TailorMe

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Project Detail

Type (Nature of project)	[✓] **Development** [ ] **Research** & **Development**			
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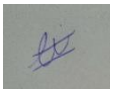
(i)	FA21-BCS-006	Muhammad Ali	MuhammadAli.16k@gmail.com	
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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

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Abstract

Clothing measurements, particularly for tailored garments, often require precise and efficient methods, which is usually done through manual measurements, and this requires being physically present at the shopping venue and the availability of measuring tools such as a measuring tape.

Hence, we have proposed TailorMe, a body measurement application, that aims to address this issue by computer vision with machine learning, for which a ResNet is used. The application processes user-uploaded images to measure body dimensions such as arm length, shoulders, neck, waist, chest and hip. Using the predicted measurements it generates a general size recommendation. We have also accommodated South Asian clothing (Shalwar Qameez) and the user can get a size prediction for it.

We hope to offer a practical solution to simplify the tailoring process and reduce the number of returns that happen during online shopping because of mismatched sizes.

In addition, the application offers a dedicated registration and dashboard system for tailors. Once registered, tailors can manage customer records, place and track orders, and view order statistics, enabling them to streamline their workflow and digitize their manual registers.

Acknowledgement

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1 Introduction

Clothing measurements are a crucial aspect of tailoring and garment shopping, yet many individuals struggle with obtaining precise and consistent body measurements. This is particularly challenging when tailoring traditional or custom-made clothing, where accurate measurements are essential for a proper fit. To address this issue, we propose TailorMe, a body measurement application that utilizes Computer Vision using Deep Learning (ResNet) for Multi-Output Regression to provide users with accurate measurements that are used for tailoring such as neck size, waist, shoulder length, arm length, chest and hip size. The app also provides tailors the functionality to manage customer records, place and track orders, and view order statistics, enabling them to streamline their workflow and digitize their manual registers.

This app aims to change how people measure their body dimensions by introducing a simple and user-friendly platform that leverages technology. Allowing them to take measurements from the privacy of their home. Using a smartphone camera, users can take or upload photos, which are processed to extract key measurements, based on which the application recommends clothing size.

The machine learning model, built with Python and powered by libraries like Tensorflow, Keras for building and training the ResNet model using deep learning. Numpy and Pandas for handling numerical computations and preprocessing the dataset. OpenCV for image preprocessing. The frontend, designed in React Native with Expo framework, provides users with an intuitive interface to interact with the App.

This introduction provides a foundation for this project, outlining its objectives and scope while highlighting its potential to simplify tailoring and garment shopping experiences for users worldwide.

1.1 Objectives

- Provide reliable body measurements using machine learning
- Offer sizing recommendations for desi clothing (Shalwar Qameez).
- Create a user-friendly application for taking and uploading images for measurements.
- Reduce dependency on manual measurement methods.
- Digitize manual tailor records and orders.

1.2 Problem statement

Accurate body measurements are essential for tailored clothing and garment shopping, yet traditional manual methods are prone to errors and inconsistencies. This often results in ill-fitting garments and a time-consuming tailoring process. Additionally, there is no accessible tool for users to measure their bodies accurately using their smartphones. The

absence of such a tool limits the ability to quickly obtain precise measurements for various clothing types, especially for desi attire where standard size charts may not suffice. This highlights the need for an innovative solution to simplify the measurement process and ensure accuracy in clothing fit.

1.3 Assumptions & constraints

1.3.1 Assumptions

- Smartphones with cameras are widely available for app users.
- Users are willing to grant camera and gallery access for measurement purposes.
- Measurement results will comply with standard size recommendations.
- Privacy and security of user images and data will be maintained.
- Users will follow on-screen guidelines for taking proper measurement photos.

1.3.2 Constraints

- Image quality directly affects measurement accuracy.
- Limited time and resources for model training, development, and testing.
- Network latency or lack of internet may delay API-based measurement results.
- Predicted measurements may not be wholly accurate and will have margin of error.
- Almost no available dataset with required measurement labels for training. Hence clothing size recommendation is limited to Shalwar Qameez.
- Dataset was collected manually across campus and hostels.
- Data imbalance (e.g., underrepresentation of certain body types) may affect model generalization.

1.4 Project scope

1.4.1 What to Consider

- Development of a computer vision machine learning model for measurement prediction using Python.
- React Native with the Expo Framework is used to build a seamless user interface.
- Integration of security measures for image data storage and processing.

1.4.2 What to not Consider

- Advanced AI features like predictive sizing beyond measurements.
- Integration with third-party clothing brands for virtual try-ons.
- Detailed customization options for niche clothing types.
- Extensions beyond core functionality like body posture analysis.

2 Requirement Analysis

We identify the requirements here and give a brief description of them in a conclusive way.

2.1 Literature review / Existing system study

Various research and development efforts have been made in body measurement extraction. Previous work includes techniques in computer vision, such as contour detection and key-point estimation using libraries like **OpenPose** [1].

During our research we came across apps like **MirrorSize** [2], which uses AI for body measurements. **3DLOOK** [3]**,** an app that captures over 80 points of measurement using just two photos taken by the user. **Bodymapp** [4]**,** a 3D body scanning app that allows users to measure and track their body composition and circumference measurements using an iPhone X or above.

We also came across the following Studies and research papers:

1. A Review of Body Measurement Using 3D Scanning [5]: https://www.researchgate.net/publication/351207865_A_Review_of_Body_Measurement_Using_3D_Scanning

2. This study focused on estimating upper body dimensions using a single RGB camera, such as those found on smartphones. The process involved several steps, including image calibration and feature extraction, to accurately derive body measurements [6]: https://www.semanticscholar.org/paper/Measuring-the-Human-Body-from-a-Single-Camera%2C-with-Montazerian-LEYMARIE/ae8c70ec2e5fe71f7692f51a9f7527f173d46f41?utm_source=direct_link

3. Designing a Contactless, AI System to Measure the Human Body using a Single Camera for the Clothing and Fashion Industry – University of London [7]: https://www.researchgate.net/publication/373343443_Designing_a_Contactless_AI_System_to_Measure_the_Human_Body_using_a_Single_Camera_for_the_Clothing_and_Fashion_Industry

4. Automatic Extraction of 3D Body Measurements from 2D Images: This paper proposes an automated system that extracts body measurements from 2D images, facilitating better garment fitting for small businesses. The system was tested on images of young females, comparing the results with manual measurements to validate its accuracy [8]~ https://www.semanticscholar.org/paper/Automatic-Extraction-of-3-d-Body-Measurements-from-Sehgal-Gupta/d49108ddfdeb2ddf973589bb078000274ee7fb01

2.2 Stakeholders list (Actors)

- Users: Individuals seeking body measurements or size recommendations.

- Tailors: Seeking to streamline their workflow from taking measurements to record keeping.
- Developers: Building and maintaining the application.

2.3 Requirements elicitation

2.3.1 Functional requirements

2.3.1.1 FR01 – User Management

Table 1. FR01 - User Management

FR01 - 01	**User Registration:** User should be able to create their profile on the application and select relevant role: Normal User or Tailor.
FR01 - 02	**User Login:** User should be to login using their credentials. (Username/Email and Password).
FR01 - 03	**Profile Management:** Users should be able to update and manage their profile information.

2.3.1.2 FR02 – Tailor Dashboard Features

Table 2. FR02 - Tailor Dashboard Features

FR02 – 01	**Register as Tailor:** Tailors can register and create a profile.
FR02 – 02	**Save and Manage Customer Records:** Tailors can save customer contact info, measurements and order history.
FR02 - 03	**Add and Update Orders:** Tailors can create new orders, update status (e.g. In-Progress, Completed), and assign delivery dates.
FR02 - 04	**View Order and Customer Statistics:** Tailors can view analytics like Total orders, customers, completed orders, pending work and total revenue.

2.3.1.3 FR03 - User Interface

Table 3. FR03 - User Interface

FR03 – 01	The User interface should be an intuitive interface for easy navigation.

2.3.1.4 FR04 - Image Upload

Table 4. FR04 - Image Upload

FR04 - 01	The user or tailor should be allowed to upload images for measurement.

2.3.1.5 FR05 – Capturing Image using Phone Camera

Table 5. FR05 - Capturing Image Using Phone Camera

FR05 - 01	The Users phone camera must be calibrated properly to take correct images for measurement extraction. They must follow the instructions on screen.
FR05 - 02	The User shall be able to capture image through the apps camera interface.

2.3.1.6 FR06 - Measurement Prediction

Table 6. FR06 - Measurement Prediction

FR06 - 01	Ensuring the measurements have minimum error.

2.3.1.7 FR07 - Measurement Adjustments

Table 7. FR07 - Measurement Adjustment

FR07 - 01	Enable users to manually edit measurements if needed.

2.3.1.8 FR08 - Clothing Size Recommendations

Table 8. FR08 - Clothing Recommendation

FR08 - 01	**Size Recommendation:** Suggests general size recommendation based on extracted measurements and size recommendations for Shalwar Qameez.

2.3.1.9 FR09 - Backend Database

Table 9. FR09 - Backend Database

FR09 - 01	**Data Storage:** The system will Store user data, measurements, and preferences securely.

2.3.2 Non-functional requirements

2.3.2.1 NFR01 - System Performance

Table 10. NFR01 - System Performance

NFR01 - 01	Ensure that the app responds to the user within reasonable time.

2.3.2.2 NFR02 - Scalability

Table 11. NFR02 - Scalability

NFR02 – 01	The app will be designed so that it can be scaled horizontally, to handle increasing user loads
NFR02 – 02	In terms of system architecture, we must make sure the app can accommodate future work.

2.3.2.3 NFR03 - Reliability

Table 12. NFR03 - Reliability

NFR03 - 01	The app should be highly available in terms of reliability. It should have minimal downtime and system failures.

2.3.2.4 NFR04 – Usability

Table 13. NFR04 - Usability

NFR04 - 01	The app should have an intuitive interface that requires minimal learning for new users.

2.3.2.5 NFR05 – Security

Table 14. NFR05 - Security

NFR05 – 01	The app that we will develop should implement robust security measures to protect user data that the user will provide us, including encryption of sensitive information of our user, secure authentication mechanisms, and protection against common security threats

2.3.2.6 NFR06 - Legal and Ethical

Table 15. NFR06 - Legal and Ethical

NFR06 - 01	Adhere to intellectual property rights and avoid unauthorized use of third-party assets.

2.4 Requirements traceability matrix

This table shows the functional requirements traceability matrix of our project gives the reference of use case description, activity diagram, sequence diagrams and test cases for all the functional requirements.

Table 16. Requirements traceability matrix

Functional Requirement Number	Functional Requirement Description	Use Case Description Number	Activity Diagram Number	Sequence Diagram Number	Collaboration Diagram Number	Test Case Number
FR01	User management encompasses all functionalities related to creating and maintaining user accounts. Users should be able to register, log in, and manage their profile. Users should be able to access and review their past measurement history and recommendations.	U01 U02 U03	AD01 AD02	SD01 SD02	CD01 CD02	TC01 TC02 TC03 TC04
FR02	Tailor Dashboard functionalities	UC04	AD05	-	CD05	TC07
FR03	The user interface should be designed to ensure an intuitive and seamless experience.	-	-	-	-	TC05 TC06
FR04	The image upload functionality provides users the option to upload an image from their phone gallery for measurement Prediction.	UC05	AD03	SD04	CD03	TC08
FR05	This functionality allows users to capture images directly through the app using their phone camera. The	UC06	AD04	SD03	CD04	TC09

	camera must be calibrated first, and app should provide an interface that guides the user to take suitable photos for measurement extraction.					
FR06	Measurement extraction focuses on accurately analyses the user's uploaded or captured photos to derive key body measurements. The system must ensure minimal error during this process.	UC05 UC06	AD03 AD04	SD03 SD04	CD03 CD04	TC10
FR07	This functionality allows users to edit adjust their extracted measurements.	-	-	-	-	TC11
FR08	The clothing recommendation algorithm provides users with a general size recommendation and a size recommendation for shalwar qameez.	UC07	AD03 AD04	SD 03 SD 04	CD03 CD04	TC12
FR09	The backend database is responsible for securely storing user data, measurements, and preferences. It ensures privacy of user information.	-	AD06	-	-	TC13

2.5 Use case descriptions

2.5.1 UC01 - User Registration

Table 17. UC01 - User Registration

Use Case Name:	User Registration
Actors:	User
Description:	User enters their credentials in the registration screen. They will input their chosen Username, Email and Password. They must also chose their role: Normal User or Tailor.
Pre-Condition:	• The app must be operational • The user shall not have another account with the same email
Post-Condition:	• The app confirms the new account was created
Normal Flow of Event	• User Opens the app. • Clicks on sign-up button. • Enters credentials. • The system validates the user's information. • A new accounted is created. • User is shown home screen relevant to chosen role.

2.5.2 UC02 - User Login

Table 18. UC02 - User Login

Use Case Name:	User Login
Actors:	User
Description:	User
Pre-Condition:	• App must be operational User must have an account as a normal user or tailor.
Post-Condition:	User is logged in.
Normal Flow of Event	• User opens the app. • Enters their credentials on the login screen. • The system validates the user. User is now logged into the app with their account.

2.5.3 UC03 - Reset Password

Table 19. UC03 - Reset Password

Use Case Name:	Reset Password
Actors:	User
Description:	User resets their password
Pre-Condition:	• App must be operational
Post-Condition:	• User has a new password, which they can use to login.
Normal Flow of Event	• The user opens the app. • User navigates to profile screen and then to settings. • User enters new password in the change password field. • User can login with the new password.

2.5.4 UC04 – Tailor Dashboard

Table 20. UC04 - Tailor Dashboard

Use Case Name:	Tailor Dashboard
Actors:	User with Tailor role.
Description:	Tailor registers their profile and gains access to features for managing customer records, adding orders, and viewing order statistics.
Pre-Condition:	• App must be operational. • User must be logged in with tailor account.
Post-Condition:	• Tailor gains access to a personalized dashboard. • Tailor data (customers, orders, stats) is stored in the database.
Normal Flow of Event	• User logs in their account with the tailor role. • User gains access to tailor dashboard.

2.5.5 UC05 – Image Upload and Measurement Prediction

Table 21. UC05 - Image Upload and Measurement Prediction

Use Case Name:	Image Upload & Measurement Prediction
Actors:	User
Description:	User shall be able to upload an image from their phone gallery for measurement extraction.
Pre-Condition:	• App must be operational. • User must be logged in.
Post-Condition:	• Measurements are predicted by the model and shown to the user.
Normal Flow of Event	• User logs in their account. • User navigates to "Take Measurement" screen. • User clicks/taps on the image upload button. • User selects an image from gallery. • Measurements are predicted by the model and shown on screen.

2.5.6 UC06 – Image Capturing Using Phone Camera and Measurement Prediction

Table 22. UC06 - Image Capturing Using Phone Camera and Measurement Prediction

Use Case Name:	Image Capturing Using Phone Camera & Measurement Prediction.
Actors:	User
Description:	User shall be able to capture an image from their phone.
Pre-Condition:	• App must be operational. • User must be logged in.
Post-Condition:	• Measurements are predicted by the model and shown to the user.
Normal Flow of Event	• User logs in their account or uses guest mode. • User clicks/taps on the image capture button. • User takes an image. • App validates the image. • Measurements are predicted by the model and shown on screen.

2.5.7 UC07 – Clothing Size Recommendation

Table 23. UC07 - Clothing Size Recommendation

Use Case Name:	Clothing Size Recommendation
Actors:	User
Description:	User can get clothing size recommendation on 1. Shalwar Qameez. 2. General Size recommendation.
Pre-Condition:	• App must be operational. • User must be logged in.
Post-Condition:	• Clothing Size Recommendations are shown to the user.
Normal Flow of Event	• User logs in their account. • User captures or uploads an image for measurement extraction. • Clothing Size recommendation are shown on screen.

2.6 Use case design

2.6.1 User Sign-up and Login

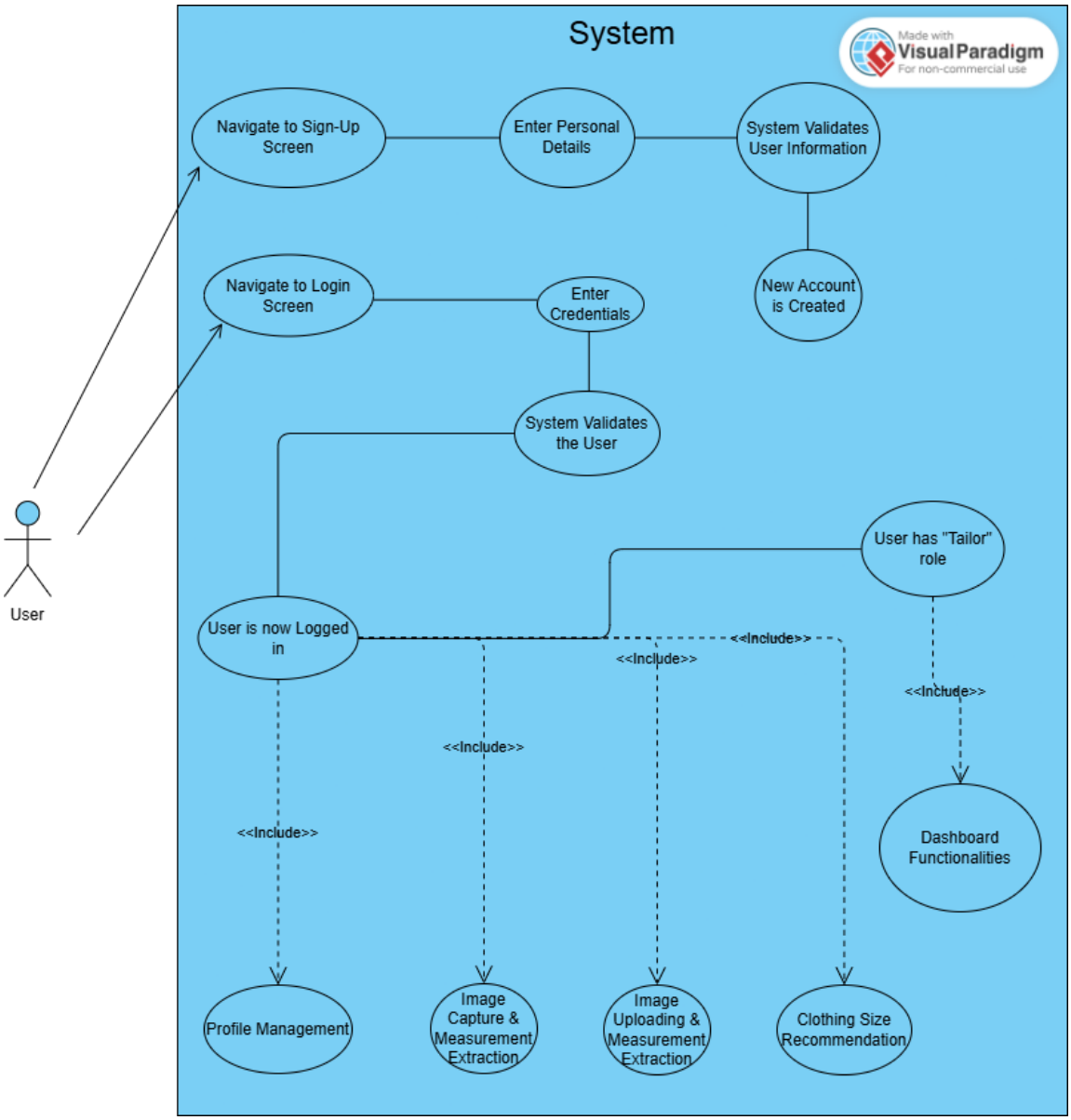

Figure 1. User Sign-up and Login

2.6.2 Profile Management

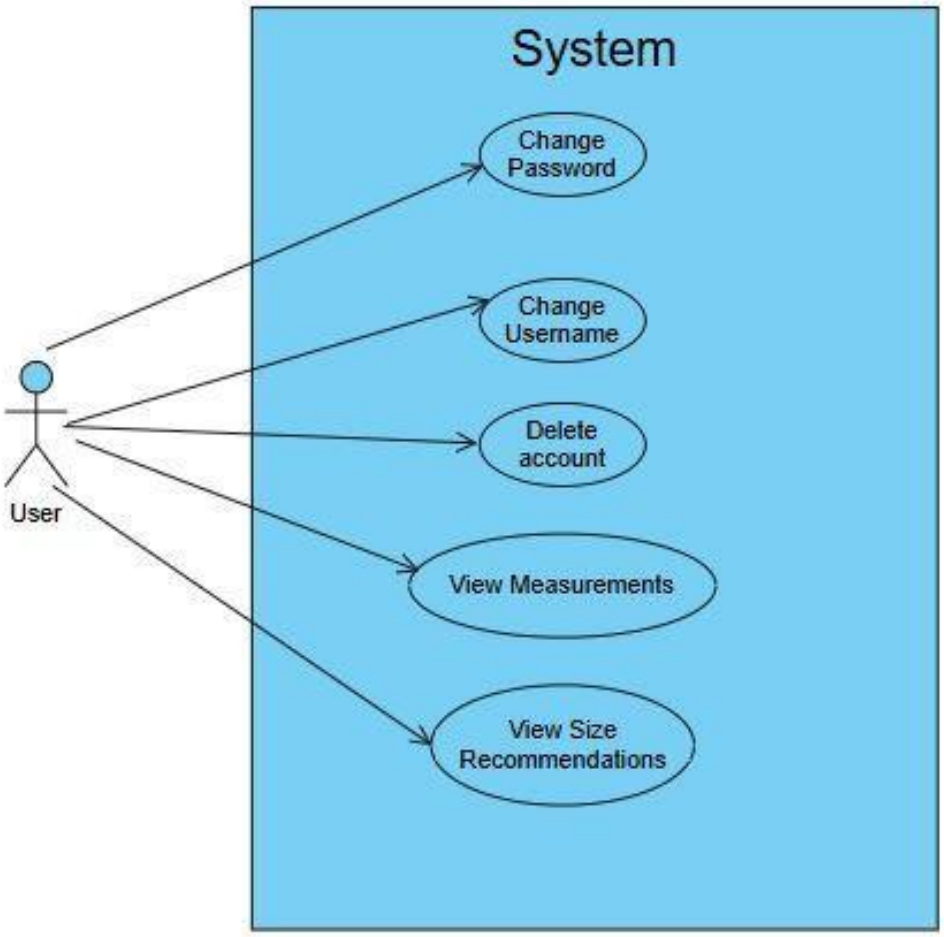

Figure 2. Profile Management

2.6.3 Image Uploading and Measurement

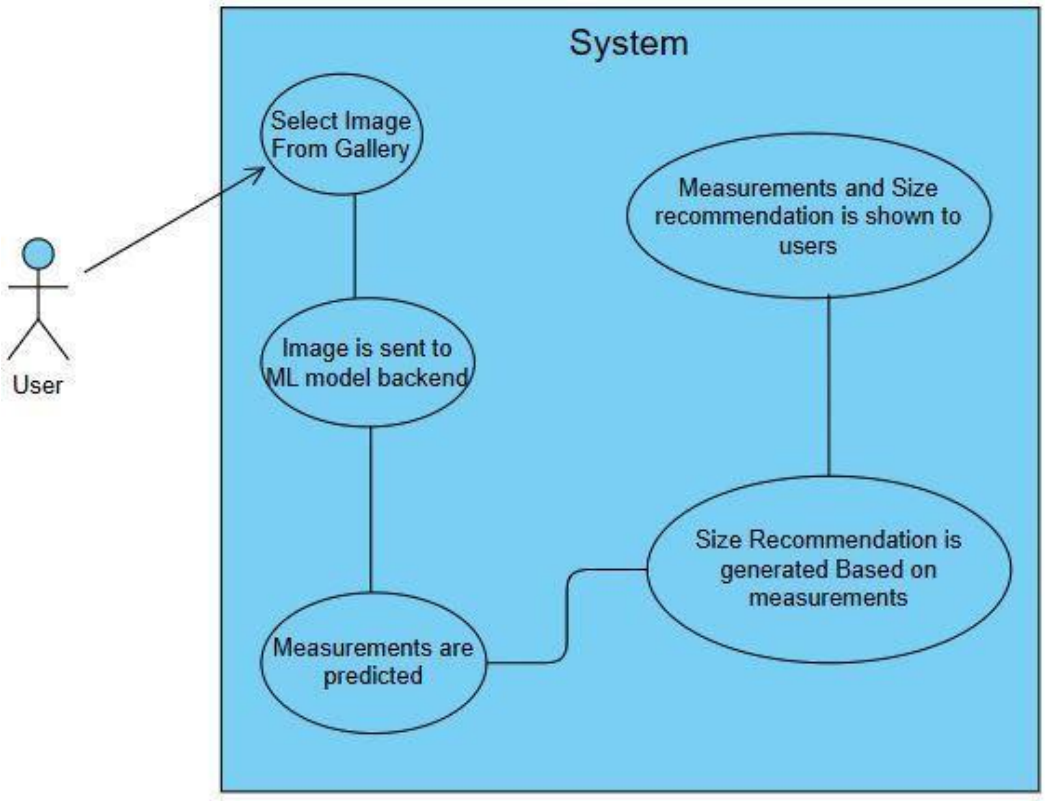

Figure 3. Image Uploading and Measurement

2.6.4 Image Capturing

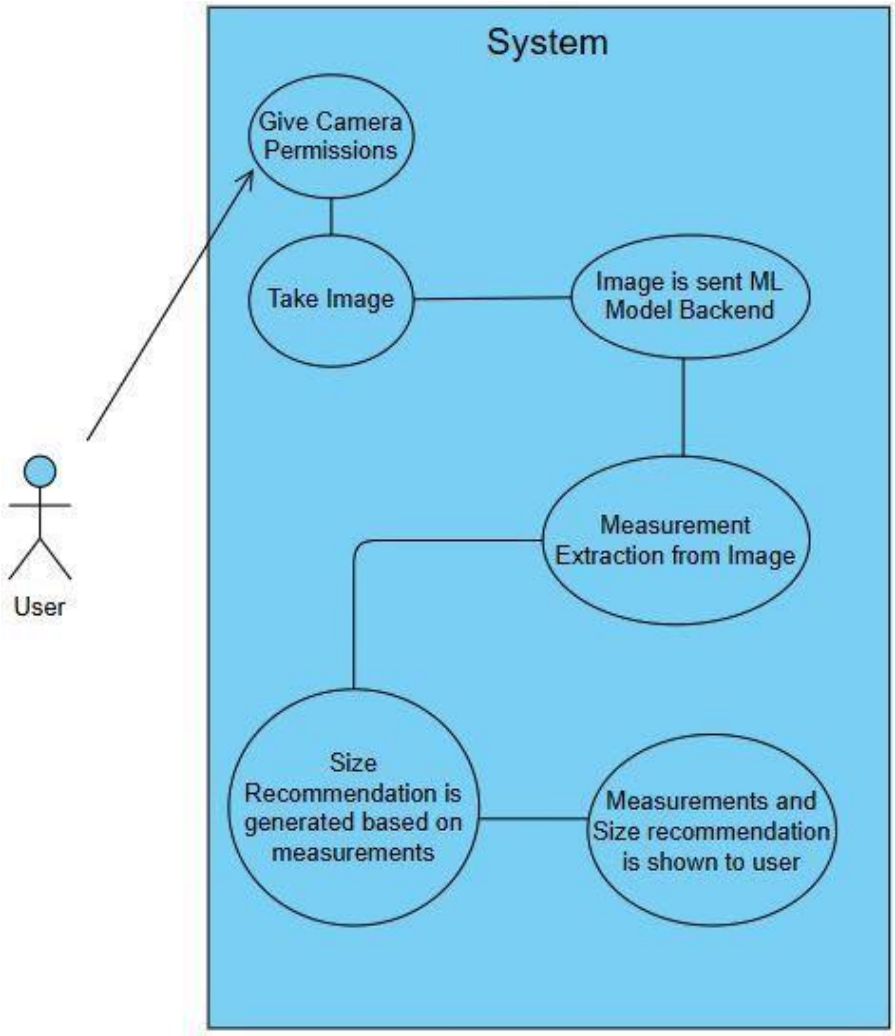

Figure 4. Image Capturing

2.7 Software development life cycle model

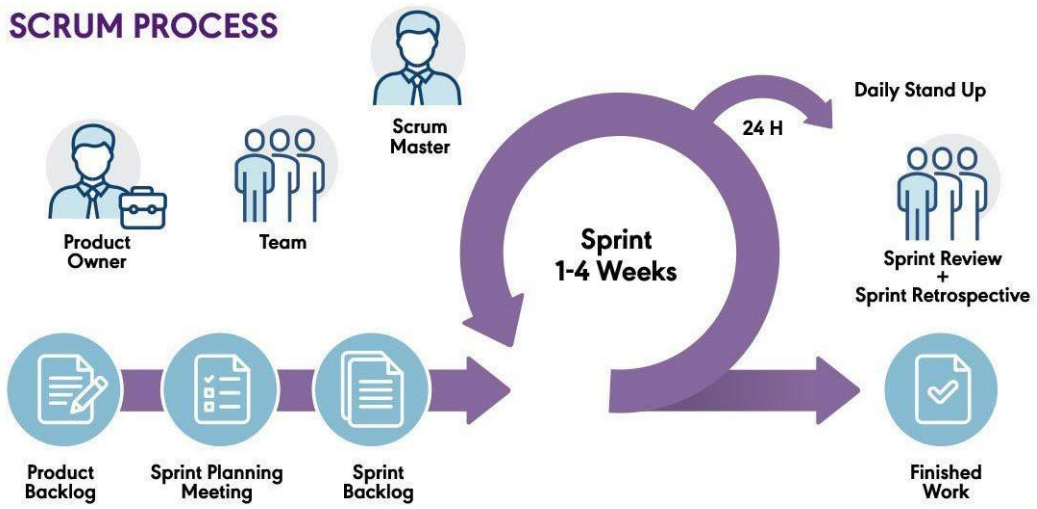

Figure 5. Software Development Life Cycle

Agile methodologies, specifically in our case the Scrum, are particularly well-suited for our project. Scrum enables our development team to work concurrently, ensuring efficient progress across various aspects of the Application. Furthermore, testing is integrated seamlessly into the development process, ensuring that quality assurance is an ongoing endeavor rather than a final step.

Scrum's adaptability is paramount for our project, as image processing and back-end algorithms may change frequently. By prioritizing tasks based on their importance for each iteration, Scrum allows us to deliver valuable increments of the project consistently, thereby enhancing accuracy of the app and a smooth UI.

Regular team meetings are a cornerstone of our Agile approach. These meetings provide opportunities to clarify requirements, test development up to that point, and ensure that the app aligns with initial project goals and objectives.

3 System Design

3.1 Work breakdown structure (WBS)

The Work Breakdown Structure (WBS) divides the project into manageable tasks and sub-tasks, ensuring a clear understanding of each phase of development. It provides a hierarchical view of the project components, helping to organize, schedule, and track progress efficiently.

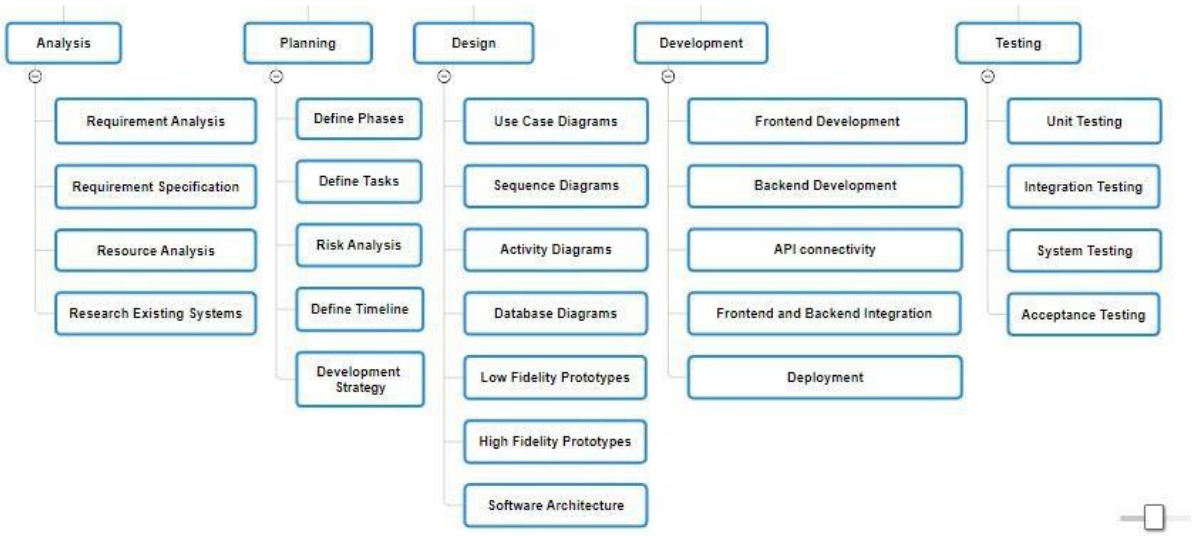

Figure 6. Work Breakdown Structure

3.2 Activity diagram

3.2.1 AD01 – Sign Up

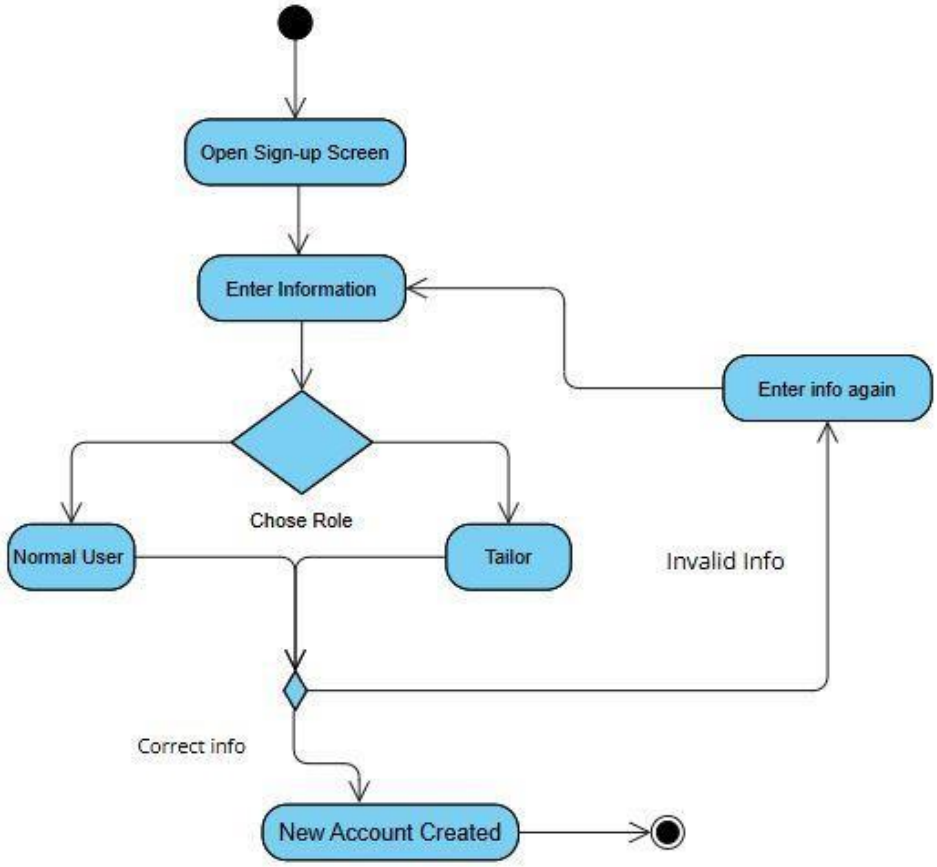

Figure 7. AD01 - Sign Up

3.2.2 AD02 – Login

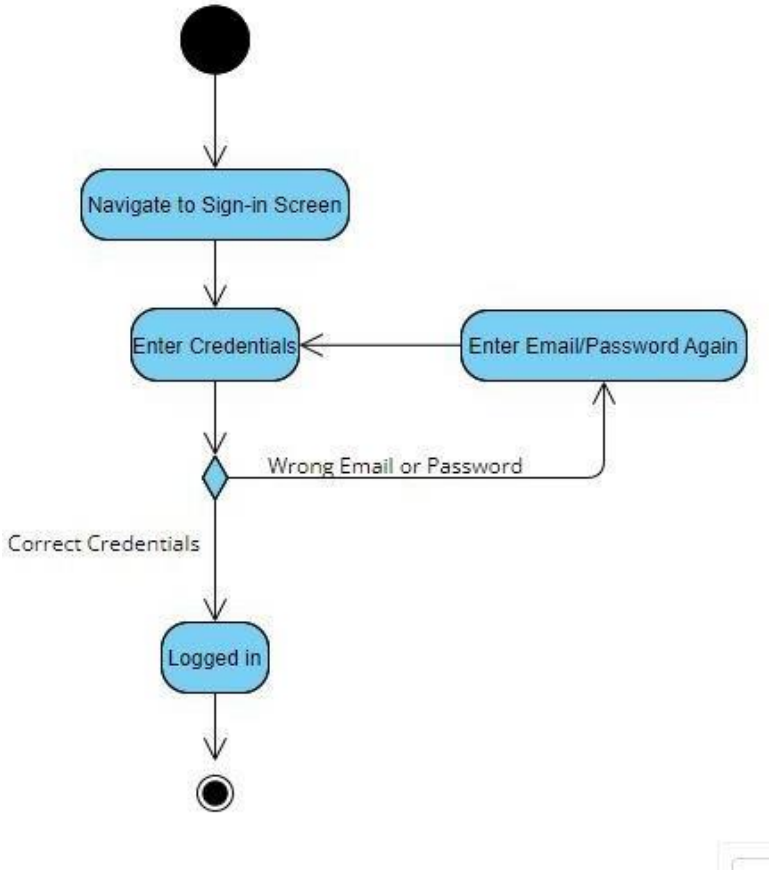

Figure 8. AD02 - Login

3.2.3 AD03 – Uploading an Existing Photo

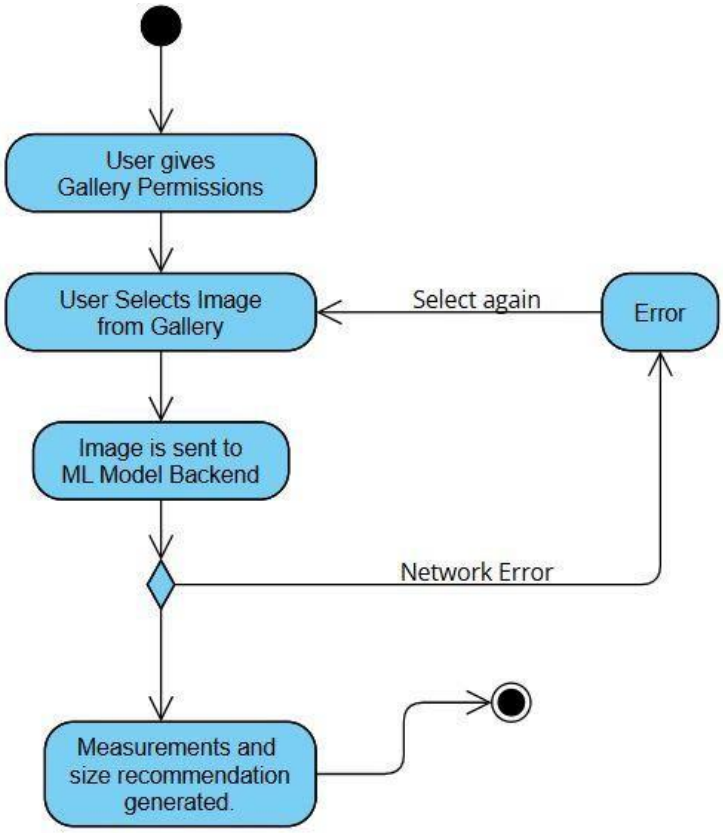

Figure 9. AD03 - Uploading an Existing Photo

3.2.4 AD04 – Taking a Photo for Measurement

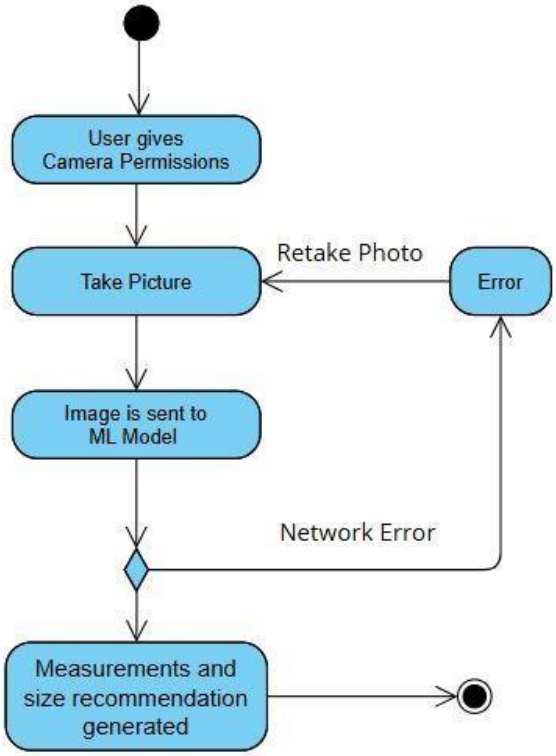

Figure 10. AD04 - Taking a Photo for Measurement

3.2.5 AD05 – Tailor Dashboard

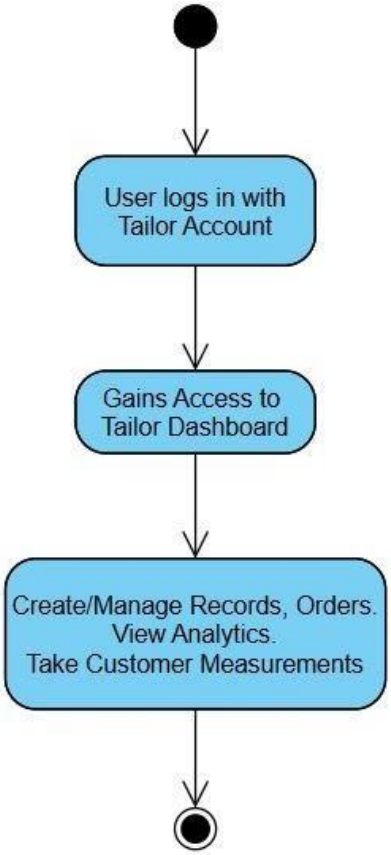

Figure 11. AD05 - Tailor Dashboard

3.2.6 AD06 – Database management

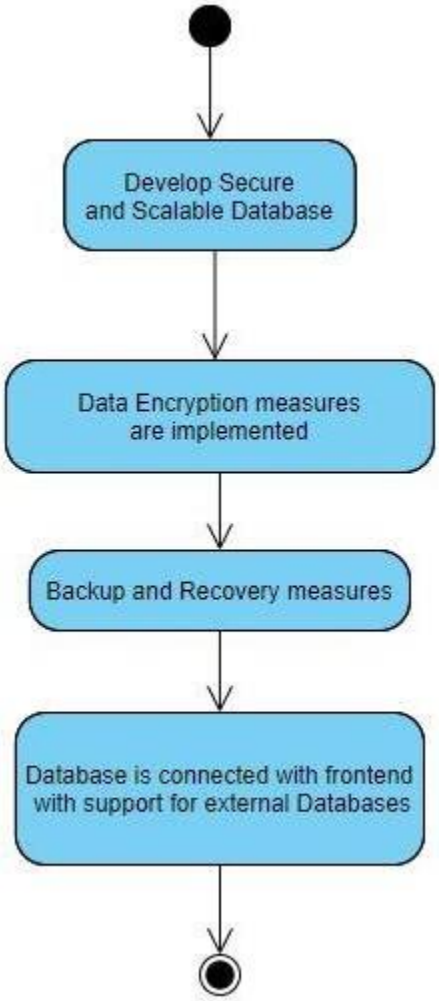

Figure 12. AD06 - Database Management

3.3 Sequence diagram

3.3.1 SD01 – Sign Up

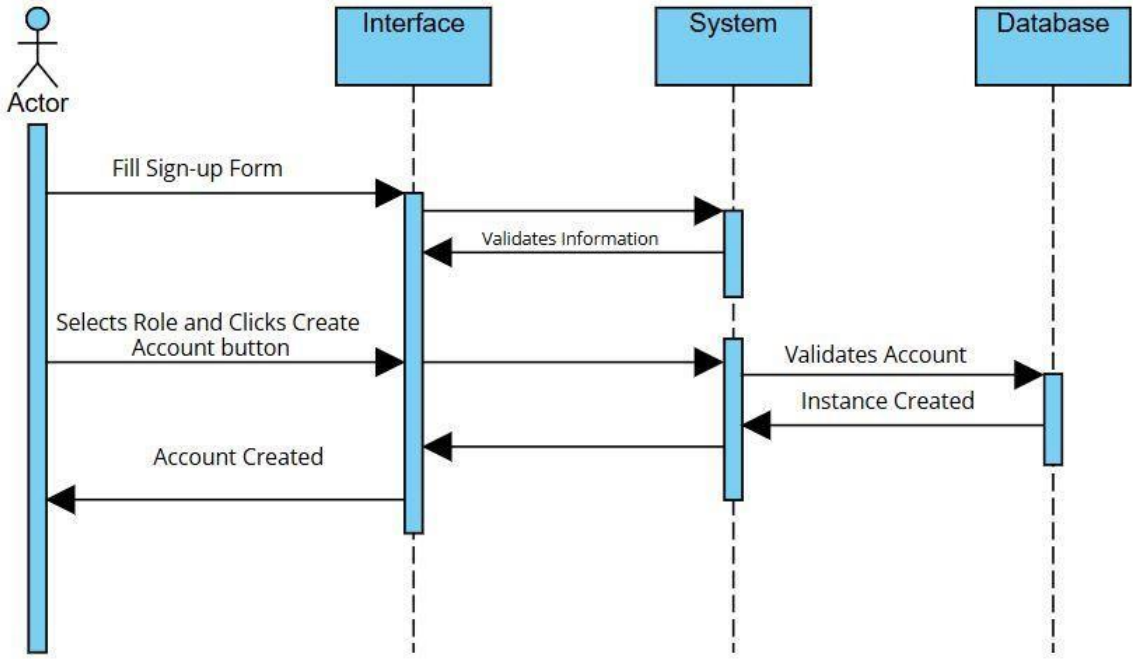

Figure 13. SD01 - Sign Up

3.3.2 SD02 – Login

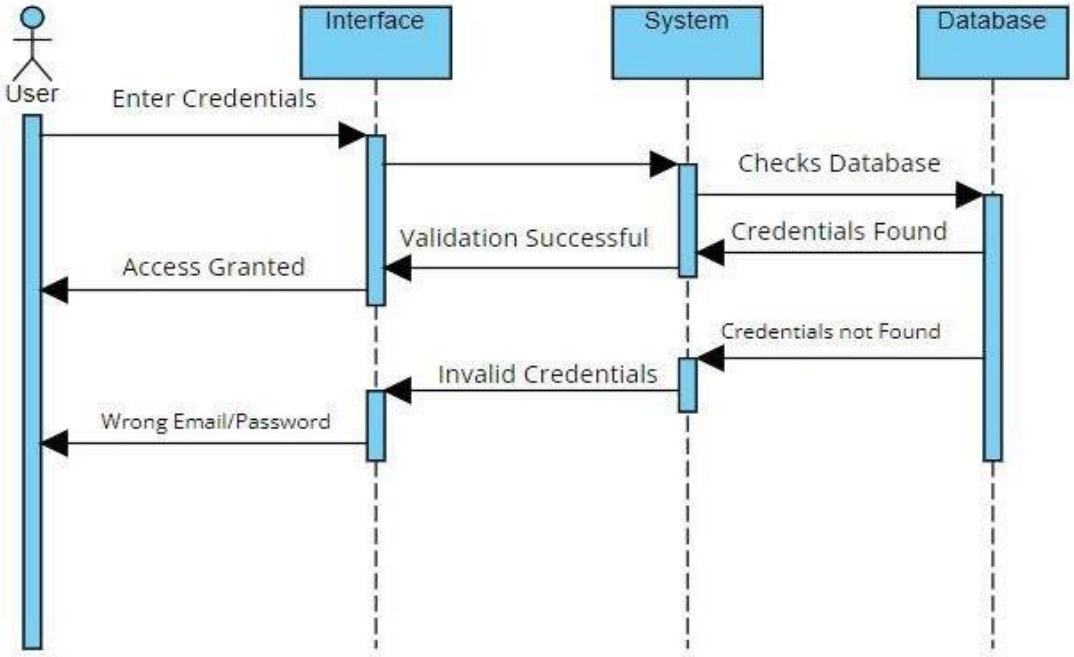

Figure 14. SD02 - Login

3.3.3 SD03 – Taking a Photo for Measurement

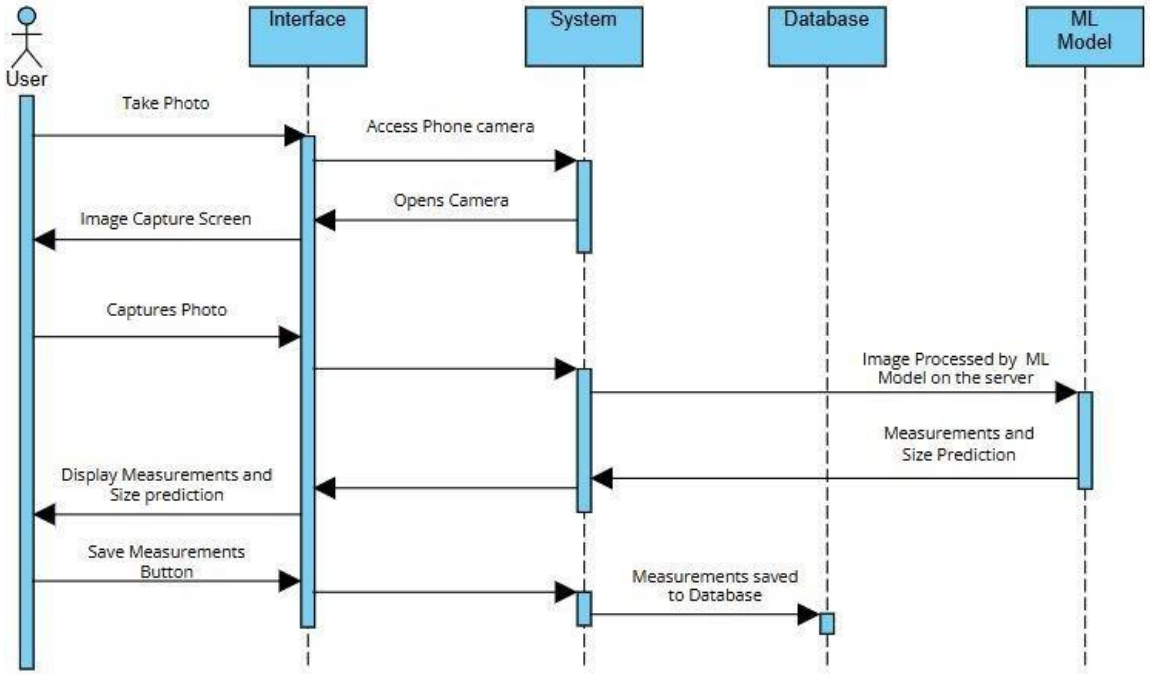

Figure 15. SD03 - Taking a Photo for Measurement

3.3.4 SD04 – Uploading Photo for Measurement

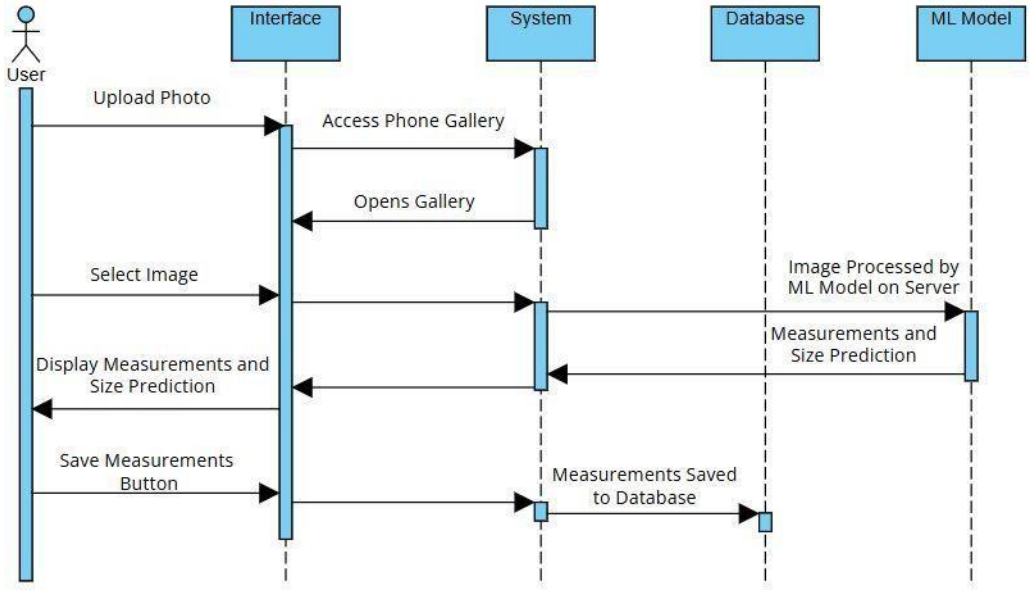

Figure 16. SD04 - Uploading Photo for Measurement

3.4 Software Architecture

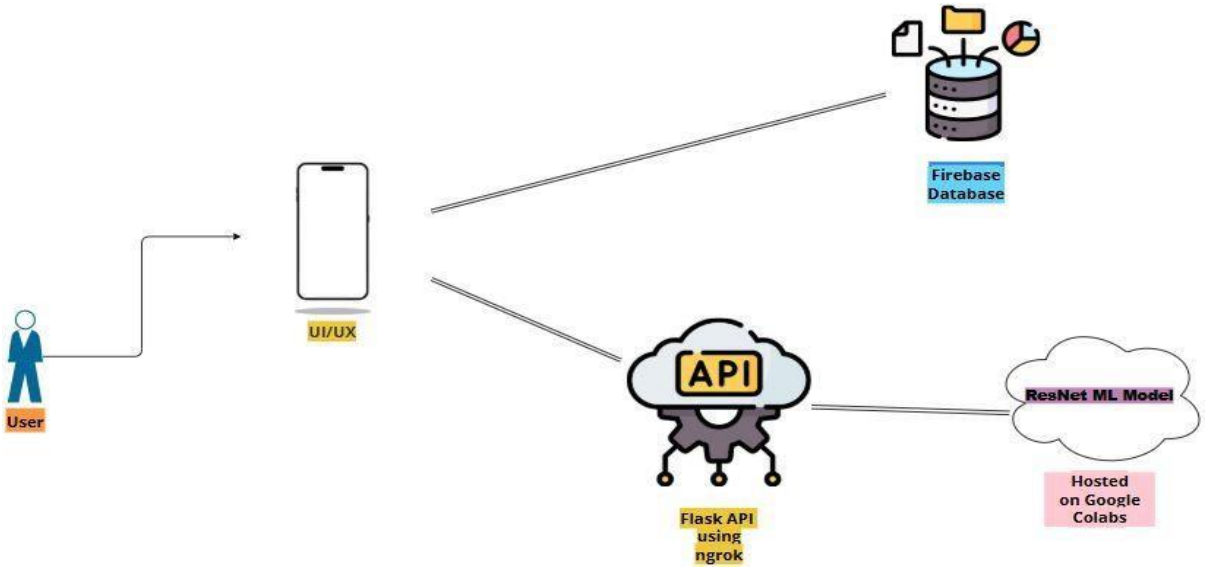

Figure 17. Software Architecture

Client-Side UI/UX is made through **React-Native** with **Expo Framework**. Which has been chosen for its cross-platform compatibility with both IOS and Android.

The **ResNet Model** is hosted on **Google Colabs** and accessed via a **Flask API** with **ngrok** used to exposed local server to the internet**.** This API handles the core functionalities of predicting body measurements and providing size recommendation.

Firebase Authentication is used for user like sign-up and login.This application database is managed using **Firebase Firestore** which stores user information, measurements, records and orders.

For production deployment, the ResNet model and API can be migrated to a **cloud platform** such as **AWS**, **Google Cloud**, or **Railway**. **Docker** can be used to containerize the backend. However, deploying in a production environment typically involves **paid server resources**.

3.5 Class diagram

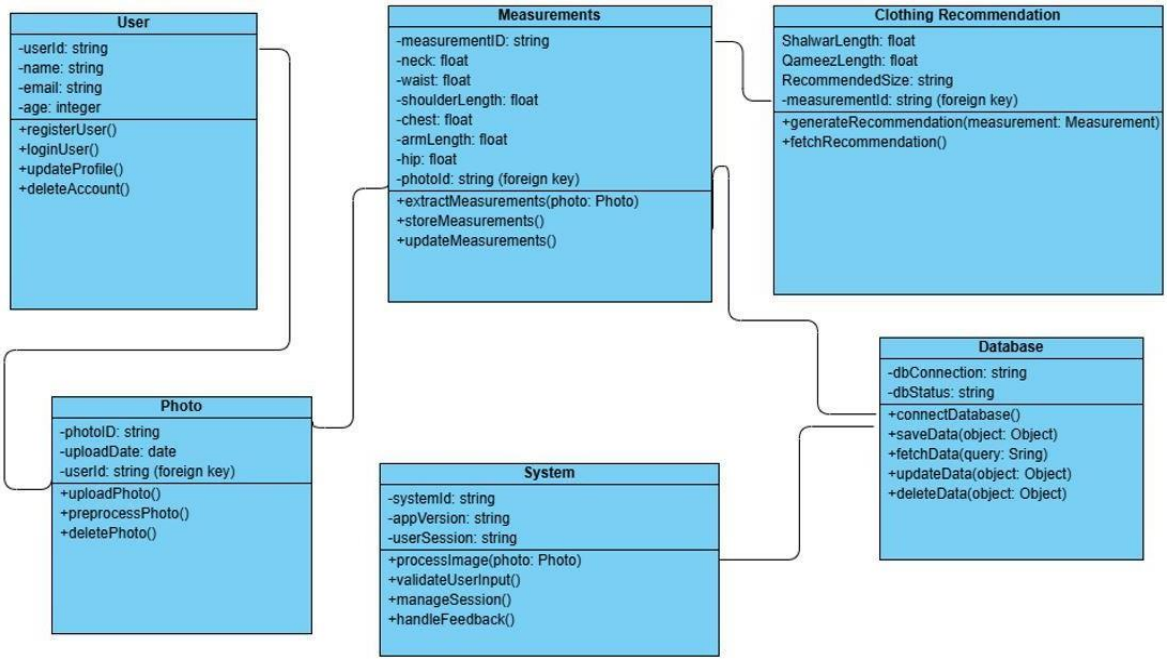

Figure 18. Class Diagram

3.6 Database diagram

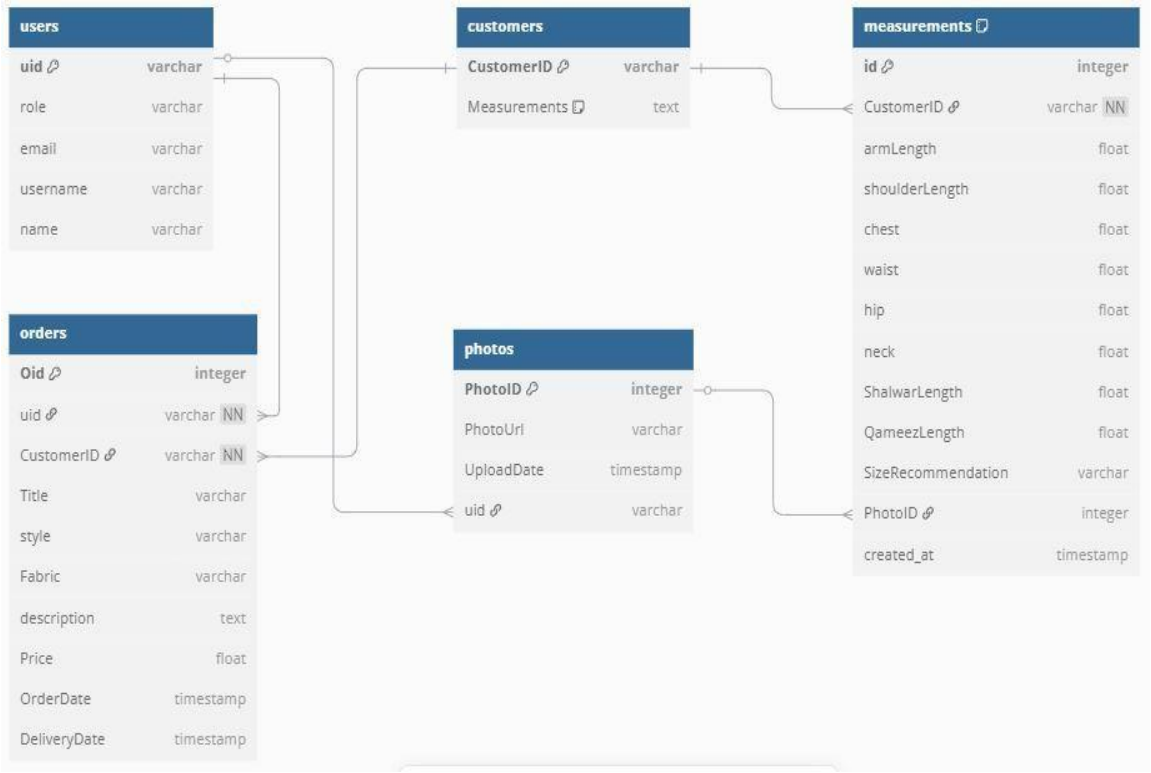

Figure 19. Database Diagram

3.7 Network diagram (Gantt chart)

3.7.1 Network diagram

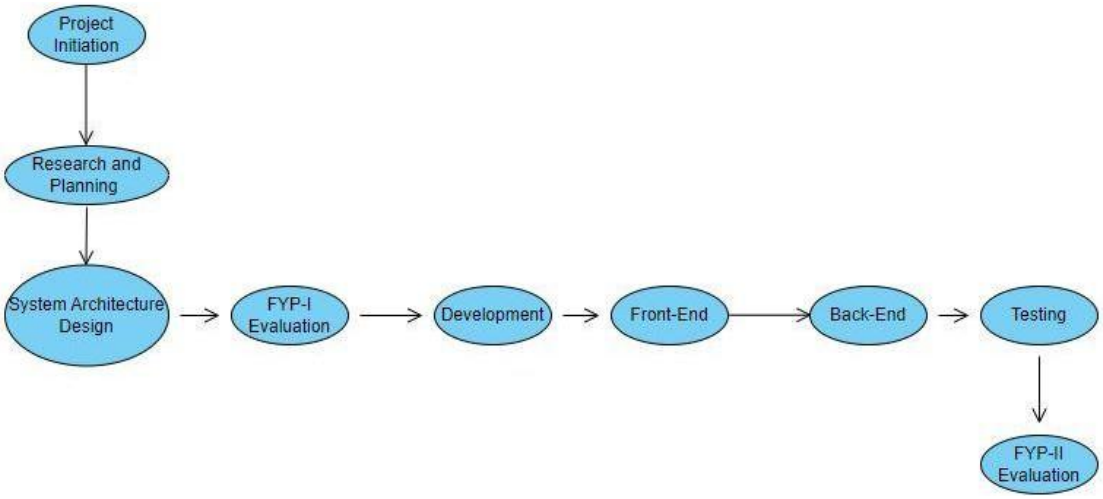

Figure 20. Network Diagram

3.7.2 Gantt Chart

Task	Start Date	End Date	Duration
Proposal Submission	02-Sep-2024	30-Sep-24	28
Research & Planning	01-Oct-2024	30-Oct-24	30
Requirement Gathering	31-Oct-2024	15-Nov-24	16
System Architecture Design	16-Nov-2024	15-Dec-24	30
Prototype FrontEnd Screens	16-Dec-2024	31-Dec-25	16
Documentation	01-Dec-2024	25-Apr-24	115
Dataset Collection	10-Feb-2025	30-May-25	110
Training the Model	25-Feb-2025	20-May-25	85
Front-End	16-Jan-2025	15-May-25	120
Back-End	20-Jan-2025	20-Mar-25	60
Testing	25-Feb-2025	20-Jun-25	116
Integration	15-Mar-2025	20-Apr-25	37

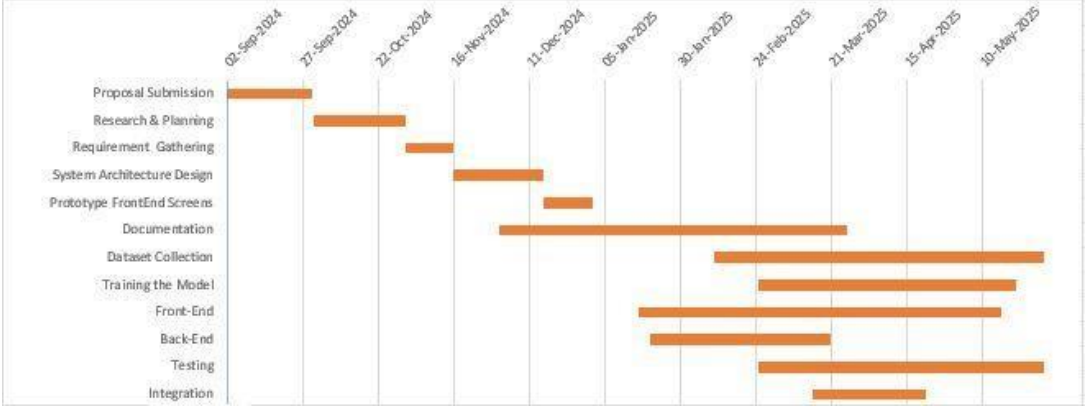

Figure 21. Gantt Chart

3.8 Collaboration diagram

3.8.1 CD01 - Login

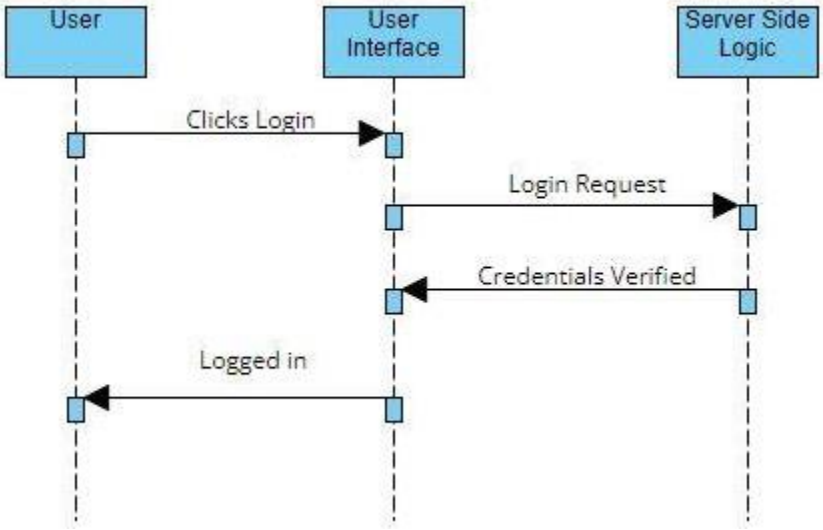

Figure 22. CD01 – Login

3.8.2 CD02 - Reset Password

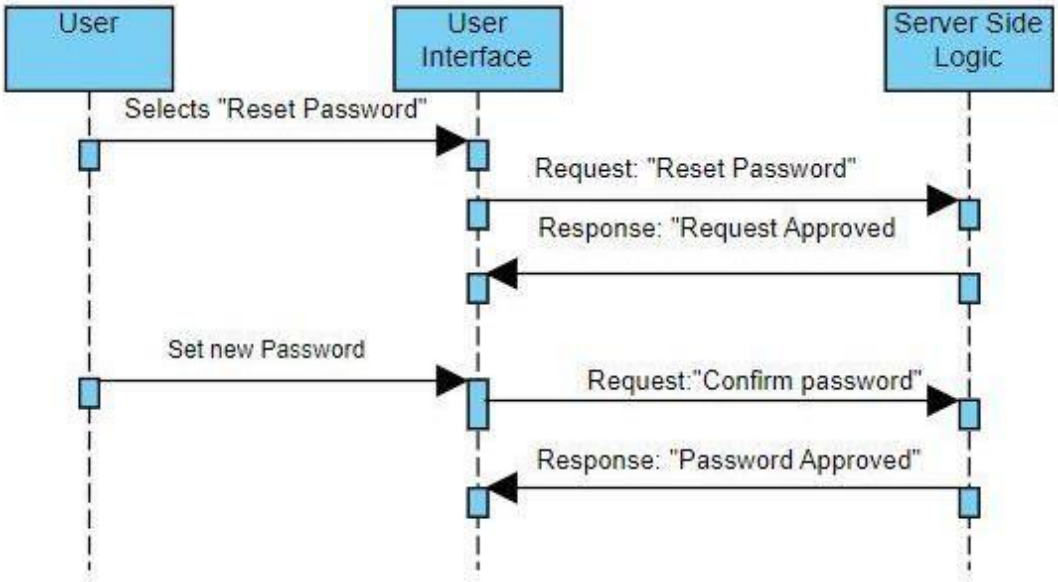

Figure 23. CD02 - Reset Password

3.8.3 CD03 - Upload Picture for Measurement

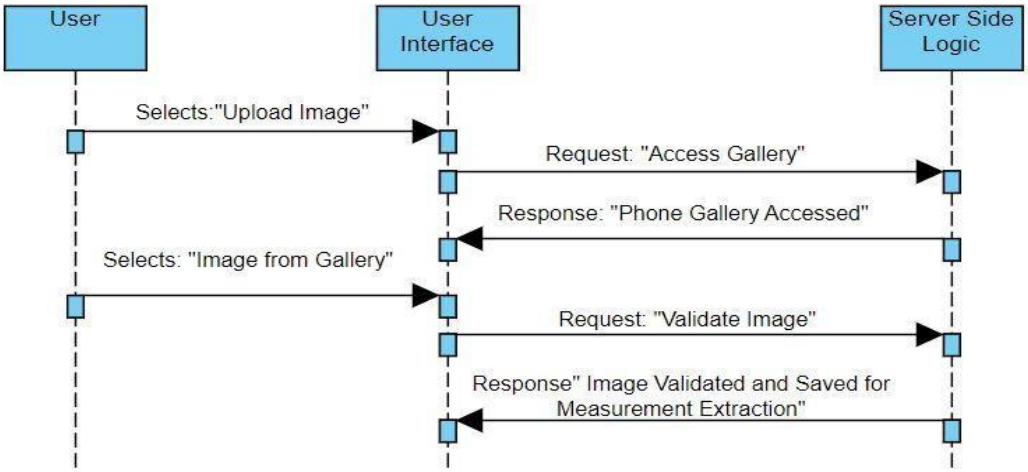

Figure 24. CD03 - Upload Picture for Measurement

3.8.4 CD04 - Take Picture for Measurement

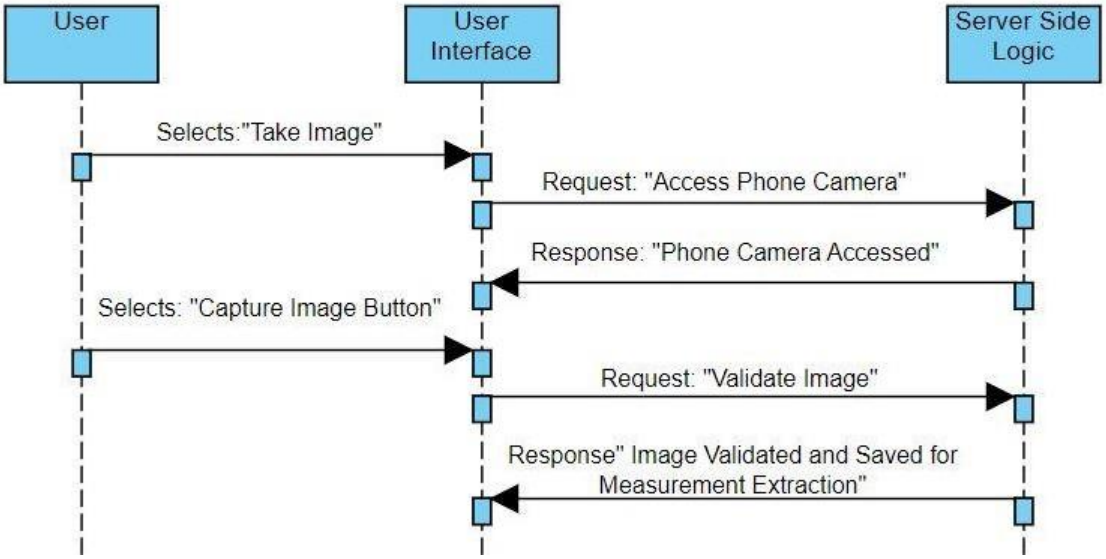

Figure 25. CD04 - Take Picture for Measurement

3.8.5 CD05 - Tailor Dashboard

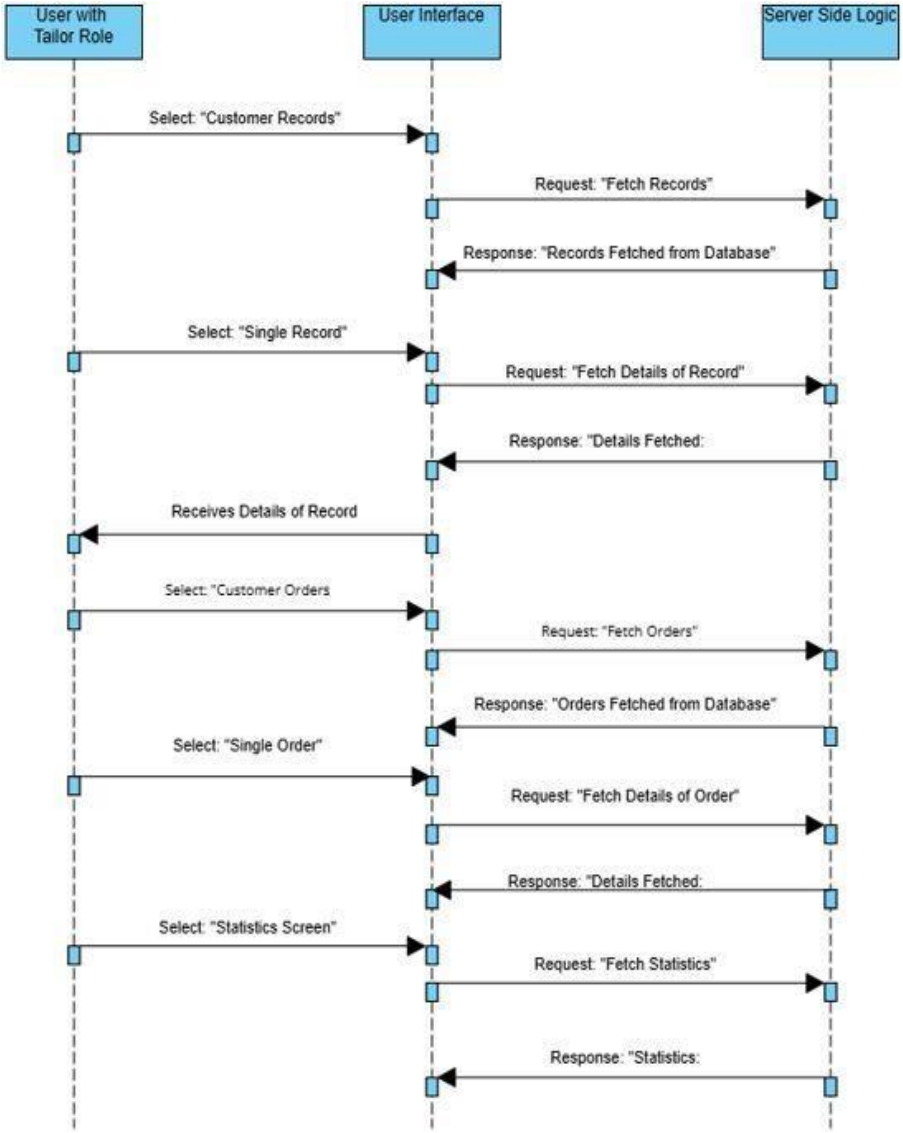

Figure 26. CD05 - Tailor Dashboard

4 System Testing

4.1 Test cases

4.1.1 Login

Table 24. Test Case - Login

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC01	Valid Credentials	Verify that the User/Admin can login in valid Credentials.	1. User navigates to login screen. 2. Enters correct email and password. 3. Taps login button.	The User is successfully logged in.	The User was successfully logged in.	Pass
TC02	Invalid Credentials	Ensure User cannot log in with Invalid Credentials.	1. User navigates to the login page. 2. Enters incorrect email or password. 3. Taps on the login button.	The app displays an error message, and the login fails.	Error message display. Login Failed.	Pass

4.1.2 Update Profile

Table 25. Test Case – Update Profile

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail

TC03	Update User Details	Verify that the user can update user details like username, name etc.	1. User taps on user profile icon. 2. User updates details like username, name, etc	The user successfully changed details	User details updated successfully.	Pass

4.1.3 Reset Password

Table 26. Test Case - Reset Password

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC04	Reset Password	Verify that the user can reset their password.	1. User taps on user profile icon. 2. User taps on reset password button. 3. User sets a new password	The user successfully sets a new password.	Password Result successful.	Pass

4.1.4 User Interface

Table 27. Test Case – User Interface

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC05	Intuitive and User-Friendly Interface	Verify that the user interface is user- friendly and easy to use	1. Users access the interface. 2. Navigates easily through different modules and functionalities.	User interface is intuitive and user-friendly. Navigation and interaction are easy.	Interface was user-friendly and easy to use. Users navigate modules without confusion.	Pass

TC06	Responsive Interface	Verify that the interface is responsive to user interaction.	1. Users access the interface 2. User finds the interface is responsive.	User interface is responsive and provides consistent user experience.	Interface was responsive and provided consistent user experience.	Pass

4.1.5 Tailor Dashboard Management

Table 28. Test Case - Tailor Dashboard Management

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC07	Tailor Dashboard Management	Verify that the users with tailor role can create/view customer records, orders and business analytics.	1. Users log into their account which has tailor role. 2. Navigate to customer record screen, order screen, statistics screen. 3. User is shown relevant information and can perform relevant functions.	User can easily create/view customer records, orders and statistics.	User was successfully able to perform all functionalities associated with tailor dashboard.	Pass

4.1.6 Image Upload

Table 29. Test Case - Image Upload

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC08	Image Upload	Verify that the app allows the user to upload images from their gallery	1. User log into their account. 2. Navigates to upload from gallery screen 3. User uploads image from gallery for measurement extraction.	User can upload image from gallery for measurement extraction.	User was able to upload images from gallery.	Pass

4.1.7 Image Capture

Table 30. Test Case - Image Capture

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail
TC09	Image Capture	Verify that the app allows the user to capture images from their phone camera for measurement extraction.	1. User log into their account. 2. Navigates to capture image screen 3. User captures an image using phone camera.	User is able to successfully capture an image via phone camera.	User was able to capture images via phone camera.	Pass

4.1.8 Measurement Extraction

Table 31. Test Case - Measurement Extraction

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/ Fail
TC10	Measurement Extraction	Verify that the app successfully extractions measurements from user uploaded/captured images with minimal error.	1. User log into their account. 2. Navigates to upload from gallery screen or image capture screen. 3. User uploads/captures an image for measurement extraction.	The app successfully extractions accurate measurements with minimal error.	Measurements were successfully predicted by the ResNet Model. The lowest total error on all measurements: Arm, Shoulder, Chest, Waist, Hip, Neck was **4.03 inches.** Highest individual error was 1.31 inches on arm length, while lowest was 0.32 inches on waist.	Pass

4.1.9 Manual Measurement Adjustment

Table 32. Test Case - Manual Measurement Adjustment

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/Fail

TC11	Manual Measurement Adjustment	Verify that the app allows the user manually adjust measurements after they are extracted	1. User log into their account. 2. If they have tailor role can edit customer measurements manually or if they have normal user role they can edit their measurements from profile.	User is successfully able to adjust measurements after they are extracted.	User was successfully able to edit measurements.	Pass

4.1.10 Clothing Size Recommendation

Table 33. Test Case - Clothing Size Recommendation

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/ Fail
TC12	Clothing Size Recommendation	Verify that the app gives users correct clothing size recommendation based on measurements.	1. User log into their account. 2. Navigates to upload from gallery screen or image capture screen. 3. User uploads/captures an image for measurement extraction.	The app successfully generates correct clothing size recommendations.	App successfully generates size recommendation based on the predicted measurements.	Pass

			4. App generates appropriate general size recommendation and sizes for shalwar qameez.			

4.1.11 Database Management

Table 34. Test Case - Database Management

Test Case ID	Name	Description	Test Steps	Expected Result	Actual Result	Pass/ Fail
TC13	Store and retrieve user data	Verify that the database can store and retrieve user data efficiently.	1. Register a new user, upload/capture images, extract measurements, get size recommendations 2. Check database to ensure all of these are stored securely in the database 3. View past user records to check if database can efficiently retrieve data.	Data is stored and retrieved efficiently and reliably.	User data was successfully stored and retrieved.	Pass

4.2 Unit

To verify and ensure that each component of the app works and operates as intended, unit testing was performed. Individual components such as database, measurement extraction, and size recommendation were tested successfully.

4.3 Integration

Integration testing was performed to ensure that the modules function as intended when integrated with each other. Components such as image capture/upload worked successfully when integrated with the model API. Moreover, we tested interactions between components like frontend and backend, application and the database.

4.4 Acceptance testing

In acceptance testing we tested to see if the app fulfils the project requirements. We tested whether users could get correct measurements and clothing size recommendations with minimal error. During this testing phase it was ensured that the flow of events: upload/capture image, extract measurements and receive clothing size recommendation, happened without issues or errors. Users had a seamless UI experience and navigation between different modules and functionalities was intuitive and easy.

5 Application Front-End

This section contains screenshots of various screens in the android application.

5.1 Tailor Screens

Following are the main screens for users with tailor role

5.1.1 Tailor Home Screen

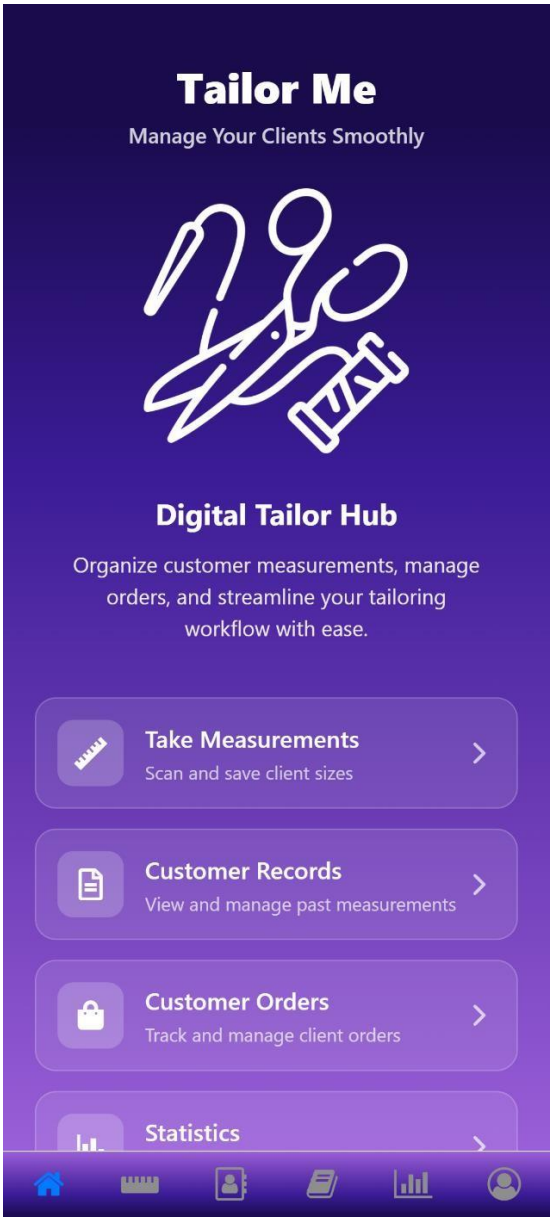

Figure 27. Tailor Home Screen

5.1.2 Tailor Measurement Screen

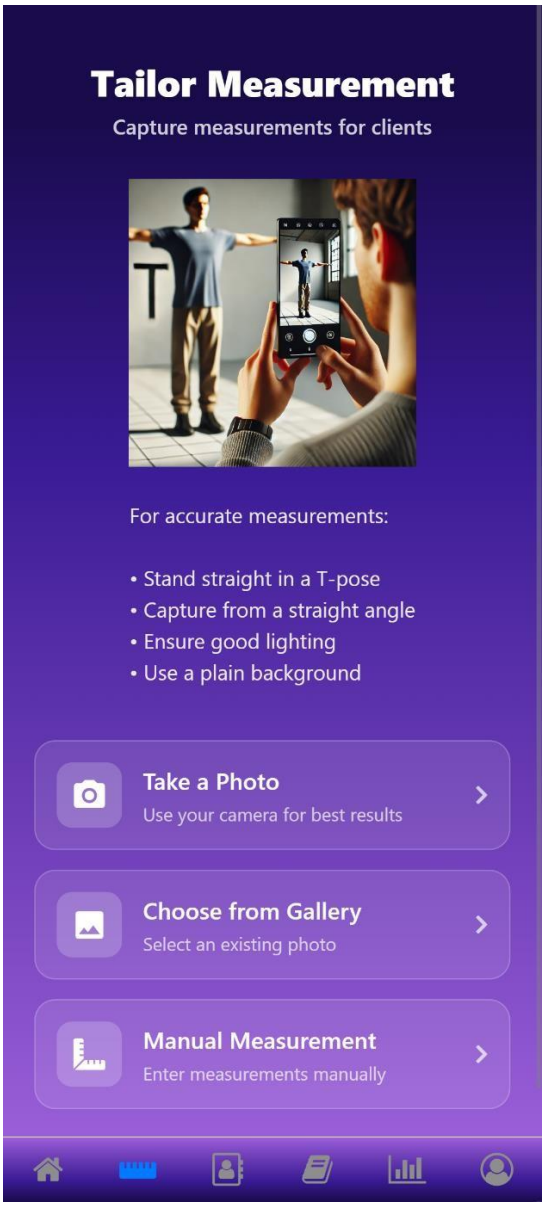

Figure 28. Tailor Measurement Screen

5.1.3 Measurements Result Screen

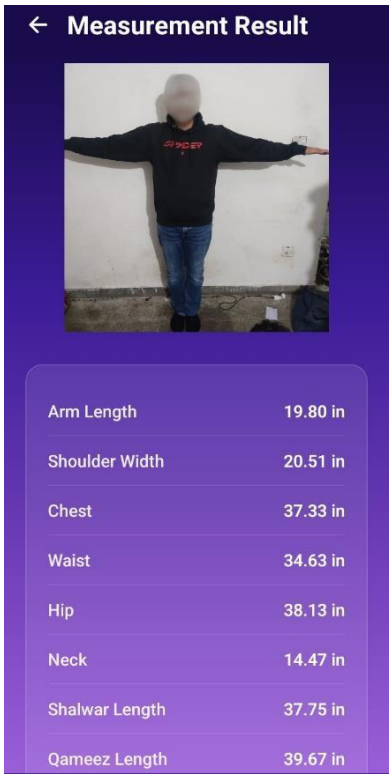

Figure 29. Measurements Result Screen 1

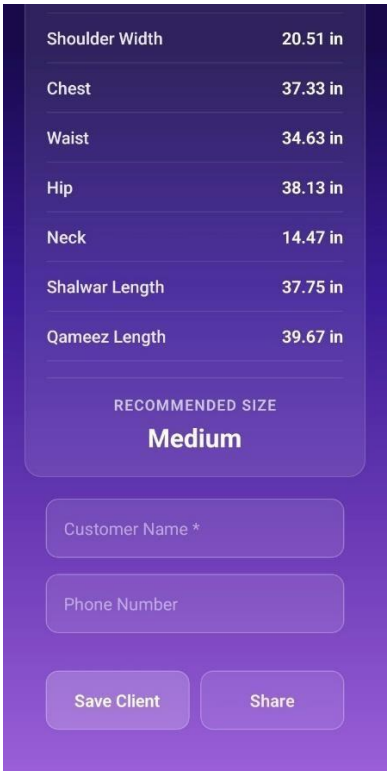

Figure 30. Measurements Result Screen 2

5.1.4 Customer Records Screen

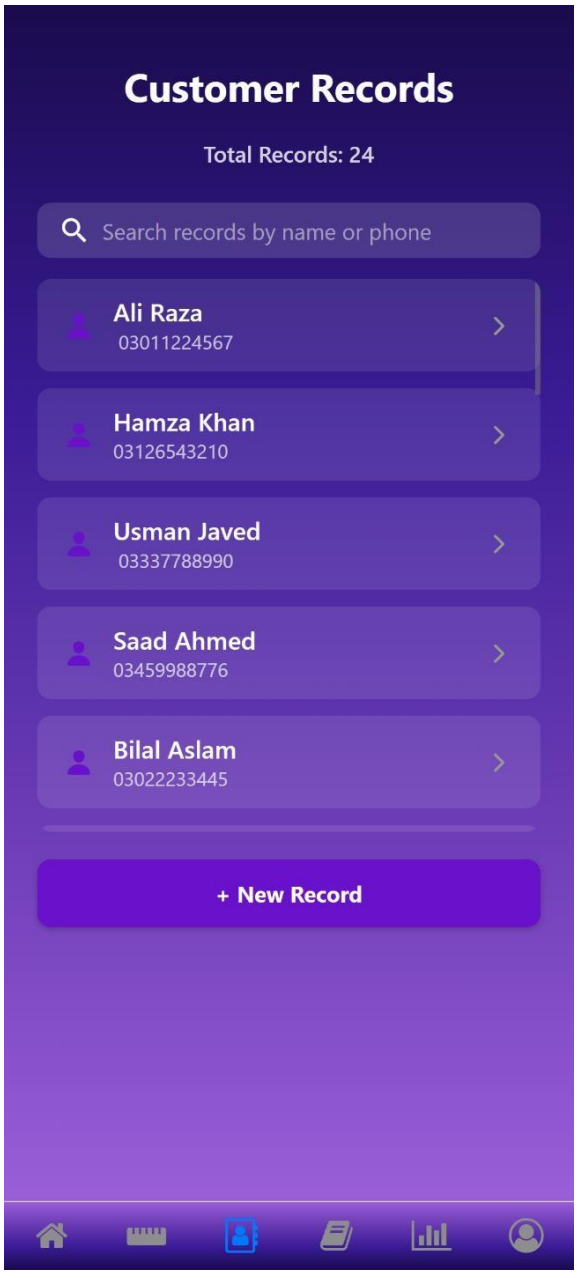

Figure 31. Customer Records Screen

5.1.5 Customer Details Screen

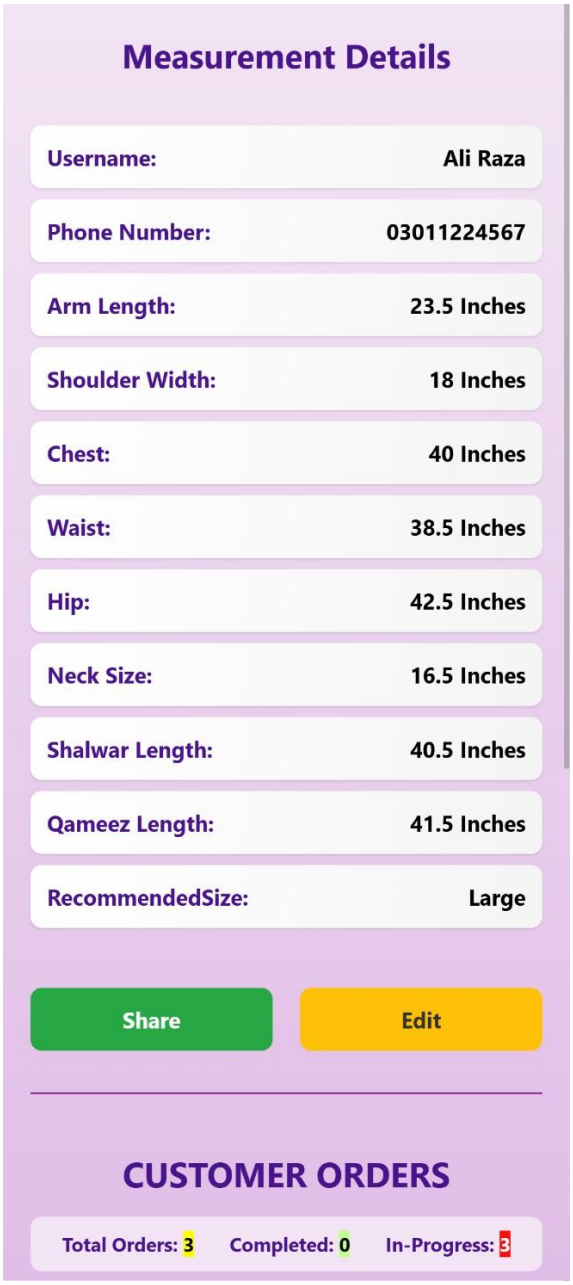

Figure 32. Customer Details Screen 1

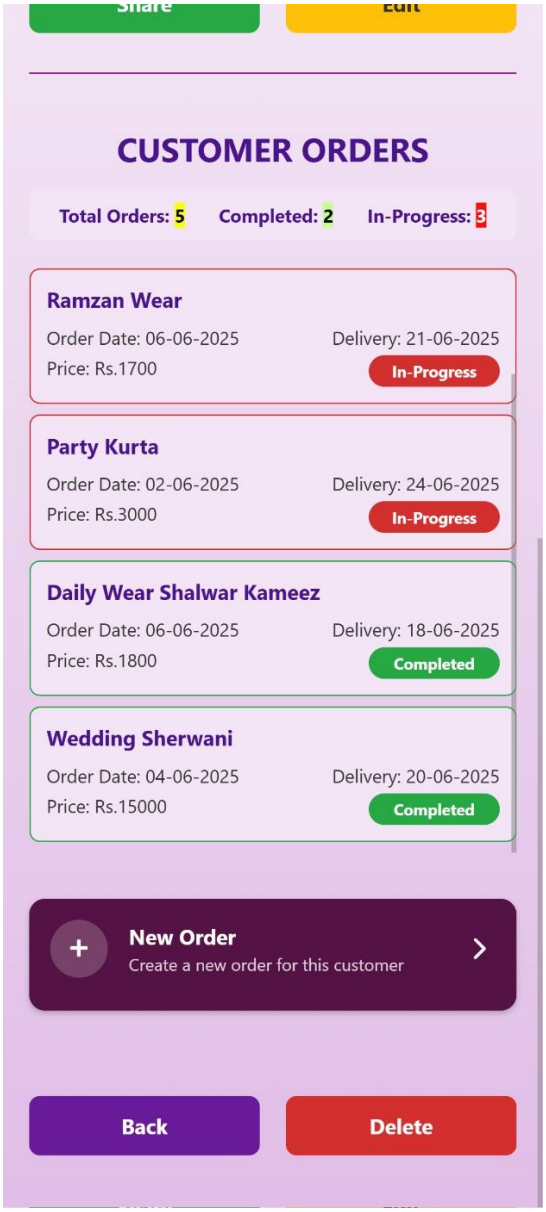

Figure 33. Customer Details Screen 2

5.1.6 Orders Screen

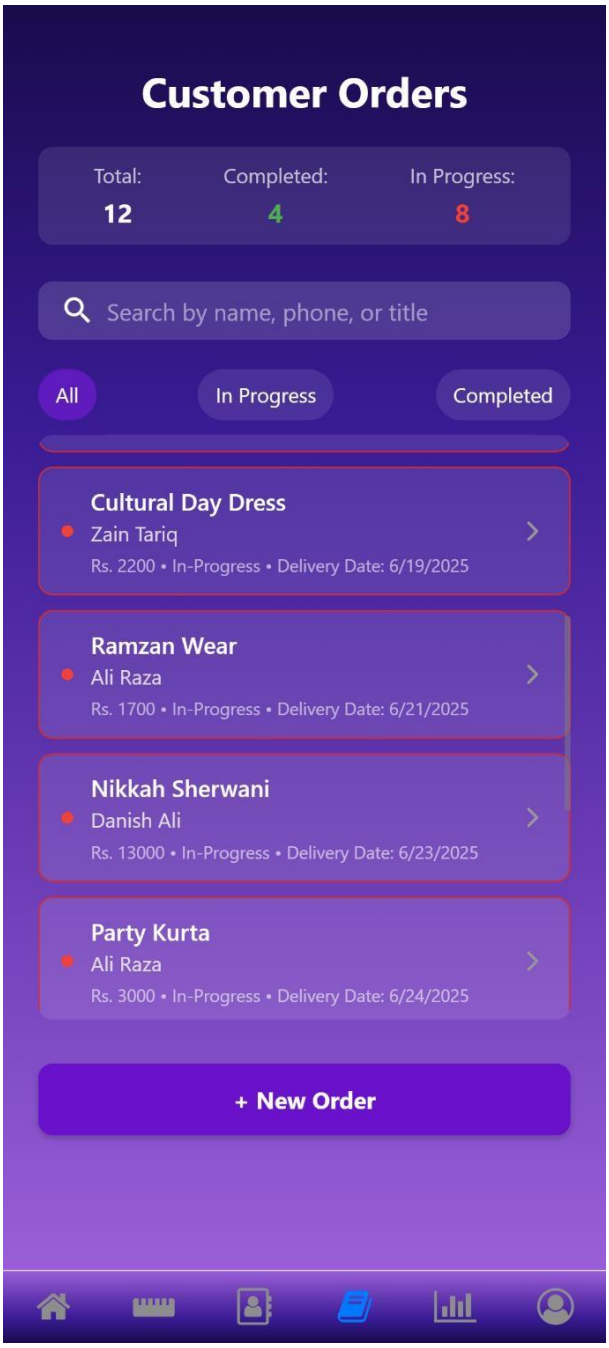

Figure 34. Order Screen

5.1.7 Order Details Screen

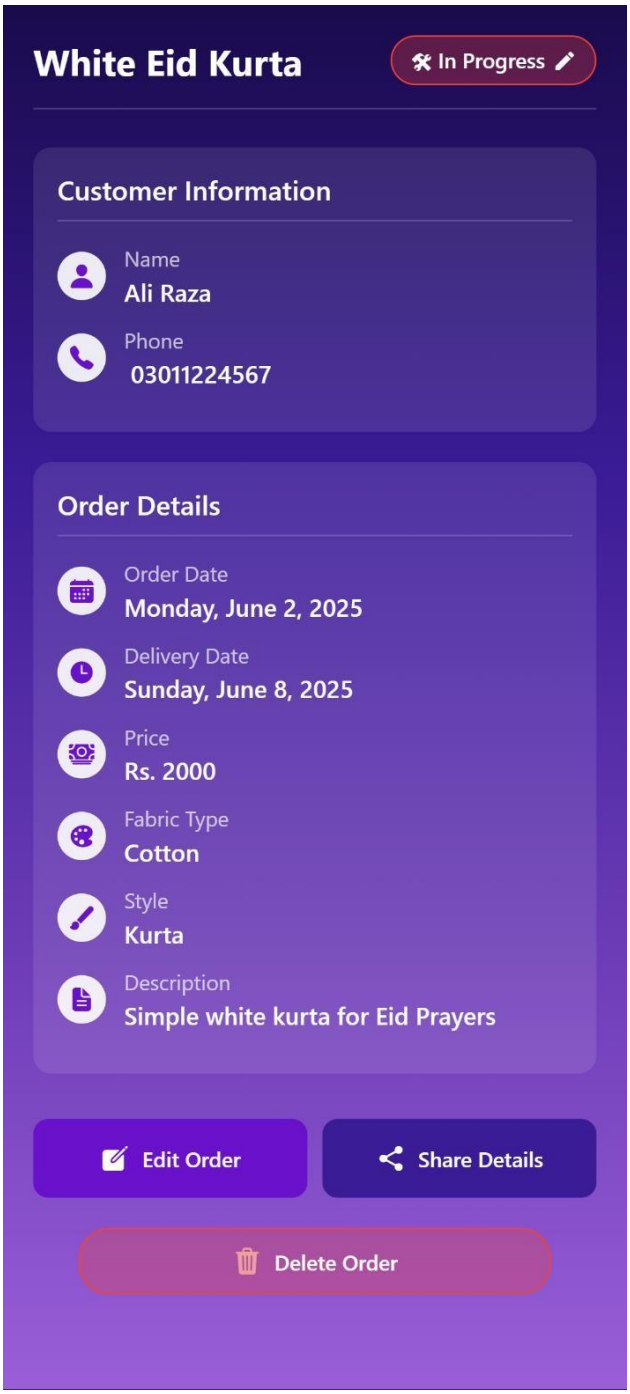

Figure 35. Order Details Screen

5.1.8 Statistics Screen

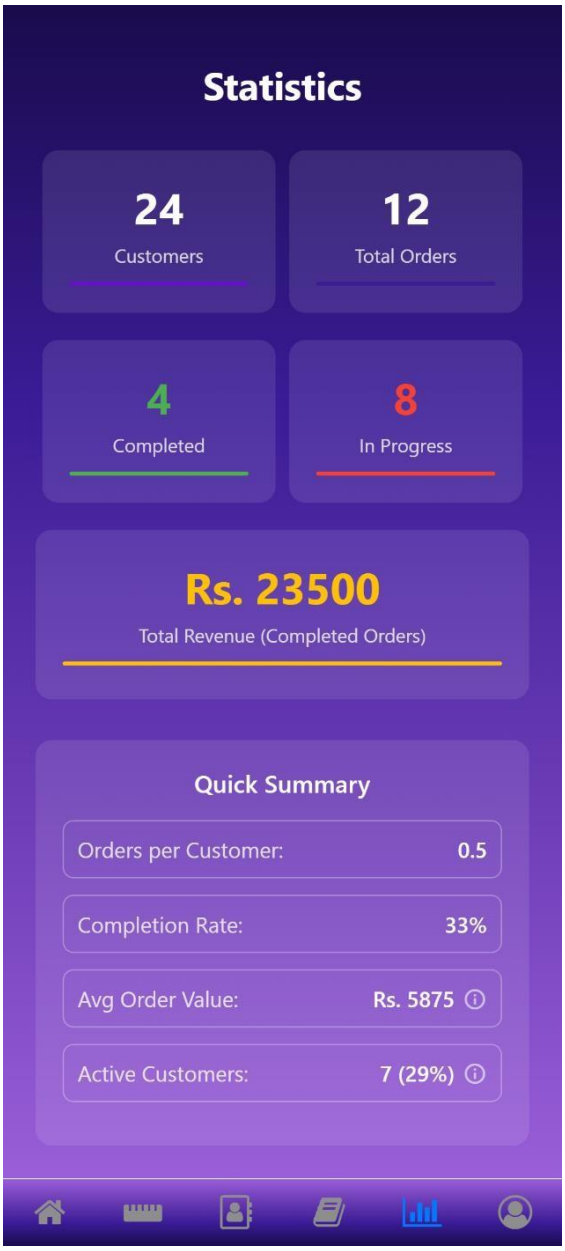

Figure 36. Statistics Screen

5.2 Normal User Screens

Following are the main screens for users with normal user role

5.2.1 User Home Screen

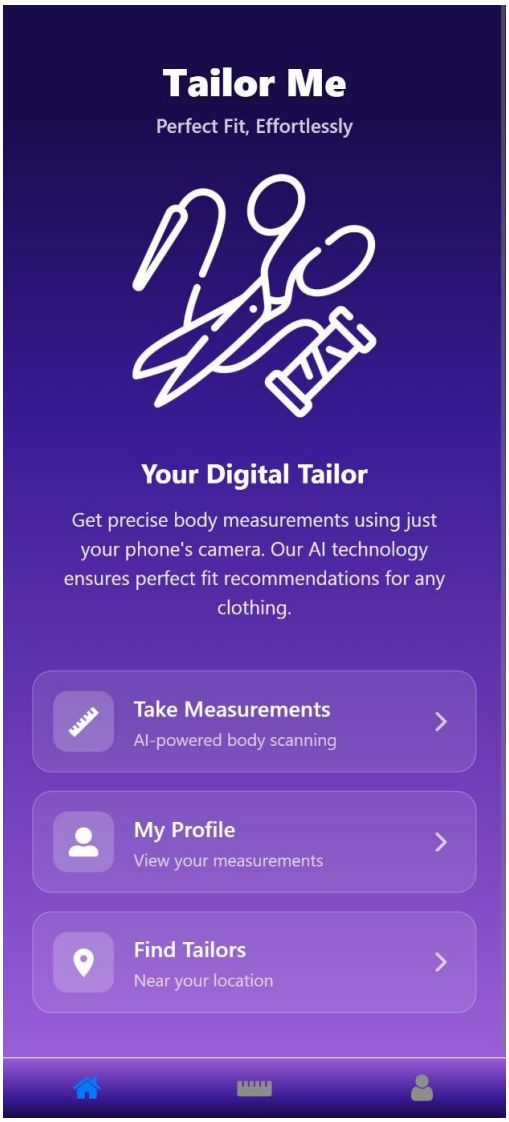

Figure 37. User Home Screen

5.2.2 User Measurement Screen

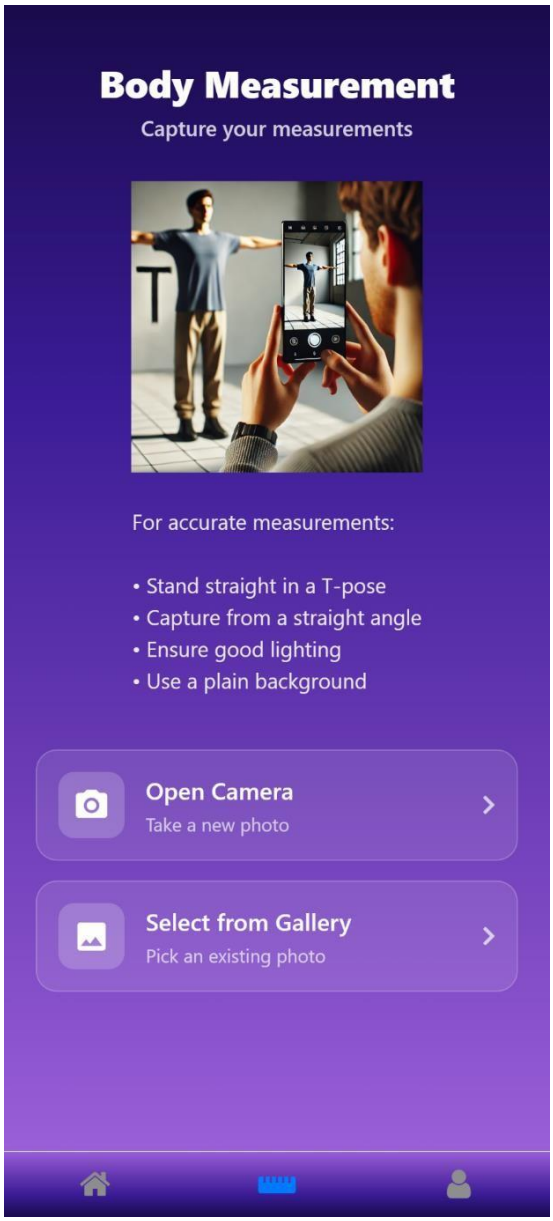

Figure 38. User Measurement Screen

5.2.3 User Profile Screen

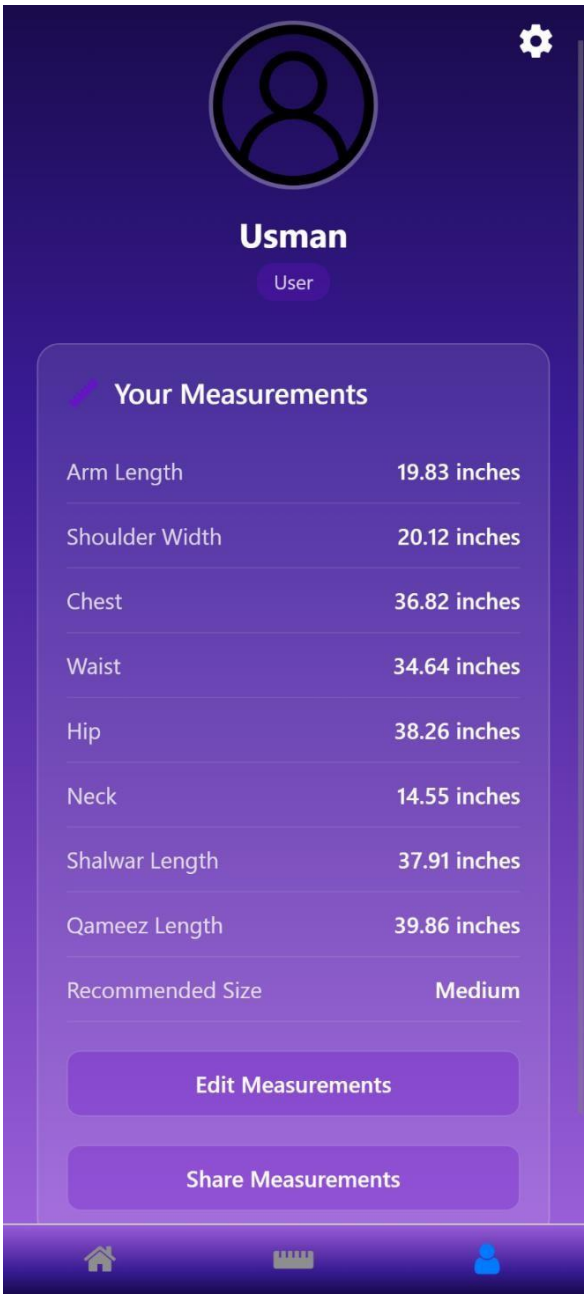

Figure 39. User Profile Screen

6 Conclusion

This section highlights the challenges encountered during development, and discusses the lessons learned. It also outlines potential future work and enhancements to improve the application.

6.1 Problems faced

We faced problems in the following areas of development:

6.1.1 Dataset Collection:

A major challenge was the unavailability of an online dataset containing human body images labelled with precise clothing measurements (e.g., chest, waist, Qameez length). Moreover, we specifically needed images of **South Asian (Desi) individuals** to reflect local clothing styles and body proportions. Additionally, most datasets didn't match the requirements in terms of pose, angle, or clothing type (shalwar qameez).

6.1.2 Server Hosting Limitation:

As students finding a free and reliable server for hosting the Flask API and ResNet model was a major challenge. Most cloud platforms such as AWS, Google Cloud, and Railway require payment for persistent deployment, especially for compute-intensive tasks like image processing**.** Free tiers or trial versions often come with strict limitations like verifying with a credit/debit card first and involve limited compute and uptime hours

6.1.3 Model Integration Challenges:

- **Library Compatibility:** The model was built using libraries (e.g., OpenCV, TensorFlow) that are not directly supported in React Native or Expo. This created compatibility issues when trying to run or interface with the model natively on the device.
- **Inference Speed & Resource Use:** Running the model on a server required sending images from the app to the server and waiting for a response, introducing latency and performance issues, especially on slower networks.

6.2 Lessons Learned

Following are the lessons we learned during development:

6.2.1 Importance of Modular Design

Breaking the project down into smaller manageable components in the beginning is key to better development, debugging and testing.

6.2.2 Iterative testing is crucial

Iterative testing must be done during development to identify issues early on the development phase. Particularly with image processing and data storage.

6.2.3 User feedback improves UI/UX

Incorporating user feedback about the UI during development enhances the app's usability and smooth.

6.2.4 Effective Time management

Time management is essential to development. We must prioritize tasks, use scheduling and employ regiment of work.

6.3 Project summary

The TailorMe project aims to revolutionize the tailoring and clothing shopping experience by providing an accurate body measurement application. It uses deep learning and rule-based algorithms to predict body measurements, such as neck, waist, shoulders, chest, hip, and arm length, along with size recommendations directly from user-uploaded or captured photos. The application also offers clothing size recommendations based on these measurements for Shalwar Qameez

Key features include measurement extraction, size recommendation, tailor dashboard, and a smooth user interface for capturing and uploading images. The project integrates backend database management for securely storing user data, measurement history, customer records, orders and statistics.

6.4 Future work

Following is the future work that we aim to do on the application:

6.4.1 Additional Features

1. **Posture detection:** Posture analysis to further improve measurement accuracy.

2. **Clothing Types:** Expand to more south Asian and western clothing for size recommendation.

3. **Integration with online Clothing Stores:** Collaborating with online retailers to redirect users to their website after a size prediction on a particular type of clothing. This expansion would require collecting additional annotated datasets across various body types and clothing styles,

4. **Social media features:** By integrating social features such as liking, commenting, following, and posting, the app can evolve into a community-driven platform. Users can showcase their stitched outfits, share styling ideas, or post their tailoring experiences. Tailors can create portfolio-like profiles and receive feedback or appreciation and accept direct orders from within the platform. This transforms the app from a utilitarian tool into a vibrant niche social network focused on tailoring, fashion, and craftsmanship.

5. **Fashion News and Forum modules:** Including a dynamic news feed that showcases the latest trends, seasonal styles, sustainable fashion practices, and tailoring innovations can enhance user engagement. A forum section would allow users to discuss design ideas, seek help, and

share knowledge on stitching techniques, fabric recommendations, and fashion trends. This makes the platform not just interactive, but educational and community-focused.

6. **Image Generation:** Generating clothing images from predicted measurements. This may involve virtual try on functionality.

6.4.2 Platform Expansion

- **Web Version**: While the React Native app can run in a browser, a dedicated web-based version using a web-specific framework would offer better optimization and performance.
- **iOS Version**: React Native supports cross-platform development, enabling the same codebase to run on iOS. However, due to lack of access to an iPhone, proper testing was not possible, and an IPA (iOS installation file) was not generated.

6.4.3 Scalability

Leverage cloud services for scalability, fast processing and responsiveness.

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