11
12   @override
13   Widget build(BuildContext context) {
14     return MaterialApp(
15       theme: ThemeData.dark().copyWith(
16         scaffoldBackgroundColor: const Color.fromARGB(255, 18, 32, 47),
17       ),
18       home: Scaffold(
19         body: ListView(children: [
20           NavBar(),
21         ]),
22       );
23     }
24   }
25
26   class NavBar extends StatelessWidget {
27   @override
28   Widget build(BuildContext context) {
29     return Column(
30       children: [
31         Container(
32           width: 375,
33           height: 90,
34           child: Stack(
35             children: [
36               Positioned(
37                 left: 8,
38                 top: 8,
39                 child: Container(
40                   width: 375,
41                   height: 80,
42                   child: Container(
43                     width: 375,
44                     height: 80,
45                     child: Stack(
46                       children: [
47                         Positioned(
48                           left: 263,
49                           top: 8,
50                           child: Container(
51                             width: 75,
52                             height: 75,
53                             padding: const EdgeInsets.symmetric(vertical: 8),
54                             child: Column(
55                               mainAxisAlignment: MainAxisAlignment.min,
56                               crossAxisAlignment: CrossAxisAlignment.center,
57                               children: [
58                                 Container(
59                                   width: 24,
60                                   height: 24,
61                                   padding: const EdgeInsets.symmetric(horizontal: 5,
62                                     clipBehavior: Clip.antiAlias,
63                                     decoration: BoxDecoration(),
64                                     child: Container(
65                                       width: 24,
66                                       height: 24,
67                                       padding: const EdgeInsets.only(top: 4, left: 3, right: 4, bottom: 3),
68                                       clipBehavior: Clip.antiAlias,
69                                       decoration: BoxDecoration(),
70                                       child: Row(
71                                         mainAxisAlignment: MainAxisAlignment.min,
72                                         crossAxisAlignment: CrossAxisAlignment.center,
73                                         children: [
74                                           Container(
75                                             width: 20.58,
76                                             height: 20,
77                                             child: Stack(children: [
78                                               ],
79                                             ),
80                                           ),
81                                         ],
82                                       ),
83                                     ),
84                                   ),
85                                 ],
86                               ),
87                             ),
88                           ),
89                         ],
90                         Positioned(
91                           left: 188,
92                           top: 8,
93                           child: Container(
94                             width: 75,
95                             height: 60,
96                             padding: const EdgeInsets.symmetric(vertical: 8),
97                             child: Column(
98                               mainAxisAlignment: MainAxisAlignment.min,
99                               crossAxisAlignment: CrossAxisAlignment.center,
100                               children: [
101                                 Container(
102                                   width: 24,
103                                   height: 24,
104                                   padding: const EdgeInsets.only(left: 3, right: 4, bottom: 3),
105                                   clipBehavior: Clip.antiAlias,
106                                   decoration: BoxDecoration(),
107                                   child: Row(
108                                     mainAxisAlignment: MainAxisAlignment.min,
109                                     crossAxisAlignment: CrossAxisAlignment.center,
110                                     children: [
111                                       Container(
112                                         width: 20.58,
113                                         height: 20,
114                                         child: Stack(children: [
115                                           ],
116                                         ),
117                                       ),
118                                     ],
119                                   ),
120                                 ],
121                               ),
122                             ),
123                           ),
124                         ],
125                         Positioned(
126                           left: 37,
127                           top: 8,
128                           child: Container(
129                             width: 66,
130                             height: 60,
131                             padding: const EdgeInsets.symmetric(vertical: 8),
132                             child: Column(
133                               mainAxisAlignment: MainAxisAlignment.min,
134                               crossAxisAlignment: CrossAxisAlignment.center,
135                               children: [
136                                 Container(
137                                   width: 24,
138                                   height: 24,
139                                   padding: const EdgeInsets.only(left: 2,
140                                     right: 1.42,
141                                     bottom: 2,
142                                   ),
143                                   clipBehavior: Clip.antiAlias,
144                                   decoration: BoxDecoration(),
145                                   child: Container(
146                                     width: 20.58,
147                                     height: 20,
148                                     child: Stack(children: [
149                                       ],
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151                                   ),
152                                 ],
153                               ),
154                             ),
155                           ),
156                         ],
157                         Positioned(
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159                           top: 8,
160                           child: Container(
161                           ),
162                         ),
163                         Positioned(
164                           left: 133,
165                           top: 8,
166                           child: Text(
167                             'Profile',
168                             style: TextStyle(
169                               color: Color(0xFF7C83B0),
170                               fontSize: 12,
171                               fontFamily: 'Roboto',
172                               fontWeight: FontWeight.w400,
173                               height: 0.11,
174                             ),
175                           ),
176                         ),
177                         Positioned(
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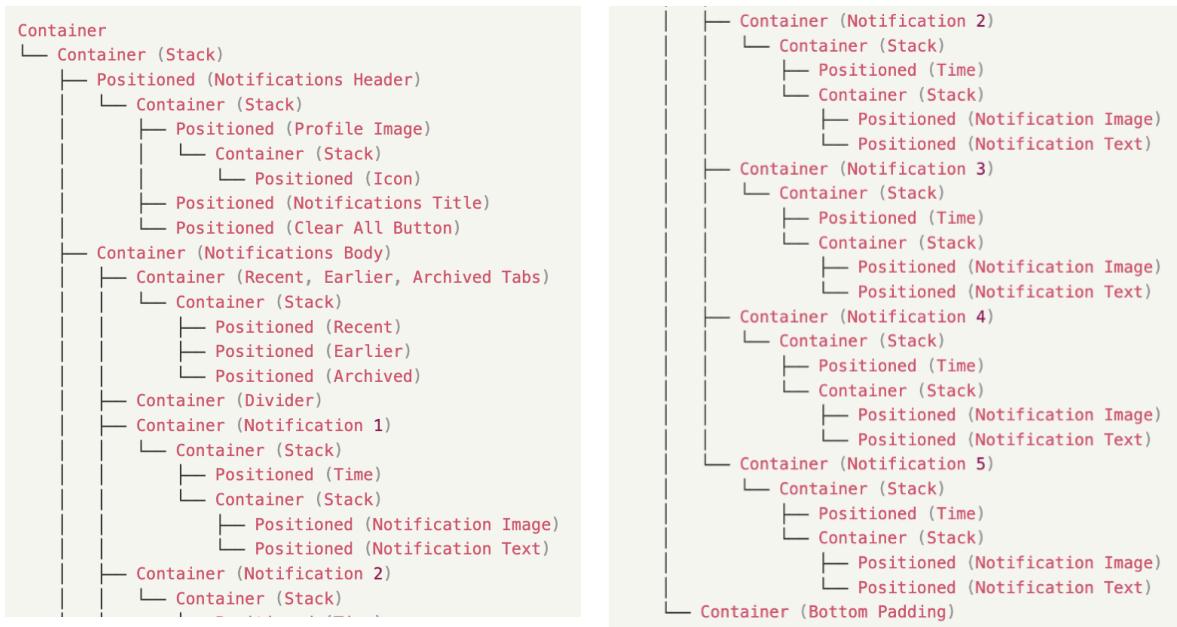
## 2. Flutter Widget Tree for Profile Page



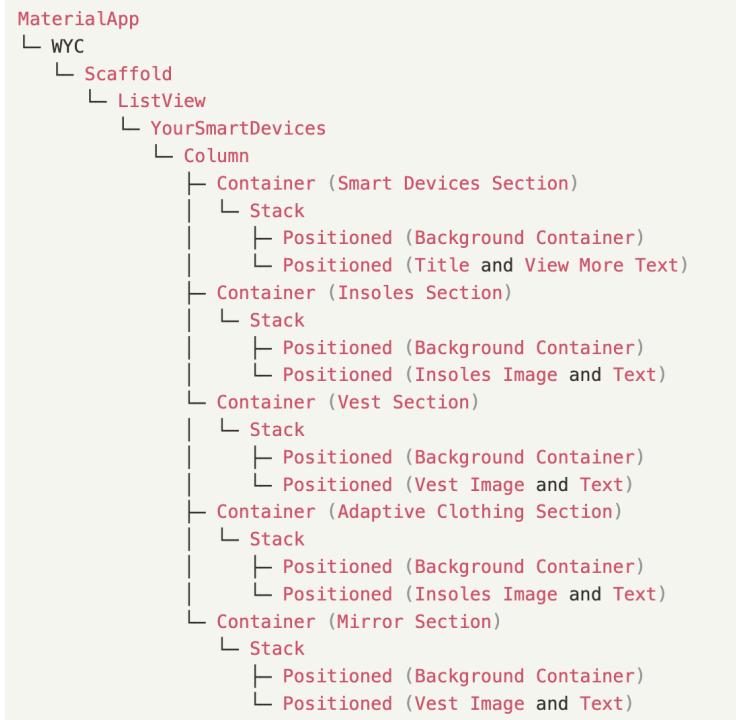
## 3. Detailed Flutter Widget Tree for the “Profile” icon on the Profile Page



#### 4. Flutter Widget Tree for Notifications Page



#### 5. Flutter Widget Tree for “Your Smart Devices” section on the Home Page



## 6. Detailed Flutter Widget Tree for Smart Insoles and Smart Vests under “Your Smart Devices” section on the Home Page



## 7. Detailed Flutter Widget Tree for the Calendar design on the Calendar Page



## W3 Thing Description for each “thing”

### 1. Smart Undershirts/Vests:

```
1  {
2      "@context": "https://www.w3.org/2022/wot/td/v1.1",
3      "id": "urn:uuid:0804d572-cce8-422a-bb7c-4412fc56f05",
4      "title": "SmartVestThing",
5      "description": "A smart vest IoT device that monitors and improves posture, activity levels, sleep quality, energy expenditure, and productivity goals.",
6      "securityDefinitions": {
7          "basic_sc": {"scheme": "basic", "in": "header", "description": "Basic authentication scheme using username and password."},
8          "oauth2_sc": {"scheme": "oauth2", "flow": "password", "tokenUrl": "https://smartvest.example.com/token", "description": "OAuth 2.0 authentication for secure access."}
9      },
10     "security": ["basic_sc", "oauth2_sc"],
11     "properties": {
12         "postureHealth": {
13             "type": "string",
14             "description": "Current posture health status.",
15             "forms": [{"href": "https://smartvest.example.com/posture", "security": "basic_sc"}]
16         },
17         "activityLevels": {
18             "type": "string",
19             "description": "Current activity levels.",
20             "forms": [{"href": "https://smartvest.example.com/activity", "security": "basic_sc"}]
21         },
22         "postureHistory": {
23             "type": "string",
24             "description": "Historical data of posture changes.",
25             "forms": [{"href": "https://smartvest.example.com/history", "security": "oauth2_sc"}]
26         },
27         "userPreferences": {
28             "type": "object",
29             "description": "User-defined preferences for the smart vest.",
30             "forms": [{"href": "https://smartvest.example.com/preferences", "security": "oauth2_sc"}]
31         },
32         "sleepQuality": {
33             "type": "string",
34             "description": "Current sleep quality metrics.",
35             "forms": [{"href": "https://smartvest.example.com/sleep", "security": "basic_sc"}]
36         },
37         "energyExpenditure": {
38             "type": "string",
39             "description": "Energy expenditure data.",
40             "forms": [{"href": "https://smartvest.example.com/energy", "security": "oauth2_sc"}]
41         },
42         "energyEfficiencyMetrics": {
43             "type": "string",
44             "description": "Energy efficiency metrics.",
45             "forms": [{"href": "https://smartvest.example.com/efficiency", "security": "oauth2_sc"}]
46         },
47         "productivityGoals": {
48             "type": "string",
49             "description": "User-defined productivity goals.",
50             "forms": [{"href": "https://smartvest.example.com/goals", "security": "oauth2_sc"}]
51         }
52     },
53     "actions": {
54         "rectifyPosture": {
55             "description": "Action to rectify posture based on user preferences.",
56             "forms": [{"href": "https://smartvest.example.com/rectify", "security": "oauth2_sc"}]
57         }
58     },
59     "events": {
60         "postureChange": {
61             "description": "Event triggered when posture changes.",
62             "data": {"type": "string"},
63             "forms": [{"href": "https://smartvest.example.com/posturechange", "subprotocol": "longpoll", "security": "oauth2_sc"}]
64         }
65     }
66 }
```

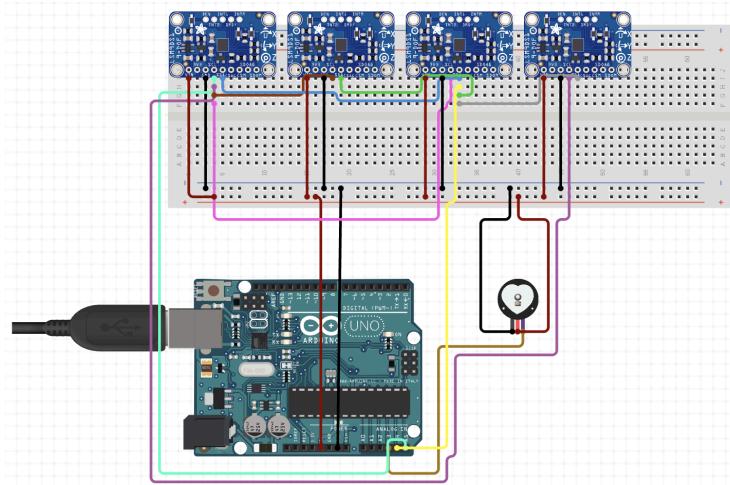
### Affordances of the “SmartVestThing”:

- Properties:
  - Posture Health (postureHealth): Provides real-time data about the user's posture health, including posture alignment, deviations, and potential issues.
  - Activity Levels (activityLevels): Monitors and retrieves the user's activity levels, such as sedentary time, active hours, and intensity of movement.
  - Posture History (postureHistory): Stores historical data of the user's posture, allowing for trend analysis and long-term monitoring.
  - User Preferences (userPreferences): Stores user-defined preferences related to the Smart Vest's functionalities, such as vibration intensity or notification settings for posture correction.

- Sleep Quality (sleepQuality): Provides insights into the user's sleep quality, including sleep stages, duration, interruptions, and overall sleep health.
  - Energy Expenditure (energyExpenditure): Tracks the user's energy expenditure, including calorie burn and exertion levels during various activities.
  - Energy Efficiency Metrics (energyEfficiencyMetrics): Measures energy efficiency related to posture and movement patterns, providing insights into energy-saving postures and activities.
  - Productivity Goals (productivityGoals): Stores user-defined productivity goals and work demands, helping users manage their work-related activities and posture.
- Actions:
  - Rectify Posture (rectifyPosture): Initiates actions to help users rectify their posture based on user preferences and historical data.
- Events:
  - Posture Change (postureChange): Notifies the system about changes in posture for real-time monitoring and analysis.

These affordances outline the capabilities of the Smart Vest thing, including data retrieval, user interaction, and system notifications, all while maintaining robust security measures to protect user data and ensure a hack-proof system. Note that all of the properties, actions, and events require security authentication, either they require a basic authentication for access or OAuth2 authentication is required for access.

#### **Arduino Code and Circuit Diagram for the “SmartVestThing”:**



```

1 #include <Wire.h>
2 #include <LSM9DS1.h>
3 #include <PulseSensorPlayground.h>
4 #include <WiFi.h>
5 #include <HTTPClient.h>
6
7 #define POSTURE_SENSOR_COUNT 4
8
9 LSM9DS1 postureSensors[POSTURE_SENSOR_COUNT];
10 PulseSensorPlayground pulseSensor;
11
12 const char* ssid = "YourWiFiSSID";
13 const char* password = "YourWiFiPassword";
14 const char* server = "smartvest.example.com";
15
16 void setup() {
17     Serial.begin(9600);
18
19     // To initialize LSM9DS1 sensors
20     for (int i = 0; i < POSTURE_SENSOR_COUNT; i++) {
21         postureSensors[i].begin();
22         postureSensors[i].calibrate();
23     }
24
25     // To initialize PulseSensor
26     pulseSensor.begin();
27
28     connectToWiFi();
29 }
30
31 void loop() {
32     // Read posture data from LSM9DS1 sensors
33     float postureHealthValues[POSTURE_SENSOR_COUNT];
34     for (int i = 0; i < POSTURE_SENSOR_COUNT; i++) {
35         postureSensors[i].readAccel();
36         postureHealthValues[i] = postureSensors[i].calcPostureHealth();
37     }
38
39     // To send postureHealthValues to the server
40     sendDataToServer("/posture", postureHealthValues, POSTURE_SENSOR_COUNT);
41
42     // To read heart rate data from PulseSensor
43     int heartRate = pulseSensor.getBeatsPerMinute();
44
45     // To send heartRate to the server
46     sendDataToServer("/heart_rate", heartRate, 1);
47
48     delay(5000);
49 }
50

```

```
49  }
50
51 void connectToWiFi() {
52     Serial.println("Connecting to WiFi...");
53     WiFi.begin(ssid, password);
54     while (WiFi.status() != WL_CONNECTED) {
55         delay(1000);
56         Serial.println("Connecting...");
57     }
58     Serial.println("Connected to WiFi!");
59 }
60
61 void sendDataToServer(String endpoint, float* data, int length) {
62     if (WiFi.status() == WL_CONNECTED) {
63         HTTPClient http;
64         String url = "http://" + String(server) + endpoint;
65         Serial.print("Sending data to: ");
66         Serial.println(url);
67         http.begin(url);
68         http.addHeader("Content-Type", "application/json");
69
70         String jsonPayload = "{}";
71         for (int i = 0; i < length; i++) {
72             jsonPayload += "\"sensor_" + String(i + 1) + "\": " + String(data[i]);
73             if (i < length - 1) {
74                 jsonPayload += ", ";
75             }
76         }
77         jsonPayload += "}";
78
79         int httpResponseCode = http.POST(jsonPayload);
80         if (httpResponseCode > 0) {
81             Serial.print("HTTP Response code: ");
82             Serial.println(httpResponseCode);
83         } else {
84             Serial.print("Error sending POST request: ");
85             Serial.println(httpResponseCode);
86         }
87         http.end();
88     } else {
89         Serial.println("WiFi not connected!");
90     }
91 }
```

## 2. Smart Insoles:

```
1  {
2      "@context": "https://www.w3.org/2022/wot/td/v1.1",
3      "id": "urn:uuid:0804d572-cc8e-422a-bb7c-4412fd56f06",
4      "title": "SmartInsolesThing",
5      "description": "A smart IoT device integrated into footwear to monitor foot health metrics, provide comfort ratings, and offer insights for improved well-being.",
6      "securityDefinitions": {
7          "basic_sc": {
8              "scheme": "basic",
9              "description": "Basic security scheme for HTTP authentication via headers."
10         },
11         "oauth2_sc": {
12             "scheme": "oauth2",
13             "flow": "password",
14             "tokenUrl": "https://smartinsoles.example.com/token",
15             "description": "OAuth 2.0 security scheme for token-based authentication."
16         }
17     },
18     "security": ["basic_sc", "oauth2_sc"],
19     "properties": {
20         "pressureDistribution": {
21             "type": "string",
22             "description": "Provides data on pressure distribution across the foot.",
23             "forms": [{"href": "https://smartinsoles.example.com/pressure", "security": "basic_sc"}]
24         },
25         "footHealthMetrics": {
26             "type": "string",
27             "description": "Measures foot health metrics such as stress points and discomfort levels.",
28             "forms": [{"href": "https://smartinsoles.example.com/foooth", "security": "basic_sc"}]
29         },
30         "comfortRating": {
31             "type": "string",
32             "description": "Offers a comfort rating based on user feedback and sensor data.",
33             "forms": [{"href": "https://smartinsoles.example.com/comfort", "security": "oauth2_sc"}]
34         },
35         "gaitAnalysis": {
36             "type": "string",
37             "description": "Analyzes gait patterns and provides insights for posture and walking improvements.",
38             "forms": [{"href": "https://smartinsoles.example.com/gait", "security": "basic_sc"}]
39         },
40         "healthInsights": {
41             "type": "string",
42             "description": "Provides insights into overall foot health and well-being.",
43             "forms": [{"href": "https://smartinsoles.example.com/health", "security": "oauth2_sc"}]
44         },
45     }
46 }
```

```
50     "activityLevels": {
51         "type": "string",
52         "description": "Monitors and reports activity levels based on foot movement.",
53         "forms": [{"href": "https://smartinsoles.example.com/activity", "security": "basic_sc"}]
54     },
55     "userPreferences": {
56         "type": "object",
57         "description": "Stores user-defined preferences for customized settings and notifications.",
58         "forms": [{"href": "https://smartinsoles.example.com/preferences", "security": "oauth2_sc"}]
59     },
60     "energyConservationMetrics": {
61         "type": "string",
62         "description": "Tracks energy conservation metrics related to walking and movement patterns.",
63         "forms": [{"href": "https://smartinsoles.example.com/energy", "security": "oauth2_sc"}]
64     },
65     "productivityLevel": {
66         "type": "string",
67         "description": "Measures productivity levels based on user activity and movement data.",
68         "forms": [{"href": "https://smartinsoles.example.com/productivity", "security": "oauth2_sc"}]
69     },
70 },
71     "actions": {
72         "suggestAdjustments": {
73             "description": "Suggests adjustments to footwear or activity based on sensor data and user preferences.",
74             "forms": [{"href": "https://smartinsoles.example.com/adjustments", "security": "oauth2_sc"}]
75         }
76     },
77     "events": {
78         "discomfortAlert": {
79             "description": "Triggers an alert in case of discomfort or abnormal foot health conditions.",
80             "data": {"type": "string"},
81             "forms": [{"href": "https://smartinsoles.example.com/alert", "subprotocol": "longpoll", "security": "oauth2_sc"}]
82         }
83     }
84 }
```

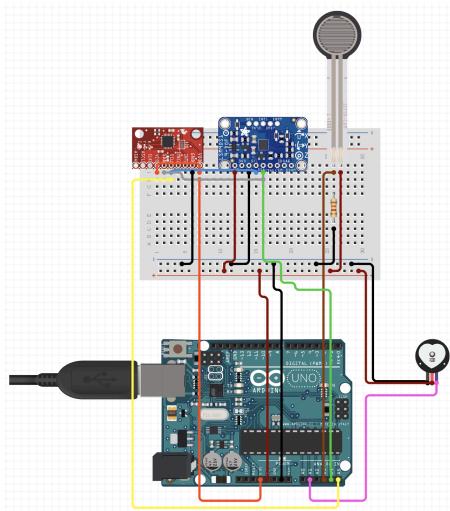
### Affordances of the “SmartInsolesThing”:

- Properties:
  - Pressure Distribution (pressureDistribution): Provides data on pressure distribution across the insoles, indicating potential discomfort points and weight distribution.

- Foot Health Metrics (footHealthMetrics): Monitors foot health metrics such as arch support, pronation, and foot alignment.
  - Comfort Rating (comfortRating): Stores user feedback on comfort levels experienced with the insoles.
  - Gait Analysis (gaitAnalysis): Offers insights into gait analysis metrics, including stride length, cadence, and foot strike patterns.
  - Health Insights (healthInsights): Provides comprehensive health insights based on foot health, posture, activity levels, and energy conservation metrics.
  - Posture History (postureHistory): Stores historical data of the user's posture, allowing for trend analysis and long-term monitoring.
  - Activity Levels (activityLevels): Monitors the user's activity levels, such as sedentary time, active hours, and intensity of movement.
  - User Preferences (userPreferences): Stores user-defined preferences related to the Smart Insoles' functionalities.
  - Energy Conservation Metrics (energyConservationMetrics): Tracks energy conservation metrics, including posture-related energy efficiency and movement patterns.
  - Productivity Levels (productivityLevels): Monitors productivity levels and work demands, helping users manage their activities effectively.
- Actions:
  - Suggest Adjustments (suggestAdjustments): Recommends adjustments in posture or footwear based on pressure distribution, foot health, and gait analysis.
- Events:
  - Discomfort Alert (discomfortAlert): Sends alerts or notifications in case of detected discomfort points or abnormal pressure distribution.

These affordances provide a comprehensive overview of the capabilities of Smart Insoles, covering various aspects such as foot health monitoring, comfort tracking, gait analysis, health insights, posture history, activity levels, user preferences, energy conservation metrics, and productivity levels, all while maintaining security protocols for data access. Note that all of the properties, actions, and events require security authentication, either they require a basic authentication for access or OAuth2 authentication is required for access.

#### **Arduino Code and Circuit Diagram for the “SmartInsolesThing”:**



```

1 #include <Wire.h>
2 #include <LSM9DS1.h>
3 #include <PulseSensorPlayground.h>
4 #include <WiFi.h>
5 #include <HTTPClient.h>
6
7 #define HEART_RATE_PIN A0
8 #define FORCE_SENSOR_PIN A1
9 #define MPU6050_INT_PIN 2
10
11 PulseSensorPlayground pulseSensor;
12 LSM9DS1 lsm9ds1;
13 MPU6050 mpu6050;
14
15 const char* ssid = "WiFiSSID";
16 const char* password = "WiFiPassword";
17 const char* server = "https://smartinsoles.example.com";
18
19 void setup() {
20     Serial.begin(9600);
21
22     // To initialize sensors
23     pulseSensor.begin(HEART_RATE_PIN);
24     lsm9ds1.begin();
25     mpu6050.initialize();
26
27     connectToWiFi();
28 }
29
30 void loop() {
31     // Read sensor data
32     int heartRate = pulseSensor.getBeatsPerMinute();
33     float footHealthMetrics = readFootHealthMetrics();
34     int pressureDistribution = analogRead(FORCE_SENSOR_PIN);
35     float gaitAnalysis = readGaitAnalysis();
36
37     // To send data to server
38     sendDataToServer("/heart_rate", heartRate);
39     sendDataToServer("/foot_health", footHealthMetrics);
40     sendDataToServer("/pressure_distribution", pressureDistribution);
41     sendDataToServer("/gait_analysis", gaitAnalysis);
42
43     delay(5000);
44 }
45
46 float readFootHealthMetrics() {
47     // To read temperature from LSM9DS1 sensor
48     lsm9ds1.readTemp();
49     float temperature = lsm9ds1.calcTempC();
50 }
```

```
50     return temperature;
51 }
52
53
54 float readGaitAnalysis() {
55     // To read accelerometer and gyroscope data from MPU6050 sensor
56     int16_t ax, ay, az, gx, gy, gz;
57     mpu6050.getMotion6(&ax, &ay, &az, &gx, &gy, &gz);
58
59     return az;
60 }
61
62 void connectToWiFi() {
63     Serial.println("Connecting to WiFi...");
64     WiFi.begin(ssid, password);
65     while (WiFi.status() != WL_CONNECTED) {
66         delay(1000);
67         Serial.println("Connecting...");
68     }
69     Serial.println("Connected to WiFi!");
70 }
71
72 void sendDataToServer(String endpoint, float data) {
73     if (WiFi.status() == WL_CONNECTED) {
74         HTTPClient http;
75         String url = server + endpoint;
76         Serial.print("Sending data to: ");
77         Serial.println(url);
78         http.begin(url);
79         http.addHeader("Content-Type", "application/json");
80         String jsonPayload = "{\"value\": " + String(data) + "}";
81         int httpResponseCode = http.POST(jsonPayload);
82         if (httpResponseCode > 0) {
83             Serial.print("HTTP Response code: ");
84             Serial.println(httpResponseCode);
85         } else {
86             Serial.print("Error sending POST request: ");
87             Serial.println(httpResponseCode);
88         }
89         http.end();
90     } else {
91         Serial.println("WiFi not connected!");
92     }
93 }
```

### 3. Adaptive Clothing:

```
1  {
2      "@context": "https://www.w3.org/2022/wot/td/v1.1",
3      "id": "urn:uuid:0804d572-ccce-422a-bb7c-4412fc56f06",
4      "title": "AdaptiveClothingThing",
5      "description": "An IoT-enabled clothing system that dynamically adjusts settings for optimal comfort and functionality based on user preferences and environmental conditions.",
6      "securityDefinitions": {
7          "basic_sc": {
8              "scheme": "basic",
9              "description": "Basic security scheme for HTTP authentication via headers."
10         },
11         "oauth2_sc": {
12             "scheme": "oauth2",
13             "flow": "password",
14             "tokenUrl": "https://adaptiveclothing.example.com/token",
15             "description": "OAuth 2.0 security scheme for token-based authentication."
16         }
17     },
18     "security": ["basic_sc", "oauth2_sc"],
19     "properties": {
20         "adaptiveComfort": {
21             "type": "string",
22             "description": "Controls the adaptive comfort settings of the clothing system.",
23             "forms": [{"href": "https://adaptiveclothing.example.com/comfort", "security": "oauth2_sc"}]
24         },
25         "activityLevelTracking": {
26             "type": "string",
27             "description": "Tracks and reports user activity levels while wearing the adaptive clothing.",
28             "forms": [{"href": "https://adaptiveclothing.example.com/activity", "security": "basic_sc"}]
29         },
30         "healthInsights": {
31             "type": "string",
32             "description": "Provides insights into user health and well-being related to clothing comfort.",
33             "forms": [{"href": "https://adaptiveclothing.example.com/health", "security": "oauth2_sc"}]
34         },
35         "weatherDetails": {
36             "type": "string",
37             "description": "Retrieves and displays real-time weather details for clothing adaptation.",
38             "forms": [{"href": "https://adaptiveclothing.example.com/weather", "security": "basic_sc"}]
39         },
40         "bodyTemperature": {
41             "type": "string",
42             "description": "Monitors user body temperature and adjusts clothing settings accordingly.",
43             "forms": [{"href": "https://adaptiveclothing.example.com/temperature", "security": "oauth2_sc"}]
44     },
45     "userPreferences": {
46         "type": "object",
47         "description": "Stores user-defined preferences for clothing settings and adjustments.",
48         "forms": [{"href": "https://adaptiveclothing.example.com/preferences", "security": "oauth2_sc"}]
49     },
50     "sleepQuality": {
51         "type": "string",
52         "description": "Analyzes and reports user sleep quality metrics related to clothing comfort.",
53         "forms": [{"href": "https://adaptiveclothing.example.com/sleep", "security": "basic_sc"}]
54     },
55     "energyConservation": {
56         "type": "string",
57         "description": "Tracks energy conservation metrics based on clothing usage and settings.",
58         "forms": [{"href": "https://adaptiveclothing.example.com/energy", "security": "oauth2_sc"}]
59     },
60     "productivity": {
61         "type": "string",
62         "description": "Measures user productivity levels while wearing adaptive clothing.",
63         "forms": [{"href": "https://adaptiveclothing.example.com/productivity", "security": "oauth2_sc"}]
64     },
65     "actions": {
66         "adjustSettings": {
67             "description": "Allows users to adjust clothing settings manually or through automation.",
68             "forms": [{"href": "https://adaptiveclothing.example.com/adjust", "security": "oauth2_sc"}]
69         }
70     },
71     "events": {
72         "temperatureAlert": {
73             "description": "Triggers an alert when clothing adjustments are required due to temperature changes.",
74             "data": {"type": "string"},
75             "forms": [{"href": "https://adaptiveclothing.example.com/alert", "subprotocol": "longpoll", "security": "oauth2_sc"}]
76         }
77     }
78 }
```

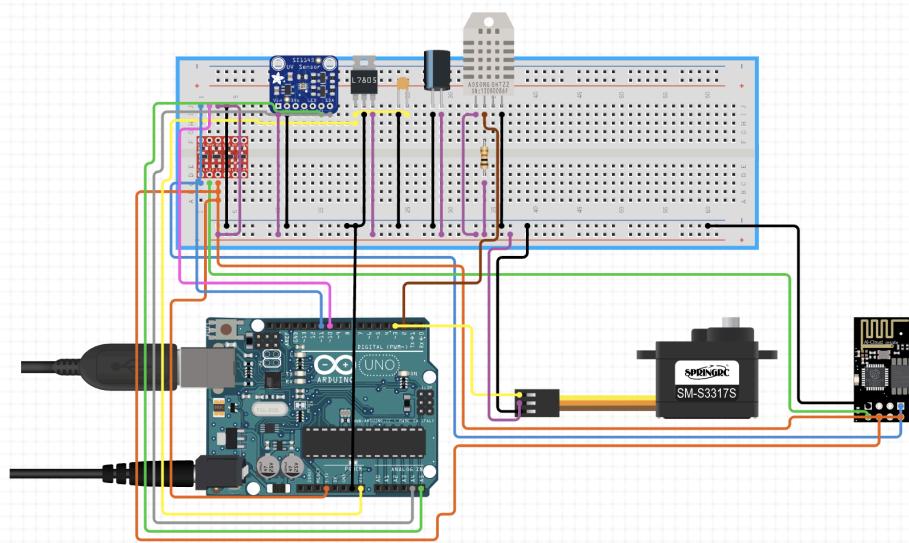
#### Affordances of the “AdaptiveClothingThing”:

- Properties:
  - Adaptive Comfort (adaptiveComfort): Provides data on the adaptive comfort levels of the clothing, including temperature regulation and moisture management.

- Activity Level Tracking (activityLevelTracking): Monitors the user's activity levels and movement patterns.
  - Health Insights (healthInsights): Offers comprehensive health insights based on clothing comfort, activity levels, and user preferences.
  - Weather Details (weatherDetails): Retrieves real-time weather details to adjust clothing properties accordingly.
  - Body Temperature (bodyTemperature): Tracks the user's body temperature to ensure comfort and regulate clothing features.
  - User Preferences (userPreferences): Stores user-defined preferences related to adaptive clothing settings.
  - Sleep Quality (sleepQuality): Monitors sleep quality metrics, including sleep stages and interruptions.
  - Energy Conservation (energyConservation): Tracks energy conservation metrics related to clothing comfort and user activity.
  - Productivity (productivity): Monitors productivity levels and work demands, helping users manage their activities effectively.
- Actions:
  - Adjust Settings (adjustSettings): Allows users to adjust adaptive clothing settings based on preferences and environmental conditions.
- Events:
  - Temperature Alert (temperatureAlert): Sends alerts or notifications in case of detected temperature variations or discomfort.

These affordances provide a comprehensive overview of the capabilities of Adaptive Clothing, covering various aspects such as adaptive comfort, activity level tracking, health insights, weather details, body temperature monitoring, user preferences, sleep quality, energy conservation, and productivity, all while maintaining security protocols for data access. Note that all of the properties, actions, and events require security authentication, either they require a basic authentication for access or OAuth2 authentication is required for access.

#### **Arduino Code and Circuit Diagram for the “AdaptiveClothingThing”:**



```

1 #include <ESP8266WiFi.h>
2 #include <Servo.h>
3 #include <Wire.h>
4 #include <Adafruit_SI1145.h>
5 #include <DHT.h>
6
7 const char* ssid = "WiFiSSID";
8 const char* password = "WiFiPassword";
9 const char* server = "https://adaptiveclothing.example.com";
10
11 #define SERVO_PIN 9
12 #define DHT_PIN 7
13
14 Adafruit_SI1145 uvSensor = Adafruit_SI1145();
15 DHT dht(DHT_PIN, DHT22);
16
17 Servo servoMotor;
18
19 void setup() {
20     Serial.begin(9600);
21
22     // To initialize servo motor
23     servoMotor.attach(SERVO_PIN);
24
25     // To initialize sensors
26     if (!uvSensor.begin()) {
27         Serial.println("UV sensor not detected!");
28     }
29     dht.begin();
30
31     connectToWiFi();
32 }
33
34 void loop() {
35     // To read data from the sensors
36     float temperature = dht.readTemperature();
37     float humidity = dht.readHumidity();
38     float uvIndex = uvSensor.readUV();
39
40     // To adjust clothing settings based on sensor data
41     adjustClothingSettings(temperature, humidity, uvIndex);
42
43     delay(5000);
44 }
45
46 void connectToWiFi() {
47     Serial.println("Connecting to WiFi...");
48     WiFi.begin(ssid, password);
49     while (WiFi.status() != WL_CONNECTED) {
50         delay(1000);

```

```

50   |     delay(1000);
51   |     Serial.println("Connecting...");
52   |
53   |     Serial.println("Connected to WiFi!");
54 }
55
56 void adjustClothingSettings(float temperature, float humidity, float uvIndex) {
57     // To check temperature and humidity
58     if (temperature > 25 && humidity > 60) {
59         // To activate cooling mechanism
60         servoMotor.write(180);
61     } else {
62         // To deactivate cooling mechanism
63         servoMotor.write(0);
64     }
65
66     // To check UV index
67     if (uvIndex > 5) {
68         // To apply UV protection
69     } else {
70         // To deactivate UV protection
71     }
72 }
73

```

#### 4. Smart Mirror:

```

1  {
2      "@context": "https://www.w3.org/2022/wot/td/v1.1",
3      "id": "urn:uuid:0804d572-cce8-422a-bb7c-4412fcdf5f06",
4      "title": "SmartMirrorThing",
5      "description": "An IoT-enabled smart mirror that provides style recommendations, user preferences management, and productivity insights.",
6      "securityDefinitions": {
7          "basic_sc": {
8              "scheme": "basic",
9              "description": "Basic security scheme for HTTP authentication via headers."
10         },
11         "oauth2_sc": {
12             "scheme": "oauth2",
13             "flow": "password",
14             "tokenUrl": "https://smartmirror.example.com/token",
15             "description": "OAuth 2.0 security scheme for token-based authentication."
16         }
17     },
18
19     "security": ["basic_sc", "oauth2_sc"],
20     "properties": {
21         "styleRecommendations": {
22             "type": "string",
23             "description": "Displays curated style recommendations based on user preferences and body characteristics.",
24             "forms": [{"href": "https://smartmirror.example.com/style", "security": "oauth2_sc"}]
25         },
26         "userPreferences": {
27             "type": "object",
28             "description": "Allows users to manage and customize style preferences stored in the smart mirror.",
29             "forms": [{"href": "https://smartmirror.example.com/preferences", "security": "oauth2_sc"}]
30         },
31         "productivity": {
32             "type": "string",
33             "description": "Provides productivity insights and suggestions for optimal work practices.",
34             "forms": [{"href": "https://smartmirror.example.com/productivity", "security": "oauth2_sc"}]
35         },
36         "actions": {
37             "adjustSettings": {
38                 "description": "Enables users to adjust smart mirror settings and configurations.",
39                 "forms": [{"href": "https://smartmirror.example.com/adjust", "security": "oauth2_sc"}]
40             }
41         },
42         "events": {
43             "styleAlert": {
44                 "description": "Triggers an alert when new style recommendations are available.",
45                 "data": {"type": "string"},
46                 "forms": [{"href": "https://smartmirror.example.com/alert", "subprotocol": "longpoll", "security": "oauth2_sc"}]
47             }
48         }
49     }
}

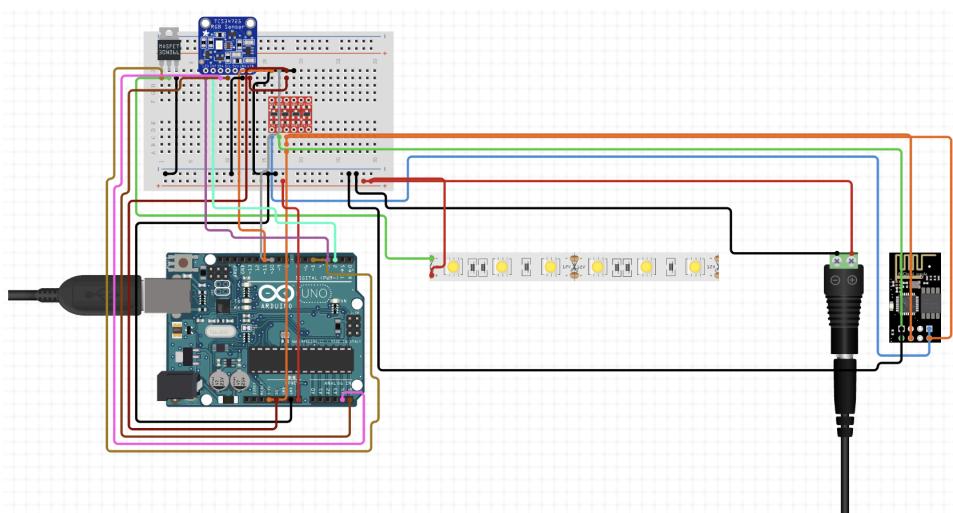
```

## Affordances of the “SmartMirrorThing”:

- Properties:
    - Style Recommendations (styleRecommendations): Provides style recommendations based on user preferences, current trends, and weather conditions.
    - User Preferences (userPreferences): Stores user-defined preferences related to style, personal grooming, and other mirror functionalities.
    - Productivity (productivity): Displays productivity-related information such as calendar events, to-do lists, reminders, and task notifications.
  - Actions:
    - Adjust Settings (adjustSettings): Allows users to adjust mirror settings, including brightness, display preferences, and style recommendations.
  - Events:
    - Style Alert (styleAlert): Sends alerts or notifications for style-related updates, recommendations, or reminders.

These affordances provide a comprehensive overview of the capabilities of the Smart Mirror, focusing on style recommendations, user preferences, productivity features, and interactive settings adjustment, all while maintaining security protocols for data access.

## Arduino Code and Circuit Diagram for the “SmartMirrorThing”:



```

1 #include <SoftwareSerial.h>
2 #include <Adafruit_TCS34725.h>
3
4 #define ESP_TX 2
5 #define ESP_RX 3
6
7 SoftwareSerial espSerial(ESP_TX, ESP_RX);
8
9 // RGB color sensor pins
10#define SDA_PIN A4
11#define SCL_PIN A5
12
13 Adafruit_TCS34725 tcs = Adafruit_TCS34725(TCS34725_INTEGRATIONTIME_50MS, TCS34725_GAIN_4X);
14
15 // LED strip pin
16#define LED_PIN 9
17
18 void setup() {
19     Serial.begin(9600);
20     espSerial.begin(115200);
21     initializeWiFi();
22
23     if (!tcs.begin()) {
24         Serial.println("Error initializing TCS34725 sensor!");
25         while (1);
26     }
27
28     pinMode(LED_PIN, OUTPUT);
29 }
30
31 void loop() {
32     uint16_t clear, red, green, blue;
33     tcs.getRawData(&red, &green, &blue, &clear);
34
35     // To calculate color temperature and lux
36     float colorTemp = tcs.calculateColorTemperature(red, green, blue);
37     float lux = tcs.calculateLux(red, green, blue);
38
39     Serial.print("Color Temperature: "); Serial.print(colorTemp, 2); Serial.println(" K");
40     Serial.print("Lux: "); Serial.println(lux, 2);
41
42     // To check for skin color for color theory analysis
43     if (red > 100 && green > 50 && blue > 40) {
44         Serial.println("Skin color detected!");
45         showSkinColor();
46     } else {
47         digitalWrite(LED_PIN, LOW);
48     }
49
50     delay(1000);

```

```

50   |   delay(1000);
51   }
52
53 void initializeWiFi() {
54   espSerial.println("AT");
55   delay(1000);
56
57   espSerial.println("AT+CWJAP=\"YourWi-FiSSID\", \"YourWiFiPassword\"");
58   delay(5000);
59 }
60
61 void showSkinColor() {
62   // To set LED strip color to simulate skin color
63   analogWrite(LED_PIN, 255);
64   delay(5000);
65   digitalWrite(LED_PIN, LOW);
66 }
```

## Learning and Intelligence

### Data Acquisition - Mobile App Interactions:

The mobile app will capture posture data through sensors in the smart devices, including metrics like alignment angles, curvature measurements, pressure distribution, and movement patterns, along with user activity levels, exercise routines, and daily movements to understand lifestyle patterns and their impact on posture and well-being, while implementing robust privacy controls and data encryption mechanisms to ensure user data security and compliance with privacy regulations.

Additionally, users have the ability to input health-related data such as sleep quality, energy levels, stress indicators, and any existing musculoskeletal conditions for personalized insights and recommendations. Users can offer feedback on comfort, style preferences, and satisfaction, refining the app's recommendations. This feedback loop helps improve the system's recommendations and adjustments.

### Data Acquisition - External Data Integration:

The integration of weather APIs offers real-time weather updates (temperature, humidity levels, precipitation forecasts, etc.), influencing adaptive clothing recommendations and posture adjustments according to environmental conditions. Partnerships with health and fitness platforms provide access to anonymized health data (including activity logs, exercise routines, nutritional information, health assessments, etc.), enhancing health insights and posture analysis capabilities. Additionally, data from fashion trends, style influencers, and user-generated content refine the style recommendations tailored to individual preferences and occasions.

### **Data Acquisition - Sensor Data from Wearable Devices:**

Smart Vests, equipped with posture monitoring sensors, vibration mechanisms for feedback, and connectivity features for data transmission, capture real-time posture data for correction and awareness. Smart Insoles, with pressure sensors, analyze foot health metrics and inform posture suggestions and comfort optimizations. Additionally, Adaptive Clothing with embedded sensors tracks body temperature, fabric comfort levels, and user activity, dynamically adjusting to environmental changes and user preferences, for optimal comfort and style. Lastly, the smart mirror collects and analyzes sensor data to provide personalized style recommendations and productivity insights.

### **Data Acquisition - Data Processing and Integration:**

Raw sensor data undergoes cloud-based processing for analysis, incorporating user inputs and external data for enhanced insights. Processed data and trained models are then deployed on edge devices (such as the smart mirrors, smart vests, smart insoles, and adaptive clothing), ensuring real-time inference and personalized recommendations, and seamless user interactions without heavy reliance on cloud services. Continuous learning techniques further refine the system, updating the models, based on new inputs and user feedback, ensuring adaptability to evolving trends.

These data acquisition methods ensure a comprehensive and diverse dataset for training intelligent models, enabling the "Wear Your Confidence" system to provide personalized, accurate, and actionable insights for users' posture, style, health, and well-being.

### **Challenges in Training - Data Quality and Variability:**

1. Sparse Data: Insufficient or sparse data for certain user demographics, body types, or environmental conditions may lead to biased or inaccurate model predictions.
2. Data Imbalance: Class imbalance in posture data (e.g., more instances of correct posture than incorrect posture) can skew model training, affecting the system's ability to detect and correct posture deviations effectively.
3. Data Variability: Variability in user behavior, preferences, and posture patterns across different contexts (e.g., work, home, exercise) poses a challenge in capturing diverse data representations and building robust models.

### **Challenges in Training - Model Interpretability and Explainability:**

1. Black Box Models: Complex machine learning models, particularly deep learning models, may lack interpretability, making it challenging to understand and explain the reasoning behind model predictions to users.
2. Bias and Fairness: Ensuring models are unbiased and fair across diverse user groups (e.g., gender, age, body types) requires careful data curation, feature engineering, and model evaluation techniques to mitigate biases and ensure equitable outcomes.

### **Challenges in Training - Adaptation to User Preferences and Feedback:**

1. Dynamic User Preferences: User preferences for comfort levels, style choices, and feedback mechanisms may evolve over time, requiring continuous model adaptation and personalization to align with changing user needs.

2. Feedback Integration: Incorporating real-time user feedback, corrections, and annotations into the training process while avoiding overfitting to noisy or inconsistent feedback poses a challenge in maintaining model accuracy and generalization.

#### **Challenges in Training - Privacy and Data Security:**

1. Data Anonymization: Ensuring sensitive user data (e.g., health information, location data) is anonymized and protected during training to comply with privacy regulations and prevent unauthorized access or data breaches.
2. Secure Model Updates: Implementing secure mechanisms for updating trained models on edge devices, ensuring integrity, authenticity, and confidentiality of model updates without exposing sensitive information.

#### **Challenges in Training - Resource Constraints and Scalability:**

1. Edge Computing Limitations: Limited computational resources and memory constraints on edge devices may restrict the complexity and size of models that can be deployed, requiring optimization techniques and model compression methods.
2. Scalability: Scaling training infrastructure and computational resources to accommodate growing data volumes, user base, and model complexity while maintaining performance and cost-effectiveness.

#### **Training and Inference Pipeline:**

1. Data Preprocessing: Clean and preprocess raw data, including feature extraction and normalization.
2. Feature Engineering: Engineer features such as posture metrics, style preferences, weather conditions, and health indicators.
3. Model Training: Utilize machine learning algorithms such as deep learning for posture analysis, collaborative filtering for style recommendations, and reinforcement learning for personalization.
4. Validation and Testing: Validate models using cross-validation techniques and testing on separate validation datasets.
5. Deployment: Deploy trained models on edge devices for real-time inference, leveraging cloud infrastructure for model updates and optimization.

#### **Infrastructure for Training and Inference:**

1. Training Infrastructure:
  - Cloud-Based Training: The training process will primarily occur on cloud-based infrastructure, leveraging platforms such as Amazon Web Services (AWS), Google Cloud Platform (GCP), or Microsoft Azure. These cloud services offer scalable computing resources, storage, and machine learning tools necessary for processing large volumes of data and training complex models.
  - Data Processing: Raw sensor data, user interactions, external data sources, and health insights are processed and cleaned using cloud-based data processing frameworks like Apache Spark or TensorFlow Extended (TFX). This step includes data transformation, feature extraction, and data augmentation to prepare the dataset for training.

- Model Training: Machine learning models, including deep learning models for posture analysis, style recommendations, and reinforcement learning algorithms for personalization, are trained using distributed computing resources on the cloud. Training involves iterative optimization, hyperparameter tuning, and model evaluation to achieve optimal performance.
  - Version Control and Model Management: Cloud platforms offer version control systems and model management tools (e.g., TensorFlow Serving, Amazon SageMaker) for organizing trained models, tracking model versions, and deploying models for inference.
2. Inference Infrastructure:
- Edge Devices: Trained machine learning models are deployed on edge devices such as smart vests, insoles, mirrors, and clothing. These devices have onboard processing capabilities (e.g., microcontrollers, embedded systems) and connectivity options (e.g., Bluetooth, Wi-Fi) for real-time inference and user interactions.
  - Edge Computing: Edge computing frameworks like TensorFlow Lite, Edge TPU, or AWS IoT Greengrass facilitate running inference tasks locally on edge devices, reducing latency and dependency on cloud services. This enables quick feedback, personalized recommendations, and adaptive responses based on user context.
  - Mobile App Integration: The mobile app serves as a gateway for communication between edge devices and cloud services. It manages data synchronization, model updates, and user interactions while ensuring seamless connectivity and data privacy.
  - Offline Capabilities: Edge devices are designed to have offline capabilities, storing essential data and pre-trained models locally to ensure uninterrupted functionality even in low-connectivity or offline scenarios. Periodic data synchronization and updates are performed when connectivity is available.
3. Scalability and Performance:
- Scalable Architecture: The system's architecture is designed for scalability, allowing seamless integration of new edge devices, data sources, and services as the user base grows. Cloud-based services provide auto-scaling capabilities to handle varying workloads during peak usage periods.
  - Performance Monitoring: Performance metrics such as latency, throughput, model accuracy, and resource utilization are monitored continuously. Monitoring tools and dashboards (e.g., AWS CloudWatch, Google Cloud Monitoring) provide insights into system performance, identify bottlenecks, and optimize resource allocation for efficient inference.

4. Security and Compliance:
  - Data Encryption: Secure communication protocols (e.g. TLS/SSL) are implemented for data transmission between edge devices, mobile apps, and cloud services to ensure data privacy and integrity.
  - Access Control: Role-based access control (RBAC) mechanisms and authentication protocols (e.g. OAuth) are employed to restrict access to sensitive data and system functionalities, maintaining security standards and regulatory compliance.
  - Data Anonymization: Personal data is anonymized and pseudonymized where applicable to protect user privacy and comply with data protection regulations (e.g., GDPR, CCPA).
  - Regular Audits and Compliance Checks: Regular security audits, penetration testing, and compliance checks are conducted to assess and improve system security posture, addressing potential vulnerabilities and threats proactively.

#### **Performance Metrics:**

1. Accuracy and F1 Score: Measures the correctness and balance of posture analysis, style recommendations, and user engagement predictions.
2. Personalization Effectiveness: Evaluates the system's ability to provide personalized recommendations that align with user preferences and needs.
3. Response Time: Tracks the system's response time for providing recommendations and feedback, ensuring timely and efficient interactions.
4. Data Privacy Compliance: Assesses the system's compliance with privacy policies and regulations, including data encryption, user consent mechanisms, and secure data handling practices.
5. Model Robustness: Measures the robustness of models against adversarial attacks, noisy data, and outlier scenarios, ensuring reliable performance in diverse conditions.

These detailed aspects provide a comprehensive overview of the learning and intelligence framework for the "Wear Your Confidence" system, addressing data collection, training challenges, pipeline architecture, infrastructure considerations, and performance evaluation metrics.

## **Managing Human-Computer Interaction**

### **Storyboard Explanation**

1. The first image shows a woman who just woke up. While still in bed, she opens her phone to check her messages. She sees that she received a notification from the "Wear Your Confidence" app. On clicking the notification, she is taken to the "Wear Your Confidence" app, where she sees that based on the weather and her schedule, the app has suggested a few outfits for her to wear for the day.
2. The second image shows a woman standing in front of her smart mirror wearing an outfit and receiving a pop-up message from the mirror itself telling her about her schedule, the weather for the day and how her day would look like. She also receives a notification from the "Wear Your Confidence" application on her smartphone with this information.

3. The third image shows a woman eating her meal. In the image, it is seen that she is slightly slouching while eating, and overall does not have a proper posture. She then receives a notification from the “Wear Your Confidence” application indicating her improper posture, and sees the image provided to identify what the correct posture is. She immediately corrects her posture.
4. The fourth image shows a woman walking to work with her bag. Her bag contains her laptop and is very heavy. This excess weight changes her overall weight distribution. However, the smart insoles get right to work as they accommodate the excess weight distribution, making sure that the user is walking comfortably and starting their day on a good note, despite the weight of the bag.
5. The fifth image shows a woman relaxing at home. She decides to check the “Wear Your Confidence” mobile application to see how her posture has been throughout the day through the posture analysis feature on the home page. She finds out that she has an 80% posture accuracy rate. This means that she has been sitting and standing all day in the proper posture for about 80% of the time. She is very happy upon seeing this.
6. The sixth and final image on the storyboard shows a woman working out in the gym. Her body temperature rises as she exerts herself on the treadmill. She receives a notification from the “Wear Your Confidence” mobile application informing her that her adaptive gym clothes have been made more breathable. This way she can work out without sweating too much and having to worry about sweat stains, unlike everyone else in the gym who is sweating.

This storyboard may be considered as individual instances where each of these six instances show different people with different lifestyles, where one of them works, or goes to the gym, or relaxes at home. Alternatively, it could show the life of one user, who wakes up, goes to work, comes home and relaxes for a while before going to the gym. This storyboard only shows the life of a woman (or multiple female users), however, it is very similar for the other genders and for children as well. Either way, the “Wear Your Confidence” accommodates all demographics despite their gender, age, or lifestyle choices.

This storyboard shows how the users interact with the different “things” and the smartphone app itself. It shows the life of the user. Despite the user being only one stakeholder, each of these images individually could represent some of the other stakeholders as well.

For example, image 4 could represent employers and workplace productivity experts, and not just an employee. As this image shows how the smart insoles make sure that the woman reaches work as comfortably as possible, thereby making sure that she can work comfortably as well, without any extra strain causing foot pain. This would mean, she is highly productive throughout the day and causes an increase in workplace ergonomics and employee satisfaction.

Another example would be image 6, where the user is not just any average user, but a fitness professional, who would like to train their students, however, doing so could cause discomfort due to sweat and lack of breathability of their clothes. This is where Adaptive Clothing comes in,

as it makes sure that the clothes are breathable and reduces discomfort, thereby helping these fitness professionals work comfortably and promote good posture correction strategies to their students, promoting overall well-being.

## Storyboard



## Managing Security and Privacy Risks

### Potential Security and Privacy Challenges:

1. Data Protection: User data collected by sensors and devices (e.g., posture data, health metrics, personal preferences) is sensitive and requires protection against unauthorized access, data breaches, and misuse.
2. Communication Security: Ensuring secure transmission of data between edge devices, mobile apps, and cloud services to prevent interception, tampering, or eavesdropping attacks.
3. User Authentication: Verifying the identity of users accessing the system, protecting user accounts from unauthorized access, and safeguarding login credentials.
4. Device Security: Ensuring the security of edge devices (e.g., smart vests, insoles, mirrors) against physical tampering, firmware exploits, or malware attacks.
5. Privacy Concerns: Respecting user privacy by anonymizing data where possible, providing transparency about data collection and usage, and offering robust privacy controls to users.

### Addressing Security and Privacy Risks:

1. Data Encryption: Implementing end-to-end encryption (e.g., TLS/SSL) for data transmission to protect data integrity and confidentiality during communication between devices and cloud services.
2. Access Controls: Implementing role-based access control (RBAC) mechanisms to restrict access to sensitive data and functionalities based on user roles and permissions.
3. Secure Authentication: Enforcing strong authentication mechanisms such as multi-factor authentication (MFA), biometric authentication, or OAuth for user login and access to the system.
4. Secure Development Practices: Following secure coding practices, conducting regular security audits and vulnerability assessments, and keeping software and firmware up to date with security patches.
5. Privacy by Design: Incorporating privacy-enhancing features such as data minimization, purpose limitation, and user consent mechanisms into the system's design and functionalities.
6. User Education: Providing user education and awareness about security and privacy best practices, encouraging users to set strong passwords, enable security features, and review privacy settings.
7. Compliance and Regulations: Adhering to data protection regulations (e.g., GDPR, CCPA) and industry standards for security and privacy to ensure legal compliance and user trust.

### Other Forms of Risk in Deployment:

1. Ethical Considerations: Addressing ethical concerns related to data usage, algorithmic biases, and potential impact on user behavior, mental health, and well-being.
2. Data Integrity: Ensuring the accuracy, reliability, and integrity of data collected and processed by the system to avoid misleading or erroneous insights or recommendations.

3. System Reliability: Building resilience and redundancy into the system to mitigate risks of system failures, downtime, or disruptions that could affect user experience and safety.
4. Regulatory Compliance: Staying updated with evolving regulatory requirements and industry standards for health tech, wearable devices, and AI-powered systems to avoid legal liabilities and penalties.
5. Faulty Sensors: Addressing faulty sensors are very important to make sure that the smart devices are functioning well.

By proactively addressing these security, privacy, and risk management considerations, the "Wear Your Confidence" system can enhance user trust, data protection, and overall system reliability, ensuring a safe and secure experience for users.

## Approaches to Evaluation

### Criteria for Evaluation:

1. Performance: Measure the accuracy and reliability of posture monitoring, activity tracking, and style recommendations.
2. Usability: Evaluate the user experience, interface design, ease of interaction, and user satisfaction.
3. Security: Assess data encryption, access controls, authentication mechanisms, and compliance with security standards.
4. Privacy: Review data anonymization, user consent mechanisms, transparency in data collection and usage.
5. Energy Efficiency: Measure energy consumption of devices, optimize power management, and assess battery life.
6. Reliability: Test system uptime, robustness against failures, error handling, and system recovery mechanisms.
7. Communication Bandwidth: Evaluate data transmission efficiency, network latency, and bandwidth usage.
8. Scalability: Assess the system's ability to handle increasing user load, data volumes, and device connections.
9. Regulatory Compliance: Ensure adherence to relevant regulations (e.g., GDPR, HIPAA) and industry standards.

### Testing and Evaluation Methods:

1. Component Testing: Conduct unit testing for individual components such as smart vests, insoles, mirrors, and adaptive clothing to validate functionality, data accuracy, and sensor readings.
2. System Integration Testing: Test the integration of all components, data synchronization, interoperability, and end-to-end system performance.
3. User Trials: Conduct usability testing with real users to gather feedback on interface design, functionality, user preferences, and overall user experience.

### **Non-Functional Requirements Testing:**

1. Communication Bandwidth Requirement: Measure data transmission rates, latency, and bandwidth usage to ensure efficient communication between devices and cloud services.
2. Energy Requirement: Assess power consumption of devices, optimize algorithms for energy efficiency, and monitor battery life during usage.
3. Reliability Testing: Perform stress testing, fault tolerance testing, and failure simulations to evaluate system reliability and robustness.
4. Security Assessment: Conduct penetration testing, vulnerability assessments, and compliance checks to validate security controls, data protection measures, and encryption protocols.
5. Scalability: Measure the system's ability to handle increasing user loads and data volumes without a significant decrease in performance. This can be tested by simulating a large number of concurrent users and monitoring response times, resource utilization, and system throughput.
6. Interoperability: Evaluate the system's compatibility and interoperability with different devices, platforms, and protocols. Test scenarios where the system interacts with third-party devices or services to ensure seamless integration and data exchange.
7. Accessibility: Assess the system's accessibility features and compliance with accessibility standards (e.g., WCAG). Test usability for users with disabilities or special needs, including screen reader compatibility, keyboard navigation, and alternative input methods.
8. Maintainability: Evaluate the ease of maintenance, updates, and modifications to the system. Test procedures for software updates, database maintenance, hardware replacements, and system configurations to ensure minimal downtime and efficient management of the system over time.

### **Acceptance Criteria for Evaluation:**

1. Performance: Achieve posture monitoring accuracy of at least 90%, activity tracking precision of 95%, and style recommendation relevance of 85%.
2. Usability: Obtain a user satisfaction score of 8 out of 10 in usability testing surveys.
3. Security and Privacy: Ensure compliance with data protection regulations, zero security vulnerabilities, and user consent for data usage.
4. Energy Efficiency: Maintain a battery life of at least 24 hours under typical usage scenarios.
5. Reliability: Achieve system uptime of 99.9%, with automatic error recovery and minimal downtime.
6. Communication Bandwidth: Meet communication bandwidth requirements with efficient data compression and optimized data transmission protocols.
7. Scalability: Demonstrate scalability to support 10,000 simultaneous users with minimal impact on system performance.
8. Regulatory Compliance: Obtain certification for compliance with relevant data privacy and security standards.

### **Mitigating Risks in Deployment:**

1. Security Risks: Mitigated by conducting regular security audits, patch management, intrusion detection systems, and continuous monitoring for potential threats.
2. Privacy Risks: Mitigated by conducting privacy impact assessments, data anonymization techniques, user-centric privacy controls, and transparent data handling policies.
3. User Acceptance Risks: Mitigated by conducting pilot trials, gather user feedback, iterate based on user inputs, and provide clear communication about system capabilities and limitations.
4. Scalability Risks: Mitigated by planning for scalability from the design phase, use cloud-based infrastructure for elasticity, implement load balancing, and monitor system performance metrics.

By following a comprehensive evaluation protocol that includes component testing, system integration testing, user trials, and assessment of non-functional requirements, the "Wear Your Confidence" system can ensure optimal performance, user satisfaction, security, privacy, and reliability when deployed in real-world scenarios.

### **References**

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## Appendix

## 1. Entire Flutter Code for the Home Page

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  top: 0,
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    height: 37,
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      children: [
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          top: 0,
          child: Container(
            width: 37,
            height: 37,
            decoration: ShapeDecoration(
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              shape: OvalBorder(),
            ),
          ),
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          top: 3.4,
          child: Container(
            width: 38.06,
            height: 31.86,
            child: Stack(
              children: [
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                  top: 0,
                  child: Container(
                    width: 12.35,
                    height: 26.67,
                    child: Stack(
                      children: [
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                          top: 3.35,
                          child: Container(
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                            height: 3.26,
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                              ],
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                        ),
                      ],
                    ),
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                ),
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                    height: 1.32,
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                    ),
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        ),
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    ),
  ),
),
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  top: 124,
  child: Container(
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    height: 358,
    child: Stack(
      children: [
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          top: 14,
          child: Text(
            'Leonardo',
            style: TextStyle(
              color: Color(0xFF1B1E28),
              fontSize: 14,
              fontFamily: 'Roboto',
              fontWeight: FontWeight.w500,
              height: 0.88,
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                      shape: OvalBorder(),
                    ),
                  ),
                ),
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            ),
          ),
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              ),
            ),
          ),
        ),
      ],
    ),
  ),
),
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  top: 124,
  child: Container(
    width: 300,
    height: 358,
    child: Stack(
      children: [
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          top: 14,
          child: Text(
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              fontSize: 38,
              fontFamily: 'Roboto',
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              height: 0.83,
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            fontSize: 38,
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            fontFamily: 'Roboto',
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        ),
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    ),
  ),
),

```

```

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394     top: 20,
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397       height: 245,
398     child: Stack(
399       children: [
400         Positioned(
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402           top: 0,
403           child: Container(
404             width: 357,
405             height: 245,
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409                 borderRadius: BorderRadius.circular(15),
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412             shadows: [
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415                 blurRadius: 16,
416                 offset: Offset(0, 6),
417                 spreadRadius: 8,
418               ),
419             ],
420           ),
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427           height: 27,
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429           children: [
430             Positioned(
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432               top: 0,
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434                 width: 235,
435                 height: 27,
436               child: Container(
437                 children: [
438                   Positioned(
439                     style: TextStyle(
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441                       fontSize: 26,
442                       fontFamily: 'Roboto',
443                       fontWeight: FontWeight.w600,
444                       height: 0.87,
445                     ),
446                   ),
447                 ],
448               ),
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455               height: 15,
456             child: Text(
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458               style: TextStyle(
459                 color: Colors.white,
460                 fontSize: 26,
461                 fontFamily: 'Roboto',
462                 fontWeight: FontWeight.w600,
463                 height: 0.87,
464               ),
465             ),
466           ),
467         ],
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476       height: 103,
477       decoration: ShapeDecoration(
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479         shape: RoundedRectangleBorder(
480           borderRadius: BorderRadius.circular(24),
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482       ),
483       shadows: [
484         BoxShadow(
485           color: Color(0x1E8B8CC8),
486           blurRadius: 16,
487           offset: Offset(0, 6),
488           spreadRadius: 8,
489         ),
490       ],
491     ),
492   ),
493   Positioned(
494     left: 21,
495     top: 42,
496     child: Container(
497       width: 315,
498       height: 103,
499       decoration: ShapeDecoration(
500         color: Colors.white,
501         shape: RoundedRectangleBorder(
502           borderRadius: BorderRadius.circular(24),
503         ),
504       ),
505       shadows: [
506         BoxShadow(
507           color: Color(0x1E8B8CC8),
508           blurRadius: 16,
509           offset: Offset(0, 6),
510           spreadRadius: 8,
511         ),
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513     ),
514   ),
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520       height: 29,
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523         shape: RoundedRectangleBorder(
524           borderRadius: BorderRadius.circular(24),
525         ),
526       ),
527       shadows: [
528         BoxShadow(
529           color: Color(0x1E8B8CC8),
530           blurRadius: 16,
531           offset: Offset(0, 6),
532           spreadRadius: 8,
533         ),
534       ],
535     ),
536   ),
537   Positioned(
538     left: 0,
539     top: 0,
540     child: Container(
541       width: 315,
542       height: 24,
543       decoration: ShapeDecoration(
544         color: Color(0xFF1B1E28),
545         shape: RoundedRectangleBorder(
546           borderRadius: BorderRadius.circular(24),
547         ),
548       ),
549       shadows: [
550         BoxShadow(
551           color: Color(0x1E8B8CC8),
552           blurRadius: 16,
553           offset: Offset(0, 6),
554           spreadRadius: 8,
555         ),
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557     ),
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570       ),
571       shadows: [
572         BoxShadow(
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574           blurRadius: 16,
575           offset: Offset(0, 6),
576           spreadRadius: 8,
577         ),
578       ],
579     ),
580   ),
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591         ),
592       ),
593       shadows: [
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595           color: Color(0x1E8B8CC8),
596           blurRadius: 16,
597           offset: Offset(0, 6),
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621       width: 99,
622       height: 24,
623       child: Text(
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625         style: TextStyle(
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628           fontFamily: 'Roboto',
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633       ),
634     ),
635   ),
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638     top: 21,
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641       height: 24,
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647           fontFamily: 'Roboto',
648           fontWeight: FontWeight.w600,
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652       ),
653     ),
654   ),
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660       height: 131,
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662         children: [
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665             top: 0,
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673                 ),
674               ),
675             ),
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677             left: 55.71,
678             top: 18,
679             child: Container(
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681               height: 96,
682             ),
683           ),
684         ],
685       ),
686     ),
687   ),

```

```

688   ),
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699             top: 0,
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702               height: 96,
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705                 shape: RoundedRectangleBorder(
706                   borderRadius: BorderRadius.circular(100),
707                 ),
708               ),
709             ),
710           Positioned(
711             left: 55.71,
712             top: 18,
713             child: Container(
714               width: 12.71,
715               height: 96,
716             ),
717           ),
718         ],
719       ),
720     ),
721   ),
722   Positioned(
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724     top: 0,
725     child: Container(
726       width: 12.71,
727       height: 96,
728       decoration: ShapeDecoration(
729         color: Colors.white,
730         shape: RoundedRectangleBorder(
731           borderRadius: BorderRadius.circular(100),
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734     ),
735   ),
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739     child: Container(
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741       height: 96,
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744         shape: RoundedRectangleBorder(
745           borderRadius: BorderRadius.circular(100),
746         ),
747       ),
748     ),
749   ),
750   Positioned(
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752     top: 0,
753     child: Container(
754       width: 12.71,
755       height: 96,
756       decoration: ShapeDecoration(
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758         shape: RoundedRectangleBorder(
759           borderRadius: BorderRadius.circular(100),
760         ),
761       ),
762     ),
763   ),
764   Positioned(
765     left: 0,
766     top: 0,
767     child: Container(
768       width: 12.71,
769       height: 96,
770       decoration: ShapeDecoration(
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772         shape: RoundedRectangleBorder(
773           borderRadius: BorderRadius.circular(100),
774         ),
775       ),
776     ),
777   ),
778   Positioned(
779     left: 0,
780     top: 0,
781     child: Container(
782       width: 12.71,
783       height: 96,
784       decoration: ShapeDecoration(
785         color: Colors.white,
786         shape: RoundedRectangleBorder(
787           borderRadius: BorderRadius.circular(100),
788         ),
789       ),
790     ),
791   ),
792   Positioned(
793     left: 0,
794     top: 0,
795     child: Container(
796       width: 12.71,
797       height: 96,
798       decoration: ShapeDecoration(
799         color: Colors.white,
800         shape: RoundedRectangleBorder(
801           borderRadius: BorderRadius.circular(100),
802         ),
803       ),
804     ),
805   ),
806   Positioned(
807     left: 0,
808     top: 0,
809     child: Container(
810       width: 12.71,
811       height: 96,
812       decoration: ShapeDecoration(
813         color: Colors.white,
814         shape: RoundedRectangleBorder(
815           borderRadius: BorderRadius.circular(100),
816         ),
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820   Positioned(
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822     top: 0,
823     child: Container(
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827         color: Colors.white,
828         shape: RoundedRectangleBorder(
829           borderRadius: BorderRadius.circular(100),
830         ),
831       ),
832     ),
833   ),
834   Positioned(
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836     top: 0,
837     child: Container(
838       width: 12.71,
839       height: 96,
840       decoration: ShapeDecoration(
841         color: Colors.white,
842         shape: RoundedRectangleBorder(
843           borderRadius: BorderRadius.circular(100),
844         ),
845       ),
846     ),
847   ),
848   Positioned(
849     left: 0,
850     top: 0,
851     child: Container(
852       width: 12.71,
853       height: 96,
854       decoration: ShapeDecoration(
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856         shape: RoundedRectangleBorder(
857           borderRadius: BorderRadius.circular(100),
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860     ),
861   ),
862   Positioned(
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864     top: 0,
865     child: Container(
866       width: 12.71,
867       height: 96,
868       decoration: ShapeDecoration(
869         color: Colors.white,
870         shape: RoundedRectangleBorder(
871           borderRadius: BorderRadius.circular(100),
872         ),
873       ),
874     ),
875   ),
876   Positioned(
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878     top: 0,
879     child: Container(
880       width: 12.71,
881       height: 96,
882       decoration: ShapeDecoration(
883         color: Colors.white,
884         shape: RoundedRectangleBorder(
885           borderRadius: BorderRadius.circular(100),
886         ),
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890   Positioned(
891     left: 0,
892     top: 0,
893     child: Container(
894       width: 12.71,
895       height: 96,
896       decoration: ShapeDecoration(
897         color: Colors.white,
898         shape: RoundedRectangleBorder(
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906     top: 0,
907     child: Container(
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909       height: 96,
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912         shape: RoundedRectangleBorder(
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926         shape: RoundedRectangleBorder(
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950       width: 12.71,
951       height: 96,
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954         shape: RoundedRectangleBorder(
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982         shape: RoundedRectangleBorder(
983           borderRadius: BorderRadius.circular(100),
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990     top: 0,
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993       height: 96,
994       decoration: ShapeDecoration(
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996         shape: RoundedRectangleBorder(
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1355     child: Container(
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1600         ),
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1602     ),
1603   ),
1604   Positioned(
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1606     top: 0,
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1610       decoration: ShapeDecoration(
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1613           borderRadius: BorderRadius.circular(100),
1614         ),
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1616     ),
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1640         shape: RoundedRectangleBorder(
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1645   ),
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1653         color: Colors.white,
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1656         ),
1657       ),
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1660   Positioned(
1661     left
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180     borderRadius: BorderRadius.circular(100),
181   ),
182   ),
183   ),
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185   ),
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200           top: 0,
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206               shape: RoundedRectangleBorder(
207                 borderRadius: BorderRadius.circular(100),
208               ),
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314               color: Color(0xFFBFA602),
315               shape: RoundedRectangleBorder(
316                 borderRadius: BorderRadius.circular(100),
317               ),
318             ),
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342   child: Container(
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344     height: 69.58,
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346       color: Color(0xFFBFA602),
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348         borderRadius: BorderRadius.circular(100),
349       ),
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361   top: 0,
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364     height: 214,
365     child: Stack(
366       children: [
367         Positioned(
368           left: 0,
369           top: 0,
370           child: Container(
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372             height: 37.24,
373             decoration: ShapeDecoration(
374               color: Color(0xFFBFA602),
375               shape: RoundedRectangleBorder(
376                 borderRadius: BorderRadius.circular(100),
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391   top: 66.76,
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394     height: 37.24,
395     decoration: ShapeDecoration(
396       color: Colors.white,
397       shape: RoundedRectangleBorder(
398         borderRadius: BorderRadius.circular(100),
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411   top: 0,
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414     height: 18.43,
415     child: Stack(
416       children: [
417         Positioned(
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419           top: 0,
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422             height: 9.76,
423             padding: EdgeInsets.only(
424               top: 0.54,
425               left: 1.70,
426               right: 1.70,
427               bottom: 0.68,
428             ),
429             child: Row(
430               mainAxisSize: MainAxisSize.min,
431               mainAxisAlignment: MainAxisAlignment.center,
432               crossAxisAlignment: CrossAxisAlignment.center,
433               children: [
434                 ],
435               ),
436             ),
437           ),
438         ],
439       ],
440     ),
441   ],
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450   left: 11.06,
451   top: 18,
452   child: Container(
453     width: 12.71,
454     height: 98,
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456       color: Colors.white,
457       shape: RoundedRectangleBorder(
458         borderRadius: BorderRadius.circular(100),
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469 Positioned(
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471   top: 0,
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474     height: 214,
475     child: Stack(
476       children: [
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479           top: 0,
480           child: Container(
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482             height: 98,
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484               color: Colors.white,
485               shape: RoundedRectangleBorder(
486                 borderRadius: BorderRadius.circular(100),
487               ),
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501   top: 0,
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504     height: 214,
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506       children: [
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508           left: 0,
509           top: 0,
510           child: Container(
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512             height: 98,
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515               shape: RoundedRectangleBorder(
516                 borderRadius: BorderRadius.circular(100),
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534     height: 214,
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539           top: 0,
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542             height: 98,
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544               color: Colors.white,
545               shape: RoundedRectangleBorder(
546                 borderRadius: BorderRadius.circular(100),
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559   left: 10,
560   top: 0,
561   child: Container(
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563     height: 214,
564     child: Stack(
565       children: [
566         Positioned(
567           left: 0,
568           top: 0,
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571             height: 98,
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573               color: Colors.white,
574               shape: RoundedRectangleBorder(
575                 borderRadius: BorderRadius.circular(100),
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577             ),
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589   top: 0,
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594       children: [
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597           top: 0,
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600             height: 98,
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604                 borderRadius: BorderRadius.circular(100),
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615 Positioned(
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617   top: 0,
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620     height: 214,
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625           top: 0,
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627             width: 12.71,
628             height: 98,
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631               shape: RoundedRectangleBorder(
632                 borderRadius: BorderRadius.circular(100),
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634             ),
635           ),
636         ),
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643 Positioned(
644   left: 10,
645   top: 0,
646   child: Container(
647     width: 357,
648     height: 214,
649     child: Stack(
650       children: [
651         Positioned(
652           left: 0,
653           top: 0,
654           child: Container(
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656             height: 98,
657             decoration: ShapeDecoration(
658               color: Colors.white,
659               shape: RoundedRectangleBorder(
660                 borderRadius: BorderRadius.circular(100),
661               ),
662             ),
663           ),
664         ),
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666     ),
667   ],
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669 Positioned(
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671   top: 0,
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674     height: 214,
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676       children: [
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679           top: 0,
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697   top: 0,
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704           left: 0,
705           top: 0,
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708             height: 98,
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712                 borderRadius: BorderRadius.circular(100),
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717       ],
718     ),
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723   top: 0,
724   child: Container(
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726     height: 214,
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731           top: 0,
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738                 borderRadius: BorderRadius.circular(100),
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741           ),
742         ),
743       ],
744     ),
745   ],
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751     height: 214,
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753       children: [
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756           top: 0,
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759             height: 98,
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766           ),
767         ),
768       ],
769     ),
770   ],
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776     height: 214,
777     child: Stack(
778       children: [
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781           top: 0,
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784             height: 98,
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787               shape: RoundedRectangleBorder(
788                 borderRadius: BorderRadius.circular(100),
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805           top: 0,
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811               shape: RoundedRectangleBorder(
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834             decoration: ShapeDecoration(
835               color: Colors.white,
836               shape: RoundedRectangleBorder(
837                 borderRadius: BorderRadius.circular(100),
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839             ),
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845 Positioned(
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855           top: 0,
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861               shape: RoundedRectangleBorder(
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865           ),
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868     ),
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870 Positioned(
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872   top: 0,
873   child: Container(
874     width: 357,
875     height: 214,
876     child: Stack(
877       children: [
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880           top: 0,
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883             height: 98,
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905           top: 0,
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934             decoration: ShapeDecoration(
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1027           top: 0,
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1045     height: 214,
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1050           top: 0,
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1073           top: 0,
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1086 Positioned(
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1096           top: 0,
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1113     width: 357,
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1116       children: [
1117         Positioned(
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1119           top: 0,
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1122             height: 98,
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1136     height: 214,
1137     child: Stack(
1138       children: [
1139         Positioned(
1140           left: 0,
1141           top: 0,
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1144             height: 98,
1145             decoration: ShapeDecoration(
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1147               shape: RoundedRectangleBorder(
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1152         ),
1153       ],
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1155   top: 0,
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1160       children: [
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1162           left: 0,
1163           top: 0,
1164           child: Container(
1165             width: 12.71,
1166             height: 98,
1167             decoration: ShapeDecoration(
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1169               shape: RoundedRectangleBorder(
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1173           ),
1174         ),
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1175 Positioned(
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1180     height: 214,
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1182       children: [
1183         Positioned(
1184           left: 0,
1185           top: 0,
1186           child: Container(
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1197       ],
1197 Positioned(
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1202     height: 214,
1203     child: Stack(
1204       children: [
1205         Positioned(
1206           left: 0,
1207           top: 0,
1208           child: Container(
1209             width: 12.71,
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1211             decoration: ShapeDecoration(
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1213               shape: RoundedRectangleBorder(
1214                 borderRadius: BorderRadius.circular(100),
1215               ),
1216             ),
1217           ),
1218         ),
1219       ],
1219 Positioned(
1220   left: 10,
1221   top: 0,
1222   child: Container(
1223     width: 357,
1224     height: 214,
1225     child: Stack(
1226       children: [
1227         Positioned(
1228           left: 0,
1229           top: 0,
1230           child: Container(
1231             width: 12.71,
1232             height: 98,
1233             decoration: ShapeDecoration(
1234               color: Color(0xFFBFA602),
1235               shape: RoundedRectangleBorder(
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1237               ),
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1239           ),
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1241 Positioned(
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1246     height: 214,
1247     child: Stack(
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1252           child: Container(
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1254             height: 98,
1255             decoration: ShapeDecoration(
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1257               shape: RoundedRectangleBorder(
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1262         ),
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1263 Positioned(
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1268     height: 214,
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1271         Positioned(
1272           left: 0,
1273           top: 0,
1274           child: Container(
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1276             height: 98,
1277             decoration: ShapeDecoration(
1278               color: Color(0xFFBFA602),
1279               shape: RoundedRectangleBorder(
1280                 borderRadius: BorderRadius.circular(100),
1281               ),
1282             ),
1283           ),
1284         ),
1285       ],
1285 Positioned(
1286   left: 10,
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1288   child: Container(
1289     width: 357,
1290     height: 214,
1291     child: Stack(
1292       children: [
1293         Positioned(
1294           left: 0,
1295           top: 0,
1296           child: Container(
1297             width: 12.71,
1298             height: 98,
1299             decoration: ShapeDecoration(
1300               color: Color(0xFFBFA602),
1301               shape: RoundedRectangleBorder(
1302                 borderRadius: BorderRadius.circular(100),
1303               ),
1304             ),
1305           ),
1306         ),
1307       ],
1307 Positioned(
1308   left: 10,
1309   top: 0,
1310   child: Container(
1311     width: 357,
1312     height: 214,
1313     child: Stack(
1314       children: [
1315         Positioned(
1316           left: 0,
1317           top: 0,
1318           child: Container(
1319             width: 12.71,
1320             height: 98,
1321             decoration: ShapeDecoration(
1322               color: Color(0xFFBFA602),
1323               shape: RoundedRectangleBorder(
1324                 borderRadius: BorderRadius.circular(100),
1325               ),
1326             ),
1327           ),
1328         ),
1329       ],
1329 Positioned(
1330   left: 10,
1331   top: 0,
1332   child: Container(
1333     width: 357,
1334     height: 214,
1335     child: Stack(
1336       children: [
1337         Positioned(
1338           left: 0,
1339           top: 0,
1340           child: Container(
1341             width: 12.71,
1342             height: 98,
1343             decoration: ShapeDecoration(
1344               color: Color(0xFFBFA602),
1345               shape: RoundedRectangleBorder(
1346                 borderRadius: BorderRadius.circular(100),
1347               ),
1348             ),
1349           ),
1350         ),
1351       ],
1351 Positioned(
1352   left: 10,
1353   top: 0,
1354   child: Container(
1355     width: 357,
1356     height: 214,
1357     child: Stack(
1358       children: [
1359         Positioned(
1360           left: 0,
1361           top: 0,
1362           child: Container(
1363             width: 12.71,
1364             height: 98,
1365             decoration: ShapeDecoration(
1366               color: Color(0xFFBFA602),
1367               shape: RoundedRectangleBorder(
1368                 borderRadius: BorderRadius.circular(100),
1369               ),
1370             ),
1371           ),
1372         ),
1373       ],
1373 Positioned(
1374   left: 10,
1375   top: 0,
1376   child: Container(
1377     width: 357,
1378     height: 214,
1379     child: Stack(
1380       children: [
1381         Positioned(
1382           left: 0,
1383           top: 0,
1384           child: Container(
1385             width: 12.71,
1386             height: 98,
1387             decoration: ShapeDecoration(
1388               color: Color(0xFFBFA602),
1389               shape: RoundedRectangleBorder(
1390                 borderRadius: BorderRadius.circular(100),
1391               ),
1392             ),
1393           ),
1394         ),
1395       ],
1395 Positioned(
1396   left: 10,
1397   top: 0,
1398   child: Container(
1399     width: 357,
1400     height: 214,
1401     child: Stack(
1402       children: [
1403         Positioned(
1404           left: 0,
1405           top: 0,
1406           child: Container(
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1408             height: 98,
1409             decoration: ShapeDecoration(
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1411               shape: RoundedRectangleBorder(
1412                 borderRadius: BorderRadius.circular(100),
1413               ),
1414             ),
1415           ),
1416         ),
1417       ],
1417 Positioned(
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1419   top: 0,
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1421     width: 357,
1422     height: 214,
1423     child: Stack(
1424       children: [
1425         Positioned(
1426           left: 0,
1427           top: 0,
1428           child: Container(
1429             width: 12.71,
1430             height: 98,
1431             decoration: ShapeDecoration(
1432               color: Color(0xFFBFA602),
1433               shape: RoundedRectangleBorder(
1434                 borderRadius: BorderRadius.circular(100),
1435               ),
1436             ),
1437           ),
1438         ),
1439       ],
1439 Positioned(
1440   left: 10,
1441   top: 0,
1442   child: Container(
1443     width: 357,
1444     height: 214,
1445     child: Stack(
1446       children: [
1447         Positioned(
1448           left: 0,
1449           top: 0,
1450           child: Container(
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1452             height: 98,
1453             decoration: ShapeDecoration(
1454               color: Color(0xFFBFA602),
1455               shape: RoundedRectangleBorder(
1456                 borderRadius: BorderRadius.circular(100),
1457               ),
1458             ),
1459           ),
1460         ),
1461       ],
1461 Positioned(
1462   left: 10,
1463   top: 0,
1464   child: Container(
1465     width: 357,
1466     height: 214,
1467     child: Stack(
1468       children: [
1469         Positioned(
1470           left: 0,
1471           top: 0,
1472           child: Container(
1473             width: 12.71,
1474             height: 98,
1475             decoration: ShapeDecoration(
1476               color: Color(0xFFBFA602),
1477               shape: RoundedRectangleBorder(
1478                 borderRadius: BorderRadius.circular(100),
1479               ),
1480             ),
1481           ),
1482         ),
1483       ],
1483 Positioned(
1484   left: 10,
1485   top: 0,
1486   child: Container(
1487     width: 357,
1488     height: 214,
1489     child: Stack(
1490       children: [
1491         Positioned(
1492           left: 0,
1493           top: 0,
1494           child: Container(
1495             width: 12.71,
1496             height: 98,
1497             decoration: ShapeDecoration(
1498               color: Color(0xFFBFA6
```



