Software Requirement Specification Document for Fit-Moi

Yasmin Mohamed Elsayed , Salma Osama , Rogina Michelle and Youssef Karam
Supervised by: Assoc. Prof. Diaa Salama, Eng. Mennat Allah Hassan

May 15, 2023

Table 1: Document version history

Version	Date	Reasons for Change
1.0	20-Nov-2022	SRS First version's specifications are defined.
1.1	12-Dec-2022	User Characteristics Functional Requirements Data Design
1.2	15-Dec-2022	Appendices section
1.3	5-March-2023	Overview and UML edited
1.4	1-May-2023	Scenario and Detailed Functional Specification updated

GitHub: https://github.com/yasminkandil/virtual_fitting_roomsGP

GitHub of the Mobile application code: https://github.com/yasminkandil/fitmoi_mob_app

PlayStore Link: https://play.google.com/store/apps/details?id=com.fitmoi.fitmoi_mob_app

Contents

1 Introduction **4**
- 1.1 Purpose of this document . . . 4
- 1.2 Scope of this document . . . 4
- 1.3 Business Context . . . 4

2 Similar Systems **5**
- 2.1 Academic . . . 5
- 2.2 Business Applications . . . 7
  - 2.2.1 Style.Me . . . 7
  - 2.2.2 Avatar AI . . . 7

3 System Description **8**
- 3.1 Problem Statement . . . 8
- 3.2 System Overview . . . 9
- 3.3 System Scope . . . 10
- 3.4 System Context . . . 10
- 3.5 Objectives . . . 11
- 3.6 User Characteristics . . . 11

4 Functional Requirements **12**
- 4.1 System Functions . . . 12
- 4.2 Detailed Functional Specification . . . 14

5 Design Constraints **20**
- 5.1 Standards Compliance . . . 20
- 5.2 Hardware Limitations . . . 20
- 5.3 Network Constraint . . . 20

6 Non-functional Requirements **20**
- 6.1 Security . . . 20
- 6.2 Reliability . . . 20
- 6.3 Portability . . . 20
- 6.4 Maintainability . . . 20
- 6.5 Availability . . . 20
- 6.6 Usability . . . 20

7 Data Design **21**

8 Preliminary Object-Oriented Domain Analysis **23**

9 Operational Scenarios **24**

10 Project Plan **24**

11 Appendices **26**
11.1 Definitions, Acronyms, Abbreviations 26
11.2 Supportive Documents 26

Abstract

Virtual fitting rooms have attracted the sights of the market need in the past two years; The world faced a colossal pandemic that led everything to be online. This project aims to solve the online shopping problem using deep learning techniques. Users face a significant issue finding the perfect fit and knowing the texture of the items they want. As a result, merchants' profit is significantly impacted because the customers return what they bought. The project aims to simulate a 3D human model. Based on the measurements extracted from the user's images. The user can see how simulated 3D clothes will look on his 3D body model. Then, he will know the exact size that fits him. Additionally, whether this is the texture he seeks. Finally, the user will have styling tips suggested according to his body fit. So he can know the most trending styles that suit him.

1 Introduction

1.1 Purpose of this document

The goal of the Fit-Moi SRS document is to illustrate detailed documentation of the Fit-Moi project. Fit-Moi is a virtual fitting room mobile-based application on which people can upload their images to extract their body sizes, try-on clothes, and pick their fit style. Firstly, the purpose and scope of this document will be provided. Followed by an overall explanation of the Fit-Moi system. Moreover, system functionality such as uploading photos of the user, extracting the user's measurements, uploading products photos of the integrated brand, and viewing the styling tips. Finally, the used datasets SMPL and TAILORNET, and Detectron2, an AI modular object detection library.

1.2 Scope of this document

The document's scope is to tackle similar systems to Fit Moi academically and business-wise, moreover illustrates the system overview, context, and scope, also the objectives of the Fit Moi mobile-based application, and the user characteristics are discussed. Furthermore, this document goes through the functional and non-functional requirements of the Fit Moi mobile-based application and system, the software and hardware limitations, the data design, and the object-oriented class diagram. Finally, this document also covers the operational scenarios of the system and the exact timeline of how this mobile application will be developed.

1.3 Business Context

There is no doubt that in the last two years e-commerce platforms became very essential in every field possible. According to [1][2] online income increased by 44% in 2020 and by 39% year over year in the first quarter of 2021. Although the lockdown is over, there is a great tendency that this rise in online shopping wave will continue because people have now gotten accustomed to it. By 2023, it is expected that eCommerce will rise up to 22% of worldwide sales retails. Considering the fact that the client always searches for the most convenient and easiest ways for him/her to shop, what would be better than shopping at the convenience of your home avoiding time loss, and

overcrowded places and without suffering to get a perfect size and never worrying about returns since what comes first to a client's mind is the return and refund policy. In addition to this, the client would be able to get the most doable knowledge on cloth textures that are to be bought as well as, get styling tips for what is now trending and all this would be accessible through a mobile application.

2 Similar Systems

2.1 Academic

In [3], the main problem of the researchers was that they wanted to get the most accurate measurements of a human body out of 2D images to make it easier for the nutritions to know their patient's body measurements. They made the image go into several steps first of all acquisition. This is the step to get the input images from the patients they specified a pose for the patients to get better results and asked them for 4 photos in 4 directions. After that, the images went through segmentation using DensePose, and they passed those images to the classifiers like CNN, Bayesian, KNN, and SVM to acquire a prediction of the body part and calculate the outline of the body then they set key points for the image and use a formula for the pixel/centimetre scale and according to the key points, they determined the limbs that upon it the whole 3d model will be generated. The used dataset is 38 skinfold measures that were calculated by a professional. And I think that the dataset used is not large enough to test the accuracy of the system. They concluded that the Bayesian approach displayed the least error percentage in the Thigh and Pectoral measures both. Moreover, KNN was the highest percentage for Fist's measure. Finally, EM was the best in measures for the forearm, waist, and biceps.

In [4], their main problem was that they wanted to reach the best 3D detailed model with any pose possible of the human. On top of the existing SMPL model, they constructed a primary parametric mesh model. By decreasing its 2D error projection in the image space, it is possible to anticipate the 3D mesh vertex movement, they developed a coarse-to-fine refining strategy. And instead of feeding the network the entire image, they fed it window-cropped images, which resulted in a more reliable and precise prediction of deformation. They also incorporated a photometric term to enable the recovery of high-frequency features. These methods were integrated to create a process that considerably enhances the reconstructed human shape from only one image aesthetically and numerically. Their framework was divided into four phases: The input photo is first used to estimate an initial SMPL mesh. Beginning with this, the following three stages are refinement phases that forecast the mesh's deformation to generate a precise human shape. The first human mesh model was predicted using the HMR approach. They identified three layers of critical points on the mesh naming their handles. And they created a deep neural network at each level, utilizing the handles as control points, to modify the 3D mesh shape. they trained these networks using the Adam Optimizer, with a learning rate of around 0.0001. Three datasets were used for the experiment: the dataset of WILD which contains a huge number of pictures with 2D joints, and two other minor datasets used for the evaluation of 3D metrics. I think they did not succeed to generate 3D models for every body position as the 3D meshes that were side images and had depth were not accurate and had high error percentages.

The main issue of [5] was the requirement to present a trustworthy 3D garment digitization technology that can function well with real-world fashion. To match the clothing's parametric mesh model, they performed high-quality texture mapping from an input catalogue photo to UV map panels. They began by anticipating a small group of 2D landmarks along the edge of the garment, then used these landmarks to do a transfer of texture using a thin-plate spline on UV map panels. They also produced a sizable collection of simulated data with a variety of texture and lighting images by predicting a limited group of 2D landmarks. On UV map panels, TPS-based texture transfer is subsequently done using these landmarks. They altered the JPPNet architecture, which was first proposed for clothing milestone prediction on the human body. The dataset comprises 1300 items, 1000 of which are for testing and 300 of which are for training. This network applies the proper texture to each panel in the UV using information from the image's non-occluded regions. 200 images from the data were chosen for this project, and 5 different annotators annotated the images. Researchers used their data sets to modify the existing MADF-Net for the texture inpainting network. They trained the network over 20 epochs using 3000 pictures and 7300 masks for the T-shirts and 12000 photos and 12000 masks for the pants. However, they used substantially fewer (almost 50% fewer) real-world training photos. They also found that a network that was built utilising both synthetic and real-world data performs nearly double the JFNet in terms of NMSE. The only drawback is the dataset was too small which leads to inaccurate results.

There was a problem to transfer the texture of clothes to a 3D model to detect the texture. This problem was facing the [6] as they wanted to identify the texture of clothes from a 2D image as fitting is costly and error-prone. Their main idea was not to write the type of texture but to be detected by the customer. First, they developed an effective neural mapping technique (Pix2Surf) that was used to map the mesh's texture to an image simply based on the skeleton shape. As the image was taken with a background that has to be deleted, they used an Image segmentation technique which was (GrapCut) and then they collected a foreground mask using thresholding. Finally, they filled the holes in the mask by closing operations. These steps were illustrated clearly in figure 23. They created their own dataset which consists of 2267 front and 2267 back images of T-shirts, 2277 for shorts and 3410 for pants. this dataset works effectively and covers up the absence of a back view photo. In conclusion, they succeeded in detecting clothes' texture from a 2D image to 3D clothing used by virtual humans. Also, they minimized the time of conversion by making it run in real-time which will help many applications. They considered that the measurements of the clothes are known which is incorrect. As they have to detect the measurements from the image.

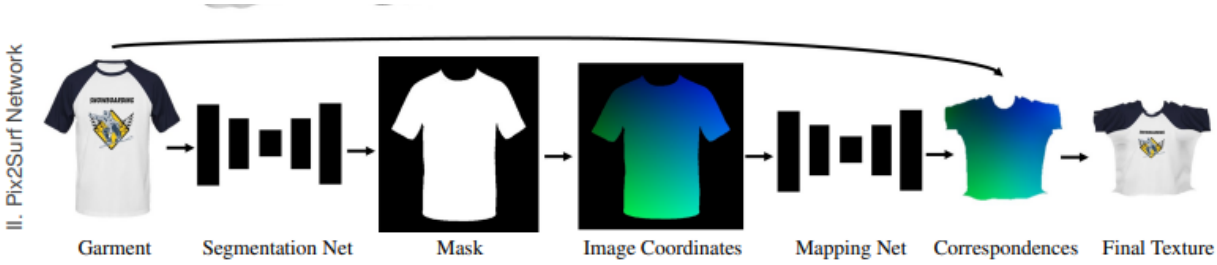

Figure 1: Pix2Surf Network
[6]

In [7], The authors noted that deep network-based recommendation systems are crucial for users and sellers equally and that many current recommendation systems depend on the user's previous shopping behaviours or feedback to produce the ideal recommendation. However, they were able to create a recommendation for clothing using only one photo from the user by combining machine learning and embedding techniques. For the recommendation portion, they used a feed-forward neural network and a survey asking participants about their age, gender, and other demographics. They developed two methods of inception, CNN for the prediction part and Stanford University's Clothing Attributes Dataset for the recommendation part.

2.2 Business Applications

2.2.1 Style.Me

Users upload a personal avatar with their basic physical details instead of a live video feed. Then, [8] offers sizing and fashion advice along with 3D representations of your clothing items. Customers can try on multiple products at once and style entire outfits.

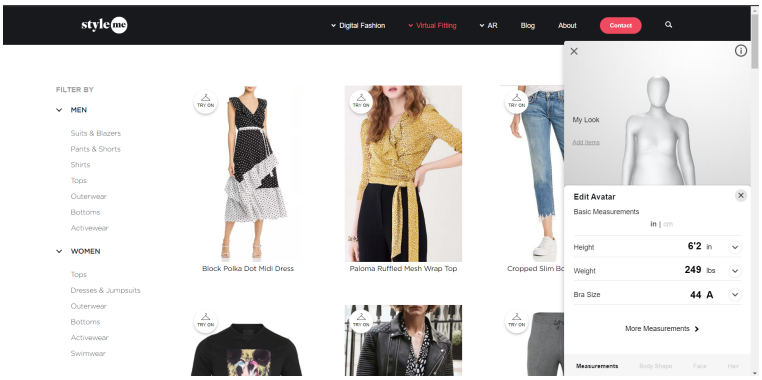

Figure 2: Style your outfit
[8]

2.2.2 Avatar AI

Because Avatar AI can produce a wide range of results, many avatars are generated so you can choose the finest ones. Transform yourself into a zombie for Halloween, a jungle Instagram model, a punk warrior in the desert, or the main character in a video game into a fashion model. You get to choose who you wish to develop into! Your AI avatars will resemble you exactly while wearing the clothing you choose.

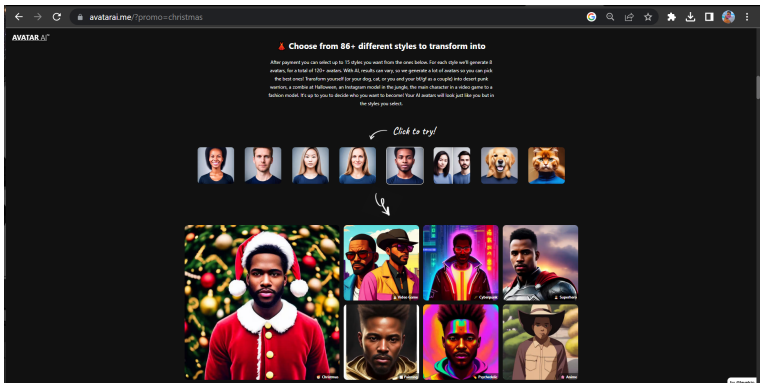

Figure 3: Avatar AI
[9]

3 System Description

3.1 Problem Statement

When it comes to the online shopping experience, the average e-commerce returns rate is around 30%, according to [10]. This rate percentage is because users mainly suffer from two significant problems when they shop; First, getting the right size is not an easy process. Most of the time, customers don't get the right size, leading to exchanges or refunds. This affects both the customer and the merchants as they both lose money in that process. Moreover, the opportunity to handle and touch the clothes is not given. Accordingly, the user doesn't know the fabric and texture of what they buy, which also leads to returns and losses.

3.2 System Overview

Figure 4: Fit-Moi System OverView

This project consists of four phases as shown in figure 4 The first phase is where the admin of the integrated brand needs to upload the 2D photos of the brand products, so they can go through image segmentation techniques which is a part of texture identification.

Moving to the second phase is the user input phase, where the user needs to upload multiple photos of him/her to increase the accuracy of body measurements and edge detection. Then, the uploaded photos will go through a pre-processing stage like the photo being converted from RGB to a gray-scale image. Moving to the normalization stage will enhance it, and moreover, the noise reduction feature will be used. However, the edge detection phase is achieved in many ways: dilation, background removal, and body contours. As for the feature extraction, it will convert the 2D model to 3D and identify the suitable size for the user. When the user chooses a specific product to view, he can view the texture clearly, and our third phase is the output, where a 3D human model with 3D clothes is shown.

In the fourth phase, when the user browses the products in our shop and selects a product he'll get to click on recommend an outfit button, and, our system is really flexible as it can recommend an outfit whether it's based on the user selected product or an uploaded product photo of the user, finally, the user will have a recommended outfit for him by the end of this phase.

3.3 System Scope

1. The system will help customers to have a live shopping by using a virtual fitting room through the 3D model.
2. The system will aid shops and merchants in improving their business.
3. The system creates texture from a 2D image.
4. The system will recommend a suitable outfit and styling tips.

3.4 System Context

As illustrated in figure 5, the context diagram of our project shows that the user will be able to upload multiple images to be converted to a 3D human model and the final output will be shown to the user at the end. Moreover, the admin of the integrated brand will be able to upload images of the clothes and they will be converted to 3D models. Detectron2 which is an AI modular object detection library will convert the 2D images uploaded by the user to the 3D model using the RCNN model and the COCO dataset. In addition, All of the images will go through image processing stages to get the most accurate textures. .

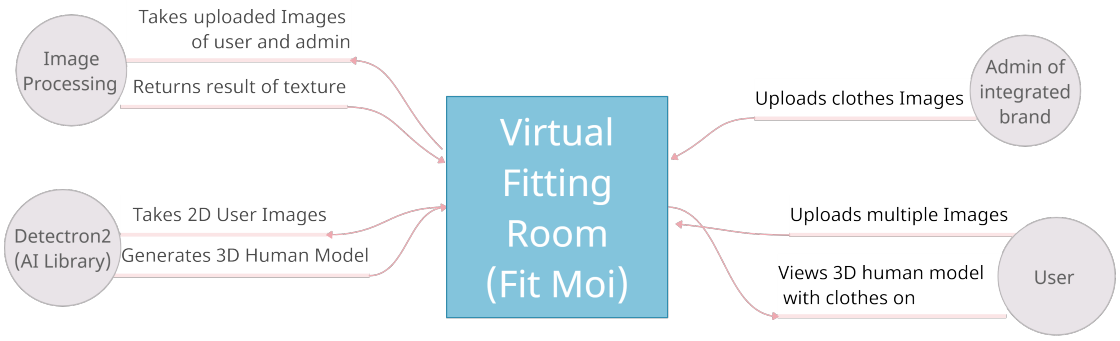

Figure 5: Fit-Moi Context Diagram

3.5 Objectives

The goals of the Virtual Fitting Room are:

- Seeing the outfit and knowing whether it suits you or not by viewing a 3D model wearing the clothes you chose.
- Managing the demands of fashion and preserving customers for business growth by developing an e-commerce mobile application.
- Aiding people to know different styles of fashion and to make sure that this is the best outfit.
- Reducing the percentage of exchanges or refunds and making it easier for the customer to have live shopping at home.
- Knowing the texture of the clothes with a high-resolution photo.

3.6 User Characteristics

- Fit Moi does not require any specific advanced computer knowledge to use it except for the developers and administrators of the system.
- Standard users are people of any age and any gender who can use just mobile application.
- Since English will be the user interface's default language, the user must have a basic understanding of the language.

4 Functional Requirements

The use case diagrams for this project are shown in the following figure. The Use Case diagram for users and admins using the app is shown in figure 6.

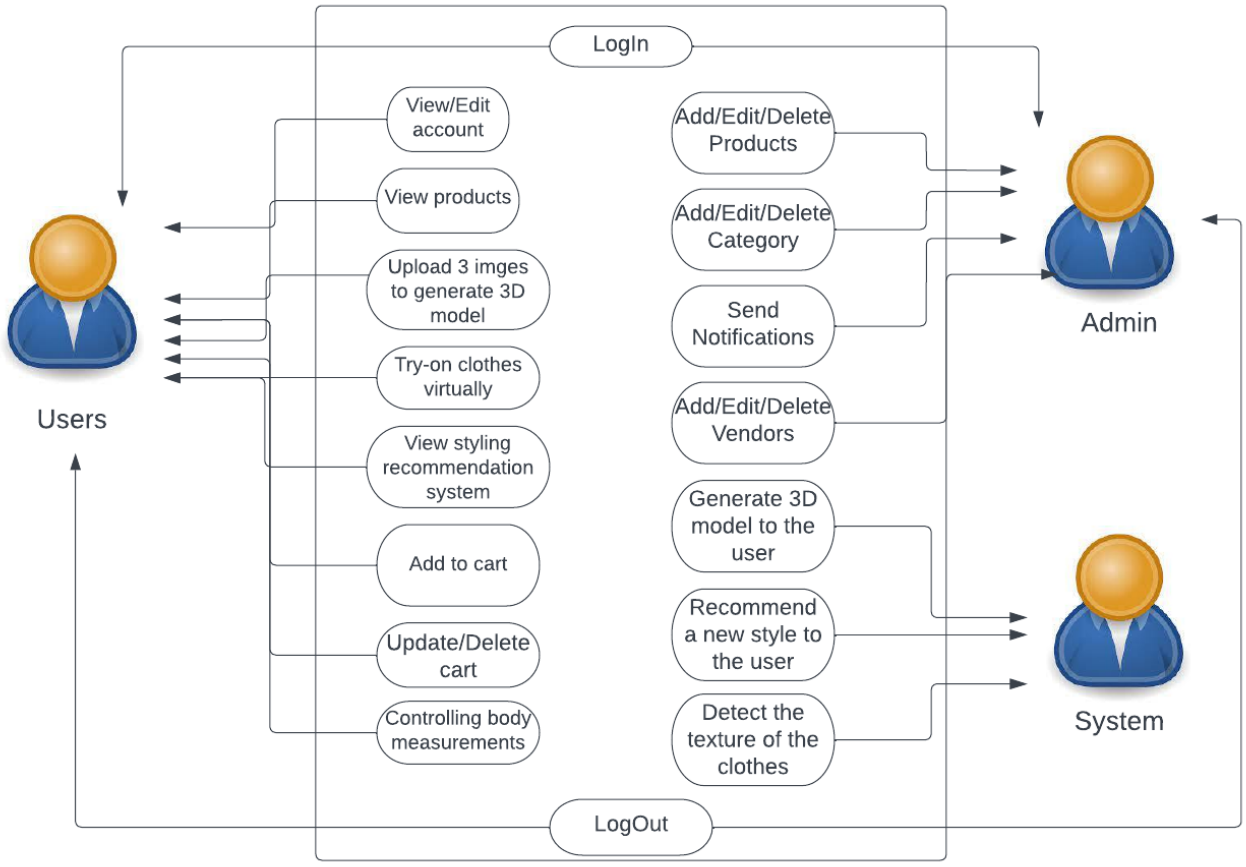

Figure 6: Use Case Diagram of Fit Moi

4.1 System Functions

- The system acknowledges that the user's photos are uploaded.
- System shall ask users to re-upload photos if an error happens.
- The system generates a 3D model based on (user photos, weight, and height).
- System allows the user to edit on his 3D model specs(weight,height,neck,waist,leg arm).
- The system shall put the chosen garment by the user on the 3D model.
- System shall view clothing recommendations for users.

- System shall send notifications to notify users about discounts.
- Admin shall add Products.
- Admin shall Edit products.
- Admin shall Delete products.
- Admin shall View orders.
- Admin shall Check the client's data.
- Admin shall Search order.
- Admin shall Search user.
- Admin shall Send a reply to the client's requests.
- Admin shall Shall login with an account.
- Admin shall add discounts on some products.
- Admin shall accept or decline a refund.
- Admin shall add textures to the 3D clothes.
- User shall Login with an account.
- User shall Edit account.
- User shall Delete account.
- User shall Register a new account.
- User shall Add products to the cart.
- User shall Search for a product.
- User shall Upload Photos to predict a 3D Model.
- User shall Try on the Clothes he/she chooses on the 3D model.
- User shall View recommended style of clothing.
- User shall Write a review about the product.
- User shall Rate a product.
- User shall View purchase history.
- User shall Send contact us form.
- User shall repurchase an item.

- User shall request a refund.
- User shall add a product to the favorites list.
- User shall view all of his previous orders.
- User shall view his favourites list.

4.2 Detailed Functional Specification

Table 2: Login

Name	**Login**
Code	Fn1
Priority	Extreme
Critical	Cell essential for the user to use all services on the mobile application
Description	It searches in a database for the entered username and password if it's valid or not
Input	Email and password
Output	Boolean(found or not found)
Pre-condition	User must already have a created account
Post-condition	If found go to the homepage if not say that email or password is incorrect
Dependency	Fn2
Risk	A previous session didn't end

Table 3: Sign Up

Name	**Sign Up**
Code	Fn2
Priority	Extreme
Critical	The data entered by the user must be checked if it has any errors
Description	It checks the data of the user before being sent to the sign up to be added in the database
Input	Email Password First and last name address and mobile number
Output	A string that prints the type of error that occurred
Pre-condition	None
Post-condition	If data has no errors send them to sign up
Dependency	None
Risk	None

Table 4: Edit Account

Name	**Edit account**
Code	Fn3
Priority	medium
Critical	none
Description	It allows user to Edit the data in the database
Input	Email Password First and last name address and mobile number
Output	Boolean(data updated or not)
Pre-condition	user must be logged in
Post-condition	If account Updated successfully
Dependency	Fn1
Risk	None

Table 5: 3D Model generation

Name	**3D Model**
Code	Fn4
Priority	High
Critical	None
Description	3D Model is generated from uploaded photos of the user by detecting joints and body parts
Input	Weight, Height, x3 photos from the front and side
Output	Accurate 3D Model of the user
Pre-condition	User must upload x3 photos beside weight and height to get the best results
Post-condition	If Data has no errors a 3D model is viewed
Dependency	Fn1
Risk	None

Table 6: Try on

Name	**Try on**
Code	Fn5
Priority	Medium
Critical	None
Description	It allows user to view the clothes he chooses on a predicted 3D Model
Input	Chosen garment
Output	A 3D Model of the user wearing the garment he/she choose
Pre-condition	User must have uploaded x2 photos and entered his/her weight and height
Post-condition	If Data has no errors View a 3D model wearing the clothes he/she choose
Dependency	Fn4
Risk	None

Table 7: Recommendation

Name	**Recommendation**
Code	Fn6
Priority	Medium
Critical	None
Description	It Gives the user a List of Style recommendation based on gender, colour, body shape
Input	Gender Body shape and Favourite Color
Output	A list of Style Recommendation that suits the user inputs
Pre-condition	user must be logged in
Post-condition	If there is no empty input View all Styling recommendation
Dependency	Fn1
Risk	None

Table 8: Search

Name	**Search**
Code	Fn7
Priority	Medium
Critical	None
Description	This function allow user to search for a specific product by using search filter
Input	Gender,Category,and Product name
Output	A list of all products from gender type and category
Pre-condition	None
Post-condition	If the product is found it will be shown to the user
Dependency	None
Risk	None

Table 9: Order History

Name	**Order History**
Code	Fn8
Priority	Medium
Critical	None
Description	This function allow the user to view previous purchases and decide whether to repurchase or return the item.
Input	None
Output	All the purchased products
Pre-condition	user must be logged in
Post-condition	all the delivered,and pending products are viewed
Dependency	Fn1
Risk	None

Table 10: Refund

Name	**Refund**
Code	Fn9
Priority	Medium
Critical	None
Description	This function is responsible to let the user refund a purchased product
Input	delivered order
Output	Refund Form
Pre-condition	user must be logged in and fill in all the Form with all details
Post-condition	If there is no empty input,the admin shall see the refund form an decide
Dependency	Fn1
Risk	None

Table 11: Checkout

Name	**Checkout**
Code	Fn10
Priority	Medium
Critical	None
Description	This function allow user to choose a payment method ,and write a delivery address information
Input	Name,Address, Email,Phone Number,Payment Method
Output	A list of Style Recommendation that suits the user inputs
Pre-condition	user must be logged in
Post-condition	If there is no empty input, the product will be getting ready to be delivered
Dependency	Fn1
Risk	None

Table 12: Add Texture

Name	**Add texture**
Code	Fn11
Priority	Medium
Critical	None
Description	It allows admin to a texture for a specific product
Input	Front back image of the product
Output	A mesh photo of the product is generated
Pre-condition	The admin must upload photos of the product
Post-condition	If there is no error while creating the mesh ,the texture will be added to the product
Dependency	Fn1
Risk	None

5 Design Constraints

5.1 Standards Compliance

The Fit Moi mobile application can work with iOS and Android operating systems.

5.2 Hardware Limitations

The user needs a smartphone that has a functioning camera to take photos of themselves in order to generate the measurements with better accuracy.

5.3 Network Constraint

For the application to function properly, a reliable internet connection is required.

6 Non-functional Requirements

6.1 Security

All through the user registration process, the system encrypts their password when they log in, Admin will create a special account for them to access the system's data and features.

6.2 Reliability

Since all client information is kept in a database and is always up to date, it can never be lost and can always be obtained from the administrator with the customer's permission.

6.3 Portability

The Fit-Moi application shall be accessible by the top mobile application distribution platforms which are: Android and iOS. As Fit-Moi shall be developed using Flutter, a cross-platform native framework.

6.4 Maintainability

No matter how much data is necessary to be entered, the system will maintain it, and it can be a system that is easily upgraded and modified.

6.5 Availability

The system should be accessible on any network on mobile devices. A reliable internet connection is all that the user needs to use our application.

6.6 Usability

The system shall be simple to use and not complex at all as it doesn't require a lot of steps from the user.

7 Data Design

In this system, we used four datasets which are SMPL, TAILORNET, COCO, and Polyvor-T. SMPL is used to simulate the 3D model [11]. We worked with the newest version of this dataset. The dataset size was 300 shapes for each male and female with a size of 350 MB. The user will pass multiple photos to the application and by using the SMPL dataset it will generate his 3D model with high accuracy. TAILORNET is used to generate 3D clothes from 2D images [12]. The space of this dataset was 6.9 GB for female t-shirts, 7.2 GB for male t-shirts, 3.3 GB for female pants, 3.4 for male pants, etc... It depends on three main factors, pose, style and garment geometry. The last dataset used is COCO. It is a large-scale object detection, captioning dataset and segmentation. It is used to detect the joints in the body and collect the body parts. Also, it helps in speeding up the development cycle [13]. Regarding the products, 2D images, data about the admin and products will be taken from the agency brand we will deal with. Finally, the Polyvore-T dataset [14] which is used to create the outfits for the recommendation system. It contains 21889 clothes and there is an image, text description, popularity score, and category for each item (like jeans, skirts, and sports, a total of 381 kinds of categories). Five classes are created from the filtered categories (top, bottom, shoes, bag, accessory).

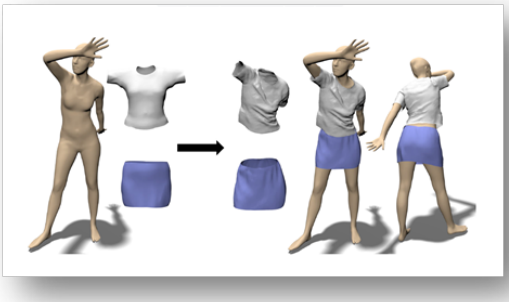

Figure 7: TAILORNET Dataset
[12]

Here in figure 8, the database for Fit-Moi's mobile application is demonstrated.

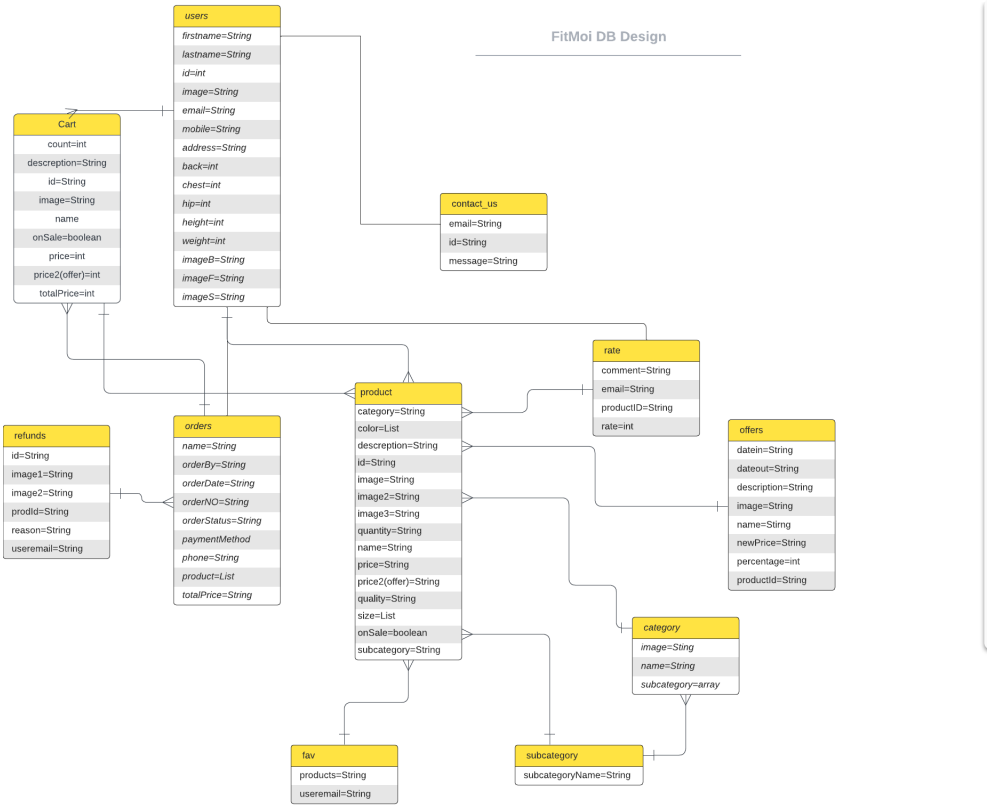

Figure 8: Fit-Moi's DataBase

8 Preliminary Object-Oriented Domain Analysis

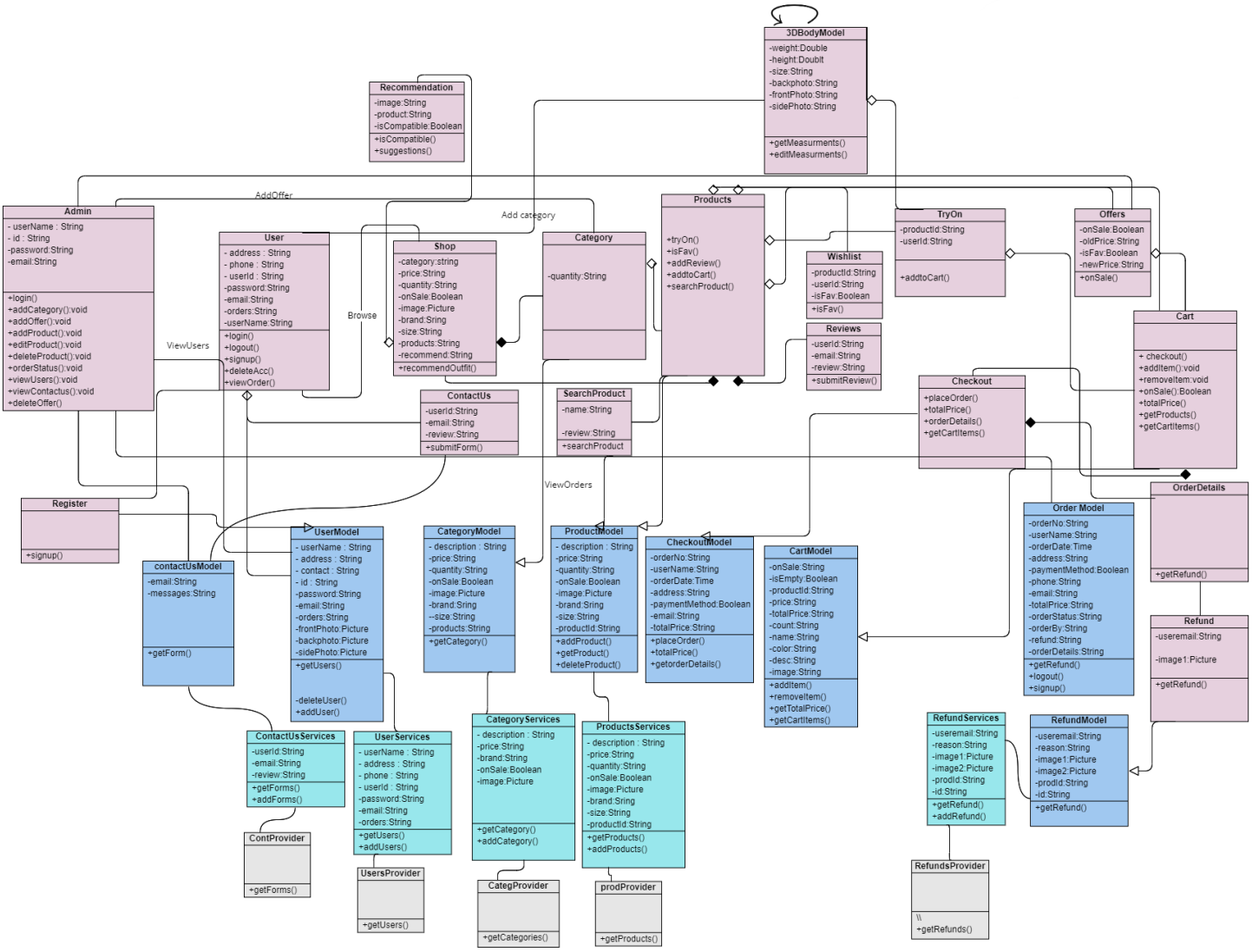

Figure 9: Fit-Moi's Class Diagram

.

9 Operational Scenarios

- **Scenario 1**
  The client will log in to have an account and start shopping. First, the client has to upload multiple images to detect his body shape with a 3D model output. Second, He/She chooses the clothes that will be uploaded to the 3D model. Third, Add this product to the cart and fill in the required form. Finally, Clients can track their orders.

- **Scenario 2**
  The client can also edit his measurements after uploading images and getting the predicted measurements and also the 3D model will be detected. There is an option called the recommendation system which suggests random outfits that depend on the chosen items the client added.

- **Scenario 3**
  The admin has to log in to have access to the system and add, remove, and edit products. Admin can browse the list of clients and know their orders. Admin can also add new features if it is valid.

- **Scenario 4**
  The database is used to save all information about the project to not be forgotten. It saves the client data and orders to be used again if needed. Additionally, the attributes that the model uses to train itself in order to create an appropriate classifier. To be able to classify and contrast the input with the training data.

10 Project Plan

The figures 10 and 11 below show the timeline of this project from the end of the proposal to SDD . .

Tasks	Start Date	End Date	Duration in days	Roles
Documentation of SRS	16/11/2022	16/12/2022	29	All Team Members
Working on Dell competition	20/11/2022	12/12/22	22	All Team Members
Increasing Dataset	22/11/2022	31/12/2022	9	Yasmin and Salma
Increasing Images uploaded by user	22/11/2022	31/12/2022	9	Youssef and Rogina
Working on Textures	01/12/22	13/12/2022	12	All Team Members
converting from 2D clothes to 3D clothes	01/12/22	13/12/2022	12	All Team Members
PowerPoint of SRS	11/12/22	16/12/2022	5	All Team Members
working on ISEIC competition	11/12/22	22/12/2022	11	All Team Members
Writing survey paper	22/12/2022	02/01/22	10	All Team Members
Developing the mobile application	20/12/2022	18/02/2022	58	All Team Members
Documentation of SDD	01/01/22	18/02/2022	58	All Team Members

Figure 10: Tasks and timeline

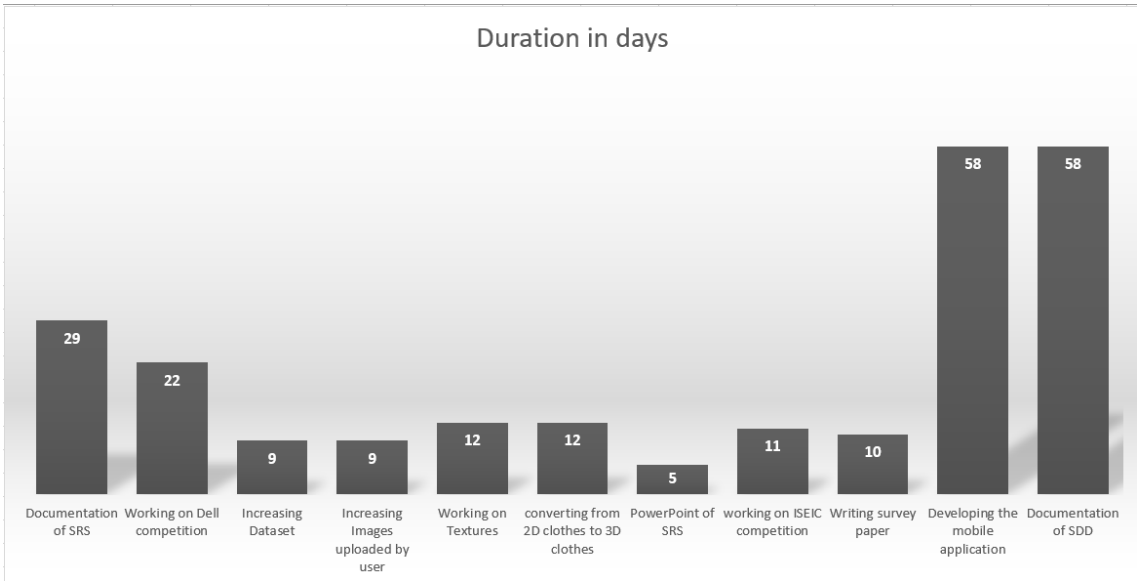

Figure 11: Chart of timeline

11 Appendices

11.1 Definitions, Acronyms, Abbreviations

Abbreviation	Definition
SMPL	Simple Modeling and Processing Language.
CNN	Convolutional Neural Networks
K-NN	K-Nearest Neighbors Algorithm
R-CNN	Region-based Convolutional Neural Networks
RAM	Random access memory is a computer's short-term memory, which is used to take care of all the active tasks and applications
E-commerce	Is the electronic purchase or sale of goods using online services or the Internet.
COCO	Common Objects In Context
SDD	Software Design Document
JPPNet	Joint Body Parsing and Pose Estimation Network
SVM	Support vector machine
GrapCut	An image segmentation method based on graph cuts
Detectron2	The object identification and segmentation platform of the future developed by FAIR
Tailornet	A neural model that accounts for the three aspects of posture, shape, and style in predicting how clothes would deform in three dimensions

11.2 Supportive Documents

- **Dataset:-**

1. TAILORNET [15]: Predicting clothes in 3D based on a person's stance, form, and clothing choice.
2. SMPL[16]: An accurate 3D simulation of the human body created using data from thousands of 3D full-body scanners,
3. COCO [17]: For object recognition, segmentation, and captioning, COCO is an important dataset. Additionally, COCO contains the following features: segmenting, context-aware recognition, and segmentation with superpixel things.
4. Polyvore-T [14]:21889 clothes from the original Polyvore dataset were chosen based on expertise. Graph segmentation is performed to separate the train, validation, and test datasets. There is an image, text description, number of votes, and category for each item (like jeans, skirts, and sports, a total of 381 kinds of categories). Five classes are created from the filtered categories (top, bottom, shoes, bag, accessory).

- **Survey:-**

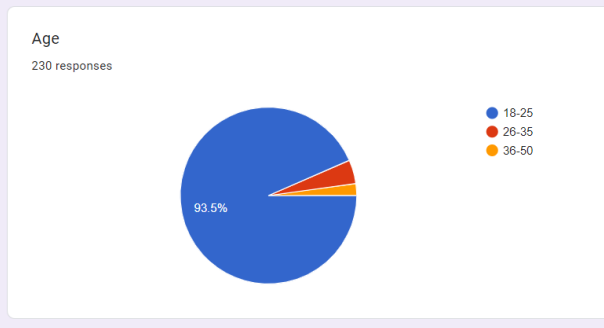

Figure 12: Question 1

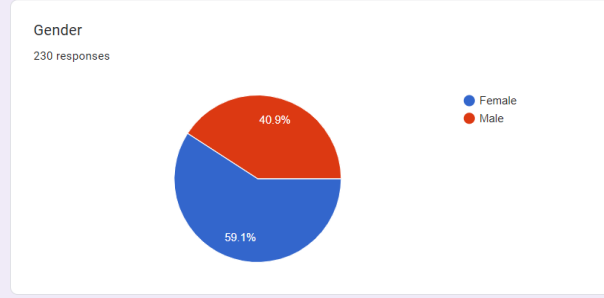

Figure 13: Question 2

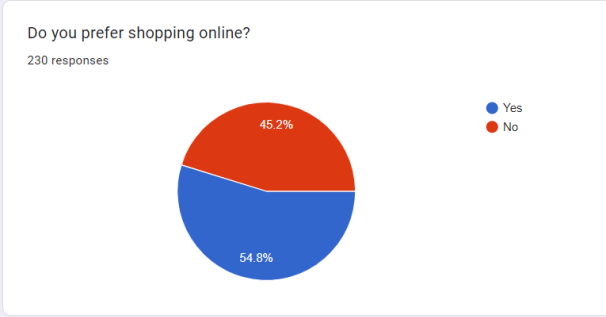

Figure 14: Question 3

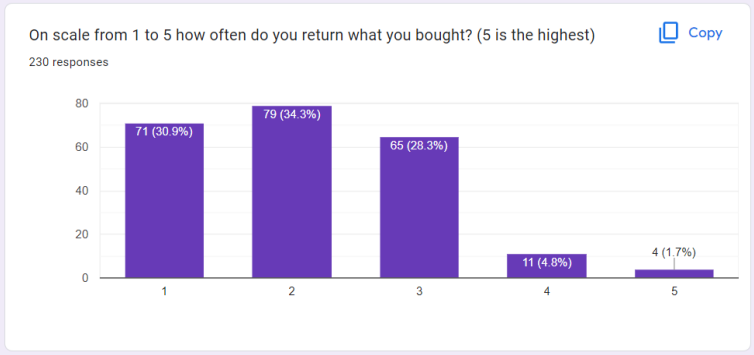

Figure 15: Question 4

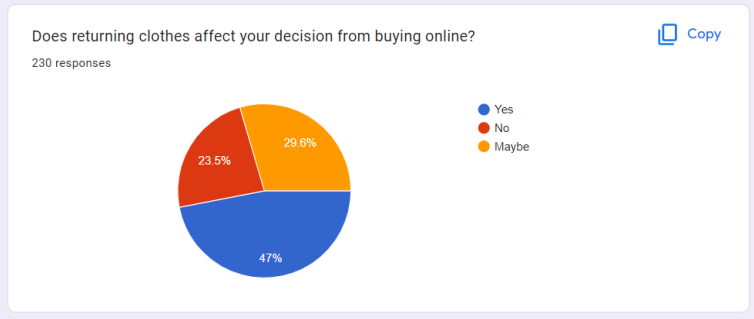

Figure 16: Question 5

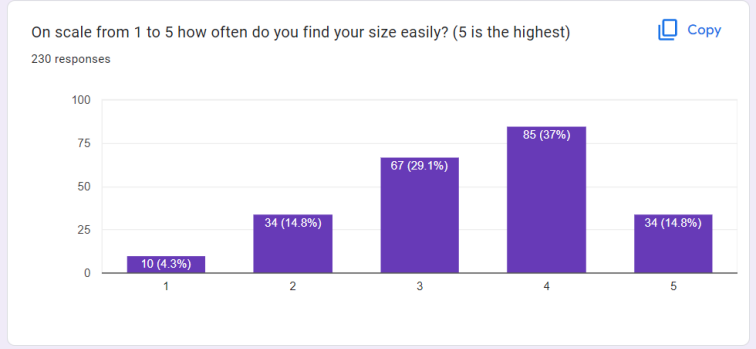

Figure 17: Question 6

Figure 18: Question 7

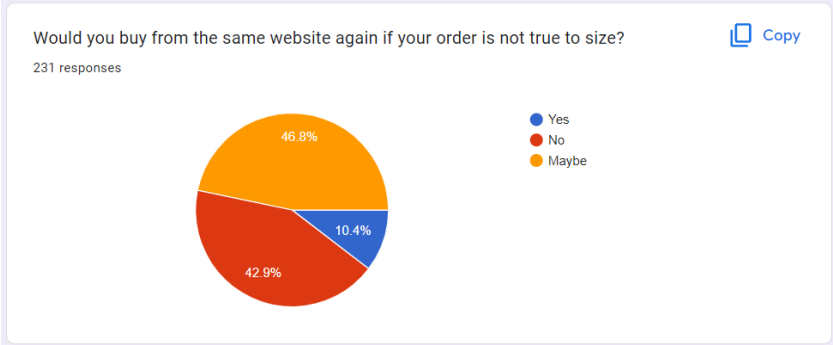

Figure 19: Question 8

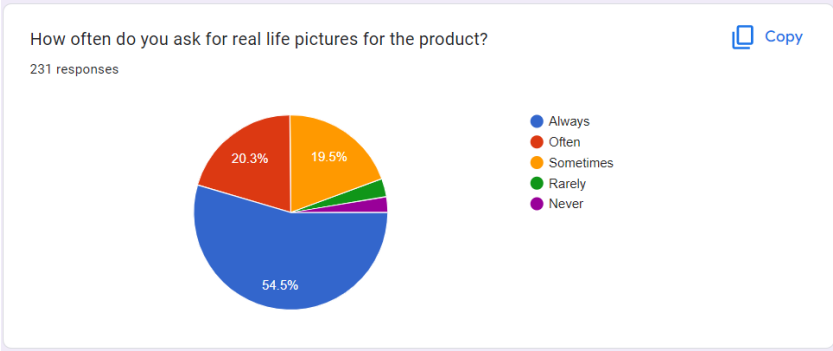

Figure 20: Question 9

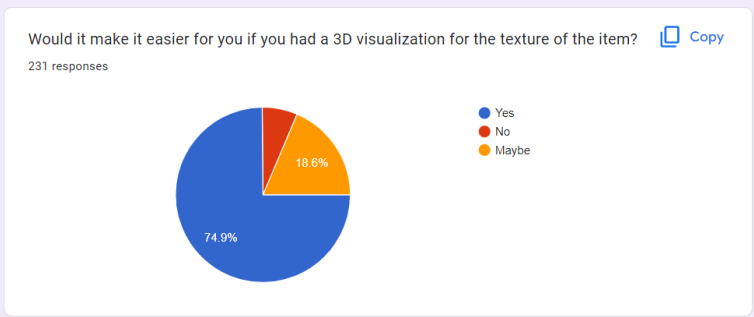

Figure 21: Question 10

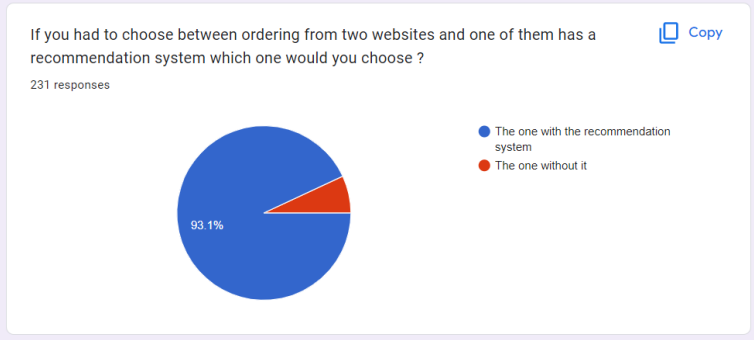

Figure 22: Question 11

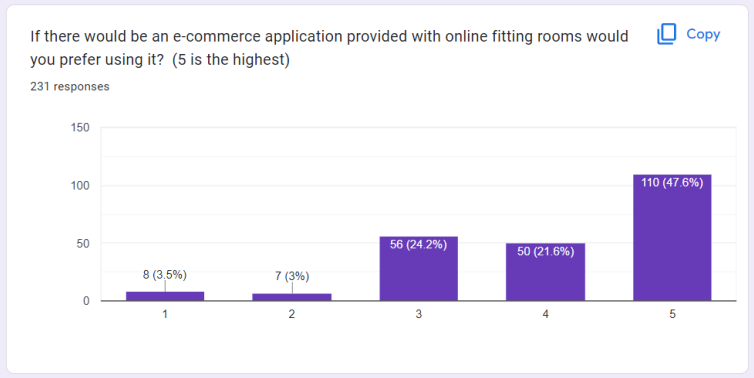

Figure 23: Question 12

References

[1] Jennifer McAdams. *Importance of ecommerce during COVID-19 amp; Online Selling*. Aug. 2022. URL: https://www.progress.com/blogs/the-growing-importance-of-ecommerce-in-a-post-covid-19-world.

[2] Beatriz Estay. *16 fascinating online shopping statistics (2022)*. July 2022. URL: https://www.bigcommerce.com/blog/online-shopping-statistics/#ecommerce-is-growing-every-day.

[3] João W. M. de Souza, Gabriel B. Holanda, Roberto F. Ivo, et al. "Predicting body measures from 2D images using Convolutional Neural Networks". In: *2020 International Joint Conference on Neural Networks (IJCNN)*. 2020, pp. 1–6. DOI: 10.1109/IJCNN48605.2020.9207330.

[4] Hao Zhu, Xinxin Zuo, Haotian Yang, et al. "Detailed Avatar Recovery from Single Image". In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* (2021), pp. 1–1. DOI: 10.1109/TPAMI.2021.3102128.

[5] Sahib Majithia, Sandeep N Parameswaran, Sadbhavana Babar, et al. "Robust 3D Garment Digitization from Monocular 2D Images for 3D Virtual Try-On Systems". In: *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*. 2022, pp. 3428–3438.

[6] Aymen Mir, Thiemo Alldieck, and Gerard Pons-Moll. "Learning to transfer texture from clothing images to 3d humans". In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2020, pp. 7023–7034.

[7] Batuhan AŞIROĞLU, Mehmet Ilkay Atalay, Alkan Balkaya, et al. "Smart Clothing Recommendation System with Deep Learning". In: *2019 3rd International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)*. IEEE. 2019, pp. 1–4.

[8] *A new way to experience digital fashion*. Sept. 2022. URL: https://style.me/.

[9] *YourFit 2.0*. Aug. 2022. URL: https://avatarai.me.

[10] Amit RG. *How to reduce ecommerce return rates: Statistics and best practices*. URL: https://www.richpanel.com/blog/ecommerce-return-rates#:~:text=The%5C%20average%5C%20ecommerce%5C%20return%5C%20rates,to%5C%20set%5C%20correct%5C%20customer%5C%20expectations..

[11] Eric Hedlin, Helge Rhodin, and Kwang Moo Yi. "A Simple Method to Boost Human Pose Estimation Accuracy by Correcting the Joint Regressor for the Human3. 6m Dataset". In: *arXiv preprint arXiv:2205.00076* (2022).

[12] Chaitanya Patel, Zhouyingcheng Liao, and Gerard Pons-Moll. "Tailornet: Predicting clothing in 3d as a function of human pose, shape and garment style". In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*. 2020, pp. 7365–7375.

[13] Vung Pham, Chau Pham, and Tommy Dang. "Road damage detection and classification with detectron2 and faster r-cnn". In: *2020 IEEE International Conference on Big Data (Big Data)*. IEEE. 2020, pp. 5592–5601.

[14] Xintong Han, Zuxuan Wu, Yu-Gang Jiang, et al. "Learning Fashion Compatibility with Bidirectional LSTMs". In: *ACM Multimedia*. 2017.

[15] Chaitanya Patel, Zhouyingcheng Liao, and Gerard Pons-Moll. "TailorNet: Predicting Clothing in 3D as a Function of Human Pose, Shape and Garment Style". In: *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*. IEEE. June 2020.

[16] Matthew Loper, Naureen Mahmood, Javier Romero, et al. "SMPL: A Skinned Multi-Person Linear Model". In: *ACM Trans. Graphics (Proc. SIGGRAPH Asia)* 34.6 (Oct. 2015), 248:1–248:16.

[17] Tsung-Yi Lin, Michael Maire, Serge Belongie, et al. *Microsoft COCO: Common Objects in Context*. 2014. DOI: 10.48550/ARXIV.1405.0312. URL: https://arxiv.org/abs/1405.0312.