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by Ali Khokar

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1 Abstract

The proposed **Body Measurement App (TailorMe)** aims to utilize image processing techniques to measure body dimensions such as neck, waist, shoulder size, height, chest and arm length from images. The backend, developed in Python, will handle image processing using libraries like OpenCV, extracting measurements from user-uploaded images. The frontend will be built using React Native, allowing users to take or upload photos, retrieve measurements, and get clothing size recommendation about based on these measurements. This could be expanded to support online clothing stores, improving the virtual try-on experience and reducing the need for returns due to size mismatches.

2 Introduction

As the world becomes increasingly digitized, with advancements in AI and virtual reality (VR) transforming industries, we believe that obtaining accurate body measurements should be as simple and accessible as taking a picture with your phone camera. Individuals should be able get accurate body dimensions without the need for traditional measuring tools.

To address this issue, we are developing an app that extracts body dimensions from images using digital image processing and computer vison techniques. Enabling users to easily obtain accurate body measurements from photos. Our App will measure height, neck size, shoulder width, waist, chest and arm length.

The app will include a profile setup stage, option to take measurements based on classes like Children, Adult, Gender, Age. This is will enchance the accuracy of the measurements, resulting in better clothing size recommendations. User will also be able to select what kind of clothes they want the size recommendation for, based on their measurements. For example Traditional South Asian: Shalwar Kameez, Saree, Lehanga, Athleisure: Tracksuits, Outerwear: Sweaters/Hoodies, Formal wear: Suits, Western Wear: T-Shirts, Pants, Jackets, etc. Hence they will get optimal size recommendation for the selected clothing.

With the rise of e-commerce, particularly in clothing and fashion, customers face difficulties in determining the right size without physically trying on items. Our app will solve this problem by allowing users to take a picture and receive accurate body measurements, which can be used for size recommendations and could be expanded to virtual clothing fitting in the future.

The project will focus on several key objectives:

- Accurately extracting body measurements from images using Python and Liberaries like OpenCV.
- Mobile User Interface by using React Native.

- Providing easy integration of the App with online shopping platforms for size recommendations.

3 Success Criterion

The success of this project will be determined by:

- Accurate measurement extraction within a reasonable margin of error.
- Integration between the React Native front-end and the Python back-end for image processing.
- A working mobile application that allows users to take photos, retrieve body measurements, and size recommendations for clothing.

4 Related Work

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 codebases, studies and research papers:

1. A Codebase containing a system that extracts anthropometric measurements from a single image using computer vision and 3D modeling techniques [5]:
   https://github.com/farazBhatti/Human-Body-Measurements-using-Computer-Vision
2. A Review of Body Measurement Using 3D Scanning [6]:
   https://www.researchgate.net/publication/351207865_A_Review_of_Body_Measurement_Using_3D_Scanning
3. 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. The results showed an average difference of ±1 cm compared to traditional manual measurements, indicating strong potential for applications in the fashion industry [7]:

https://www.semanticscholar.org/paper/Measuring-the-Human-Body-from-a-Single-Camera%2C-with-Montazerian-LEYMARIE/ae8c70ec2e5fe71f7692f51a9f7527f173d46f41?utm_source=direct_link

4. Forest Health Monitoring App Developed at LUMS (image segmentation, Tree height estimation using AI, image capture using mobile) [8]: https://wit.lums.edu.pk/node/9489

5. Designing a Contactless, AI System to Measure the Human Body using a Single Camera for the Clothing and Fashion Industry – University of London [9]: 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

6. FITME: BODY MEASUREMENT ESTIMATIONS USING MACHINE LEARNING [10]~ https://www.sciencedirect.com/science/article/pii/S1877050919321416

7. 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 [11]~ https://www.semanticscholar.org/paper/Automatic-Extraction-of-3-d-Body-Measurements-from-Sehgal-Gupta/d49108ddfdeb2ddf973589bb078000274ee7fb01

8. A systematic literature review and analysis of try-on technology: Virtual fitting rooms [12]: https://www.sciencedirect.com/science/article/pii/S2543925123000347

5 Project Rationale

The motivation for this project stems from multiple areas. One is the growing demand for online clothing shopping and the challenges of accurate sizing. Many returns in e-commerce are related to incorrect sizing, leading to increased costs for retailers and customer dissatisfaction. By providing a tool that helps users measure their body dimensions from the comfort of their home and privacy, we aim to make online shopping more accurate as the users will be able to know what is the appropiate size to order.

The research paper "**A systematic literature review and analysis of try-on technology: Virtual fitting rooms** [12]" highlights the facts:

I. With 2% of the GDP, the fashion industry has a considerable impact on the world economy (Qasem, 2021a).
II. The most frequent online purchase is clothes, but consumers have trouble finding outfits that match their size and skin tone, which results in a return rate that is 60% higher than in other e-commerce industries (Zhang, Wang, Cao, & Wang, 2019).
III. Fashion companies now frequently use virtual fitting rooms to improve customer satisfaction and attitudes toward online shopping. Today's internet platforms, however, are unable to give customers a tangible grasp of the products (Yang & Xiong, 2019).

Moreover, as we know the problem of getting body measurements from images is not entirely solved and still has room for improvement. We hope our work results in an optimised solution and adds to the existing work done on this problem.

5.1 Aims and Objectives

We want to give users a smooth experience, where they can get their body measurements by simply taking images from their phone camera. Our main Aims and Objectives include:

- Develop a Python backend capable of processing images to extract body measurements.
- Build a React Native mobile app for users to interact with, upload images, and visualize clothing fit.
- Integrate advanced image processing algorithms to improve measurement accuracy.
- Provide size recommendations based different user demographics like Children, Adults, Gender and Age.
- Provide size recommendations based on the type on a dress/fitting.

5.2 Scope of the Project

- Development of a backend in Python for image processing.
- Frontend mobile app development using React Native.
- Developing an algorithm that provides size recommendations according type of clothing and user demographics, such as age, gender. Based on the measurements taken.
- Testing and evaluation of the measurement accuracy with various image conditions.

6 Proposed Methodology and Architecture

6.1 Methodology

6.1.1 Requirement Analysis:

- Gather requirements through interviews, surveys, and feedback sessions to identify essential features and functionalities.

6.1.2 Platform Design:

- Develop a user-friendly interface tailored for diverse users, ensuring accessibility and ease of navigation.
- Create prototypes and wireframes, emphasizing usability to facilitate a seamless user experience.

6.1.3 Database Development:

- Design and implement a connected database to manage user profiles, measurements, and clothing types.
- Employ appropriate data modeling techniques to ensure efficient data retrieval and storage.

6.1.4 Frontend Development:

- Implement **React Native** for mobile development, allowing for the creation of a native-like user experience on both iOS and Android platforms using a single codebase.
- Leverage React Native's component-based architecture to build reusable UI components that enhance performance and facilitate rapid development.
- Utilize libraries like **React Navigation** for smooth transitions and navigation within the app, ensuring an intuitive user experience.

6.1.5 Data Processing:

- Preprocess data by handling any inconsistencies and normalizing measurements for uniformity

6.1.6 Backend Development:

- Choose an appropriate backend framework (e.g., Django or Flask) to manage user authentication, data processing, and integration with the front end.

6.1.7 Security Implementation:

- Data Encryption, User Authentication, Secure APIs

6.1.8 Testing and Quality Assurance:

- Employ various testing methods (unit testing, integration testing, and user acceptance testing) to ensure the platform functions correctly.

6.1.9 Deployment and Launch:

- Deploy the application on a reliable hosting service with robust server architecture.

6.1.10 User Training and Support:

- Create comprehensive user documentation and guides to assist users in navigating the app.

6.1.11 Documentation and Reporting

- Ensure that all project stages and decisions are documented for future reference and learning.

6.2 Architecture

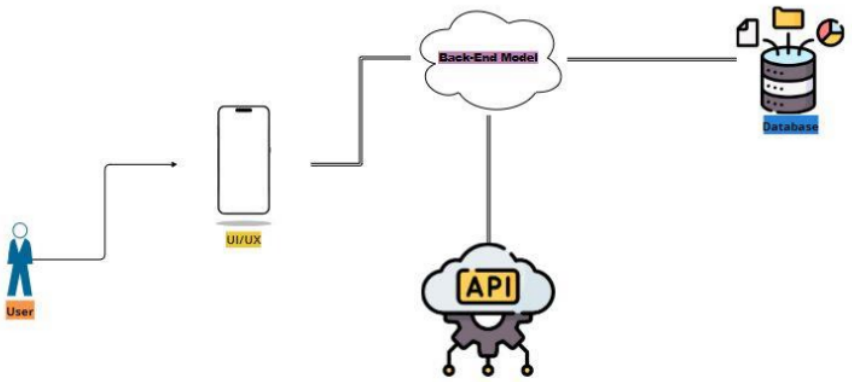

Fig 1. Basic Architecture of the App

6.2.1 Client-Side (Frontend)

On the client-side, this component represents the user interface of the body measurement application, which users will interact with in real-time. It will be built using **React Native** for mobile platforms, allowing for a native-like experience on both iOS and Android devices.

6.2.2 Server-Side (Backend)

The backend server processes client requests and communicates with the main database to handle data operations. It will implement user authentication and authorization to ensure that the requesting user is legitimate and has the necessary permissions. Business logic will be executed in this layer to manage core functionalities, such as measuring user inputs and storing measurement data. The backend will can developed using **FastAPI** , providing a high-performance framework for building RESTful APIs.

6.2.3 Database

The application will utilize a relational database management system, likely **PostgreSQL**, to securely store and manage critical user data, including body measurements, user profiles, and preferences. This choice ensures data integrity and the ability to perform complex queries efficiently, meeting the application's needs for scalability and reliability.

6.2.4 Deployment

The application can be deployed in a cloud environment, such as **AWS** or **Google Cloud**, etc, to ensure high availability and scalability. The backend can be hosted using **Gunicorn** to manage the FastAPI application, while **Docker** will be used for containerization, making the deployment process smoother and allowing for easy scaling of the application as user demand grows.

7 Gantt Chart

Task	Start Date	End Date	Duration
Proposal Submission	02-Sep-2024	30-Sep-24	28
Research & Planning	01-Oct-2024	15-Oct-24	15
Requirement Gathering	16-Oct-2024	31-Oct-24	16
System Architecture Design	01-Nov-2024	30-Nov-24	30
Python-based Model Development	01-Dec-2024	16-Mar-25	105
Documentation	15-Dec-2024	25-Feb-24	72
Front-End	02-Dec-2024	17-Feb-25	77
Back-End	16-Jan-2025	20-Apr-25	94
Testing	25-Feb-2025	20-May-25	89
Integration	20-Apr-2025	10-May-25	20

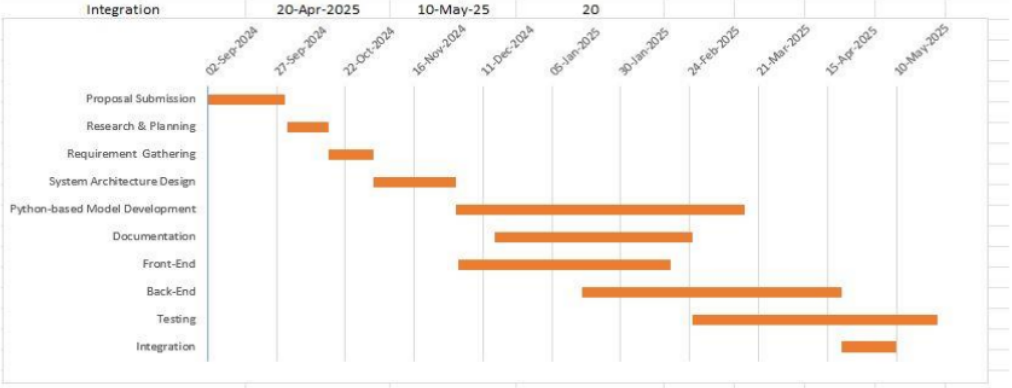

Fig 2. Gantt Chart

8 Tools and Technologies

- **Programming Languages**: Python (Backend), JavaScript (React Native)
- **Frameworks**: Flask/Django (Backend), React Native (Frontend)
- **Libraries**: OpenCV, NumPy,os (python library), Pil, Pillow, Axios/FASTAPI (for API communication), TensorFlow or PyTorch for implementing any machine learning models if needed for enhanced accuracy.
- **Database**: SQLite (local), PostgreSQL/MongoDB (production)
- **Hosting**: Heroku (Backend) or other Hosting Platforms
- **Version Control**: GitHub/Git
- **Documentation**: MS Word, Obsidian.md, LaTex.

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ORIGINALITY REPORT

14%	5%	12%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Raheela Batool, Jian Mou. "A systematic literature review and analysis of try-on technology: Virtual fitting rooms", Data and Information Management, 2023 Publication	5%
2	assets.researchsquare.com Internet Source	2%
3	Submitted to American University of Beirut Student Paper	1%
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11	Kristijan Bartol, David Bojanic, Tomislav Petkovic, Tomislav Pribanic. "A Review of Body Measurement Using 3D Scanning", IEEE Access, 2021 Publication	<1 %

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FINAL GRADE

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GENERAL COMMENTS

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