CBS1901 - TARP

VIRTUAL FIT

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Overview

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Title: Virtual Fit to predict the fitness of the dress using DL/ML

Problem Statement:

The aim of the system is virtual try on clothes and predict whether the dress suits the person or not. The proposed system should be able to identify the body's actual shape in three dimensions so that the clothing could be appropriately fitted to the body. Virtual experiences make it easier, faster, and more convenient to try on multiple clothes in different sizes, without searching for items in-store and dealing with cumbersome fitting rooms. Because of this we know how we look in a particular dress without wearing the dress.

Abstract:

Customers can digitally try on clothes using virtual try-on clothing software, which eliminates the need to physically try on items or visit a store. The software creates a realistic image of the user's body using cutting-edge 3D modeling and computer vision technologies, enabling users to visualize how various clothing items might appear on them.

The user can browse a virtual catalog of apparel after the 3D model has been built and choose the items they want to try on. The software then superimposes the piece of clothing onto the user's 3D body model so they can view how it would appear on them from every angle.

Project Objectives

01

Detect and extract human body skeleton-based joint positions

02

Calculate body measurements based on the extracted body skeleton joint positions

03

Fit virtual garments onto the human body according to the extracted body skeleton joint positions.

04

Develop an interactive AR virtual fitting room web application

Related Works

Sr. No.	Citation	Advantages	Disadvantages
1	Minar, M. R., Tuan, T. T., Ahn, H., Rosin, P., & Lai, Y. K. (2020, June). Cp-vton+: Clothing shape and texture preserving image-based virtual try-on. In CVPR Workshops (Vol. 3, pp. 10-14).	• Focuses on preserving both the shape and texture of the clothing during the virtual try-on process. • The method is image-based, which means it does not require 3D models or complex garment parameterization. This makes it relatively easier to implement and use in practical applications. • The use of GANs (Generative Adversarial Networks) allows the model to generate clothing images that are coherent with the target person's appearance.	• GANs tend to be complex and computationally expensive. Implementing and training such models might require significant computational resources and expertise. • The quality of generated images in GAN-based approaches can be inconsistent. • The paper does not discuss in detail how the proposed method's results are quantitatively evaluated. • The success of the virtual try-on process might heavily depend on the quality of the input images (both the source clothing and the target person).

Related Works

Sr. No.	Citation	Advantages	Disadvantages
2	Ge, C., Song, Y., Ge, Y., Yang, H., Liu, W., & Luo, P. (2021). Disentangled cycle consistency for highly-realistic virtual try-on. In Proceedings of the IEEE/CVF conference on computer vision and pattern recognition (pp. 16928-16937).	• Disentangled cycle consistency is designed to improve the realism of virtual try-on. • The approach aims to disentangle various factors such as clothing appearance, body shape, and pose. This disentanglement could result in greater flexibility and control over how clothing items are applied to different body types and poses. • By focusing on cycle consistency, the proposed approach might mitigate artifacts and inconsistencies that can occur in virtual try-on systems, leading to a higher quality output.	• Depending on the approach's complexity, there could be a risk of overfitting to the training data, leading to poor generalization to new data and scenarios. • Disentangling factors in virtual try-on can introduce computational and technical complexities. • While the proposed approach might work well under controlled conditions, its performance in real-world scenarios with diverse clothing styles, body shapes, and lighting conditions could be challenging.

Feasiblity

Technical

The development of virtual try-on clothes software requires advanced 3D modeling and computer vision technology to create a realistic representation of the user's body. The software needs to accurately map the user's body shape and size to create a digital model of the user that can be used to try on clothes virtually. This requires a significant amount of computing power and data processing capabilities.

Economic

The development and implementation of virtual try-on clothes software require significant investment in software development, data management, and server maintenance. This means that the cost of implementing this technology may be high. However, the potential benefits of virtual try-on clothes software may outweigh the costs.

Legal

Virtual try-on clothes software needs to comply with legal and regulatory requirements, such as data privacy regulations like the GDPR or CCPA. The software needs to ensure that user data is collected and processed in a legal and ethical manner. Retailers also need to ensure that the software does not infringe on any patents or copyrights.

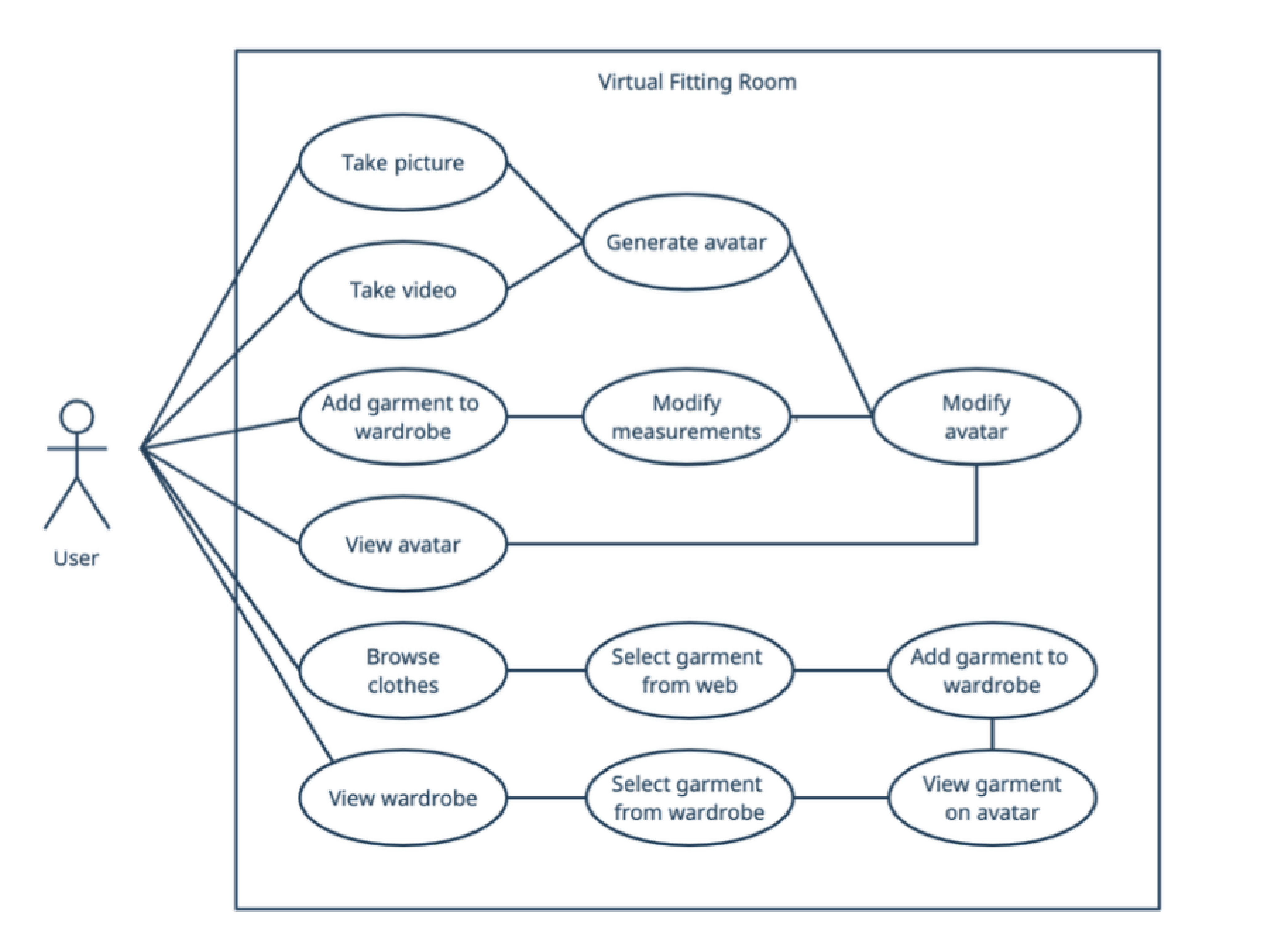
Requirements:

- Image Recognition: The model should be able to recognize the different items of clothing or accessories from images, videos or 3D models.
- Body Measurements: The model should be able to extract measurements of the user's body, including height, weight, chest, waist, and hip measurements, and use them to customize the fit of the virtual clothes.
- Garment Simulation: The model should be able to simulate the appearance of the garment when worn, including how it drapes, folds, and stretches on the body.

Requirements:

- User Interaction: The model should provide the user with an intuitive and easy-to-use interface for selecting and trying on virtual clothing items and accessories.
- Realistic Movement: The model should be able to animate the virtual clothes and accessories in a way that is realistic, and responds to user movements and interactions.
- Integration: The model should be able to integrate with e-commerce websites and social media platforms to provide a seamless shopping experience for users.

Use Case Diagram



Approach

Computer Vision

Used to detect and recognize faces, identify objects, classify human actions in videos, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high-resolution image of an entire scene, find similar images.

Image Processing

Used to enable the model to simulate how clothing items would look on a person. Image processing techniques used may include color correction, image segmentation, feature detection, and machine learning algorithms

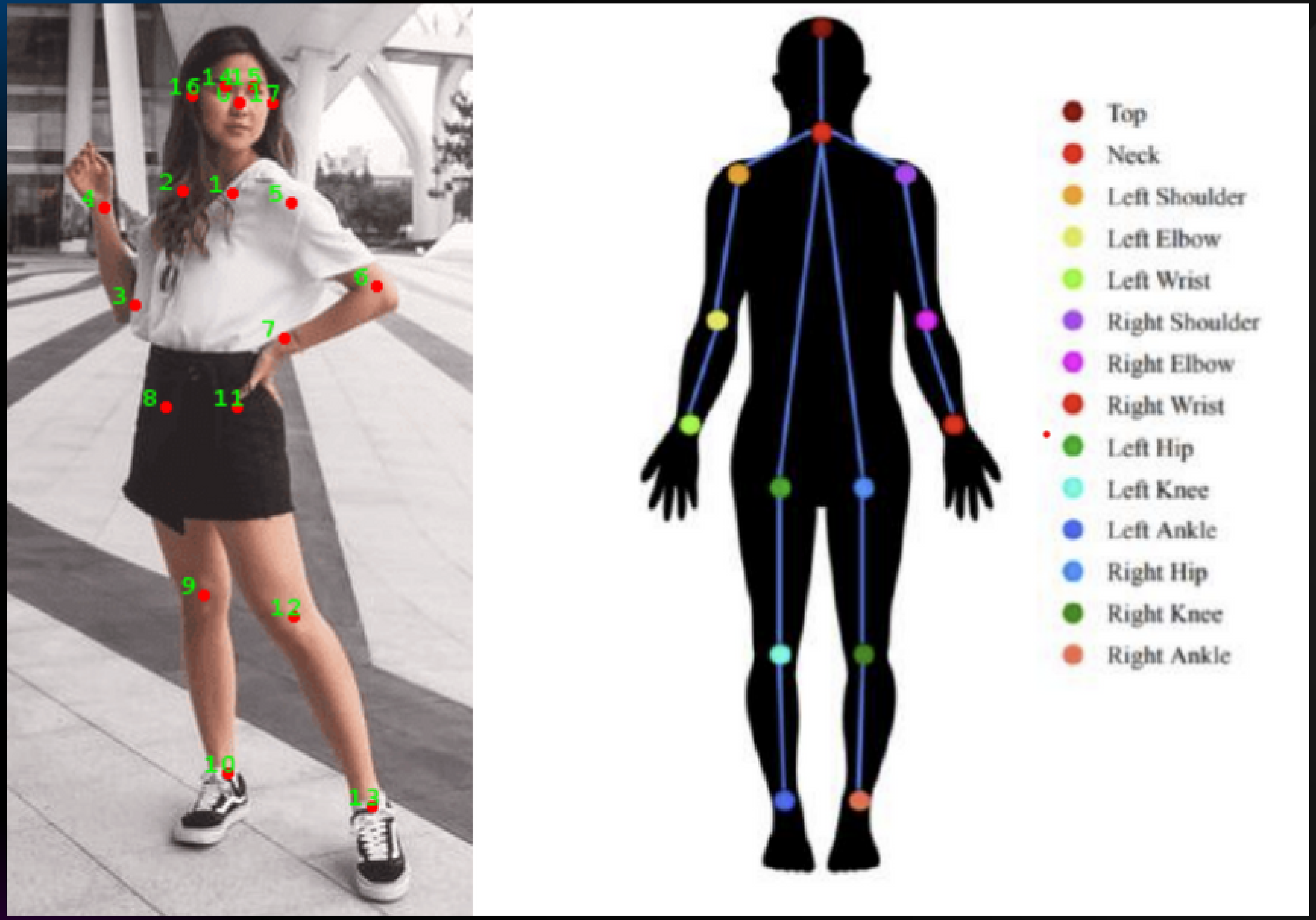
Mask Creation

Mask creation is used to separate the clothing item from the background and the person wearing it, allowing the model to simulate how the clothing item would look on a different person or background.

Resizing and superimposition

To create a mask superimposition, the model uses the mask of the clothing item, and techniques such as perspective transformation and color correction, to adjust the mask to match the pose and lighting of the person in the image or video.

Approach


Top
Neck
Left Shoulder
Left Elbow
Left Wrist
Right Shoulder
Right Elbow
Right Wrist
Left Hip
Left Knee
Left Ankle
Right Hip
Right Knee
Right Ankle

Implementation

Stage 1:
Specifying hardware and software requirements

Stage 2:
Human Body Recognition, Detection, and Motion tracking

Stage 3:
Generation of garment model and superimposition over human body

Stage 4:
Build a web server for final implementation

Technologies Used

Open CV

Anaconda

Tensor Flow

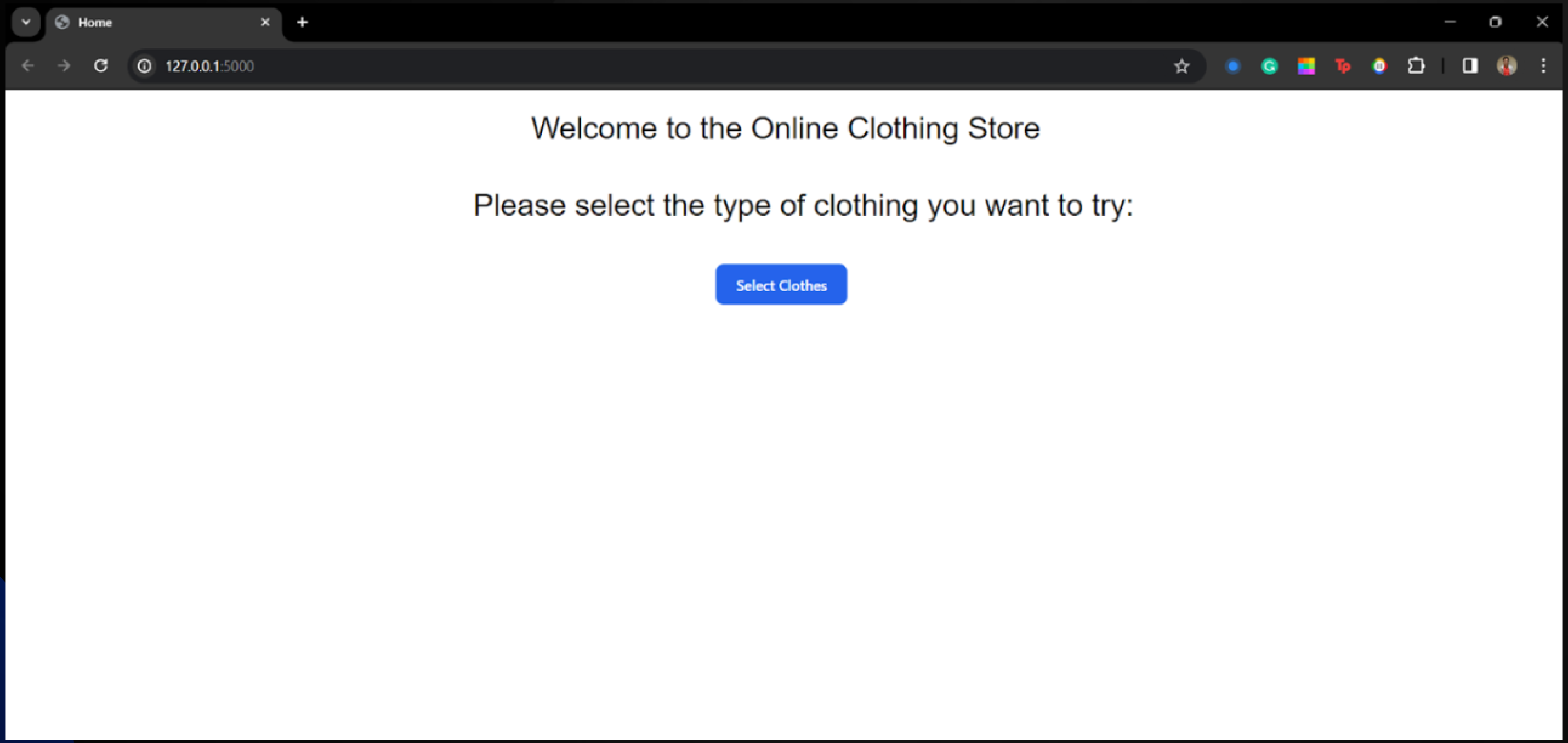
Spyder

Output and Results

PROBLEMS OUTPUT TERMINAL PORTS DEBUG CONSOLE

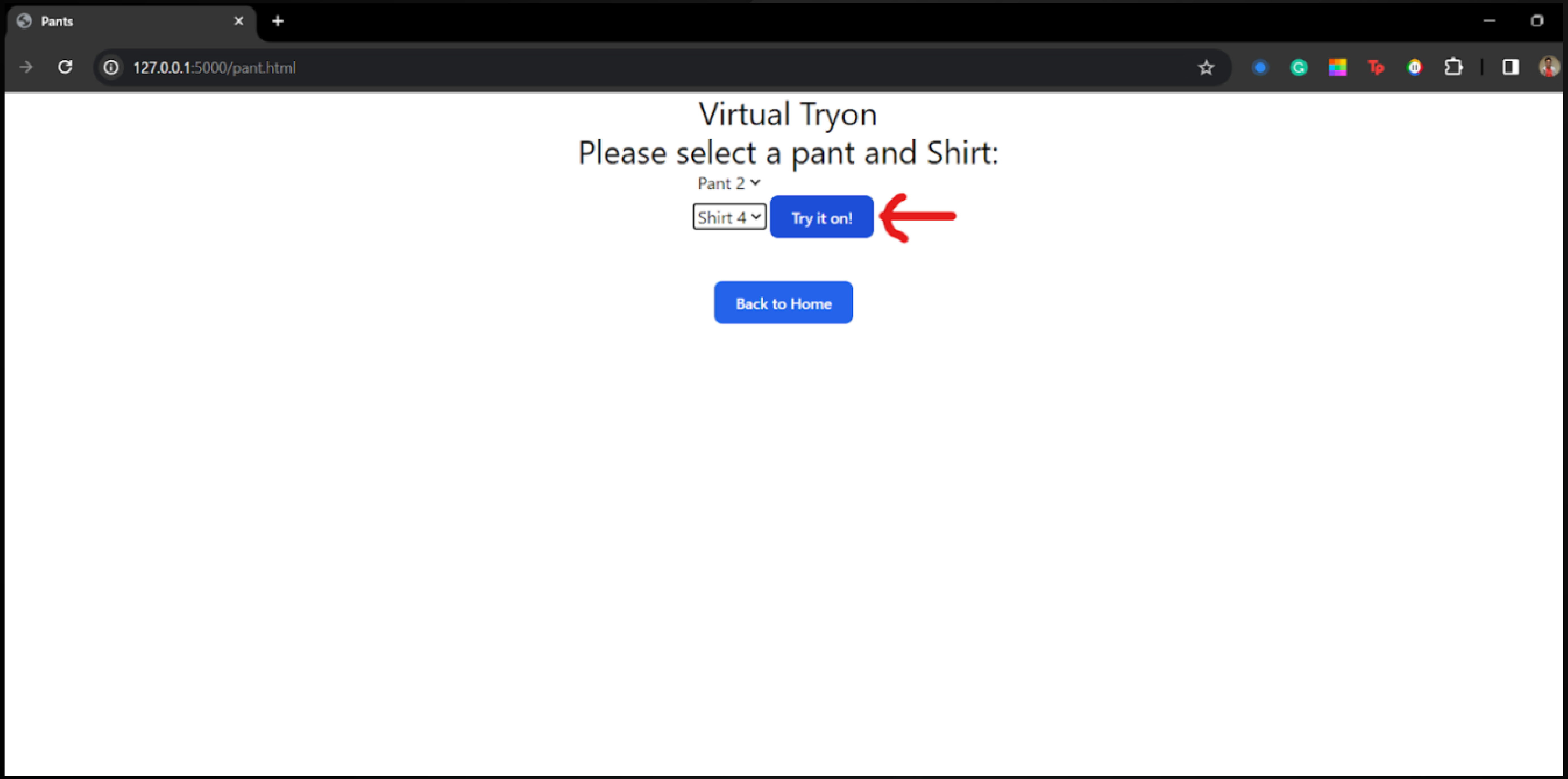
```
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on all addresses (0.0.0.0)
 * Running on http://127.0.0.1:5000
 * Running on http://172.20.10.5:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 101-938-149
```

After running the code in Visual Studio Code, it generates a Website link. Ctrl + Click on the link to redirect to the website.



Landing page of the redirected website

Output and Results



After selecting your desired clothes, click on TRY IT NOW!

Output and Results

A window pops up after you grant camera access where our prototype runs successfully! Happy Trying-On!

Limitations and scope of future work:

- The accuracy of the predictions heavily relies on the quality and representativeness of the training data.
- The reliance on digital avatars or virtual representations of users may not fully capture the individual variations in body shape, size, and posture, which could impact the accuracy of fitness prediction.
- Another limitation is the computational complexity and resource requirements of DL/ML models.
- Furthermore, virtual try-on technology is heavily dependent on the availability and quality of 3D models of clothing items.

Conclusion:

- Virtual try-on and dress fitness prediction using DL/ML techniques hold great promise in revolutionizing the fashion industry by providing virtual fitting experiences for online shoppers.
- Despite the limitations, the potential for future research and advancements in DL/ML techniques, technologies, and user-centric design is vast. Further development of large and diverse datasets, incorporation of physics-based simulations, multi-modal inputs, improved garment modeling techniques, etc.
- With continued research and innovation, virtual try-on and dress fitness prediction using DL/ML have the potential to transform the online shopping experience, reduce returns, and improve customer satisfaction in the fashion industry.

THANK YOU

For watching this presentation