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AI-POWERED VIRTUAL GARMENT TRIAL ROOM

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ABSTRACT

Easy on the budget is a hallmark of the second-stage training of the AI-based Virtual Garment Trial Room; this unique system uses the latest set of AR and machine-learning-based processes. The body detection very accurately is done using highly efficient Haar cascade algorithms based on OpenCV, while the alignment of the garment uses state-of-the-art convolutional neural networks (CNNs)-creating a very involving and lifelike trial experience through standard webcams. The system favors a significant number of software solutions over a few limited hardware-heavy options like the Kinect on the basis of price and scale. Huge future advancements like Pose Alignment Networks (PAN) and Texture Refinement Networks (TRN) will greatly increase accuracy and realism. The system can greatly reduce the difference between online and offline shopping experiences, bringing the potential of greatly enhancing customer experience and reduce returns.

Keywords: Opencv, Machine Learning, AR, Haar Cascade, Dlib, CNN, PAN, TRN, Kinect.

I. INTRODUCTION

The AI-powered Virtual Garment Trial Room transforms online shopping, letting you virtually try on clothes and accessories in real time using your webcam. This system combines advanced augmented reality (AR) and image processing and it uses Haar cascade datasets for body detection and convolutional neural networks (CNNs) for precise alignment. Software replacements for expensive hardware considerably improve accessibility. This upgrade also increases customer satisfaction.

This project integrates exceptionally advanced processing of a large number of live video feeds, coupled with strikingly accurate real-time garment overlay capabilities, in addition to a considerably intuitive user-friendly interface; therefore, it is ideally suited for e-commerce applications. It lowers return rates and increases customer confidence and it offers meaningful scalability and future improvements such as Pose Alignment Network (PAN).

II. PROBLEM STATEMENT

Problem Statement:

Online stores face a real problem as customers can't try clothes on before buying them, so they're unsure about how they'll fit, look and feel. Retailers face high return rates, which increase operating costs and frustrate shoppers. Several current virtual try-on technologies often require costly equipment such as Kinect or produce some degree of inaccuracy in garment fitting. Variations in body shape and posture reduce the realism of these virtual trials. Lighting conditions also lessen their realism. Online shopping suffers from a considerably problematic absence of a readily available, affordably priced, and supremely accurate solution, thus creating a large deficiency in the overall experience.

Disadvantages:

- Absence of Physical Interaction – Even though there has been an increase in the use of AI coupled with AR, virtual trial rooms are unable to provide the full experience of the feel and texture a person gets while trying clothes, which makes the experience markedly different.
- Accuracy Issues- Great expectations regarding the beltway performance of virtual try-ons are not moderated by the fact that try-ons are put into motion with gowns constantly shifting. Because of shifting body parts, posture, and even alterations in the surrounding lighting, accurate placement of GTO is bound to fail, leading to an inaccurate visualization.

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- Technical Limitations – The performance of the system is linked to the webcam definition and the power of the device in use. There is a huge chance that the performance and accuracy will go down because of this.
- Privacy Concerns Real-time detection of the body and processing of image data can raise privacy issues because users are reluctant to permit AI systems to crawl and analyze their body images.
- Limited Clothing Customization – Virtual trial rooms might be unable to properly simulate the modification of garment properties that can change owing to movements like elasticity, draping, and layering. These changes will limit the realism of the fit, making it more challenging to achieve a proper fit.

III. PROPOSED SYSTEM

AI Virtual Garment Trial Room enhances the experience of shopping online by providing virtual trial room features. With the Virtual Garment Trial Room, users can give their webcams a new purpose as Depth Sensors aren't as easily accessible. The webcams will make it possible to put on clothes by the use of algorithms and GEI and style extraction.

The system incorporates Pose Alignment Networks (PAN) which rotates the clothing for more precise facial angles. It also contains contour fitting which adjusts to the wearer's shape in real-time. All parts of the system connect smoothly to e-commerce which eliminates waiting time and is far more efficient than PAN. Future implementations include Texture Refinement Networks (TRN) which enhance the portrayal of clothing materials. Most people will genuinely prefer this because they will have fewer problems buying new clothes.

- Cost Effective: We exploit ordinary webcams as well as existing machine learning libraries instead of sophisticated hardware. This drastically cuts down the implementation costs for businesses and customers.
- Time Efficient: The software solution is simple to install as opposed to traditional virtual setups which require extensive pre-work. This makes the solution user-friendly and scalable for large deployments.
- Improved Accuracy: By using Pose Alignment Networks (PAN), in combination with other deep learning architectures, models make precise garment overlay enabling clothes to dynamically adjust to changing body postures or movements. Hence, the realism and credibility of the virtual try-ons are augmented, increasing the customers' trust in buying items from the website.
- Enhanced User Experience: Users can change garments using hand gestures or UI buttons, thereby making the solution more appealing and usable.
- Reduces Return Rates: The system minimizes incorrect size selection by allowing users to visualize how the garment would fit, hence reducing product returns and saving money for retailers.

IV. SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- Processor - I3/Intel Processor
- Hard Disk - 160GB
- RAM - 8GB

SOFTWARE REQUIREMENTS

- Operating System : Windows 7/8/10 .
- IDE : Pycharm.
- Libraries Used : CMake (3.12.0), Dlib (19.15.0), OpenCV (3.4.2.17), SciPy (1.0.0), Tkinter, NumPy (1.18.1), Anaconda (4.8.2), Flask (1.1.1)
- Technology : Python 3.6+.

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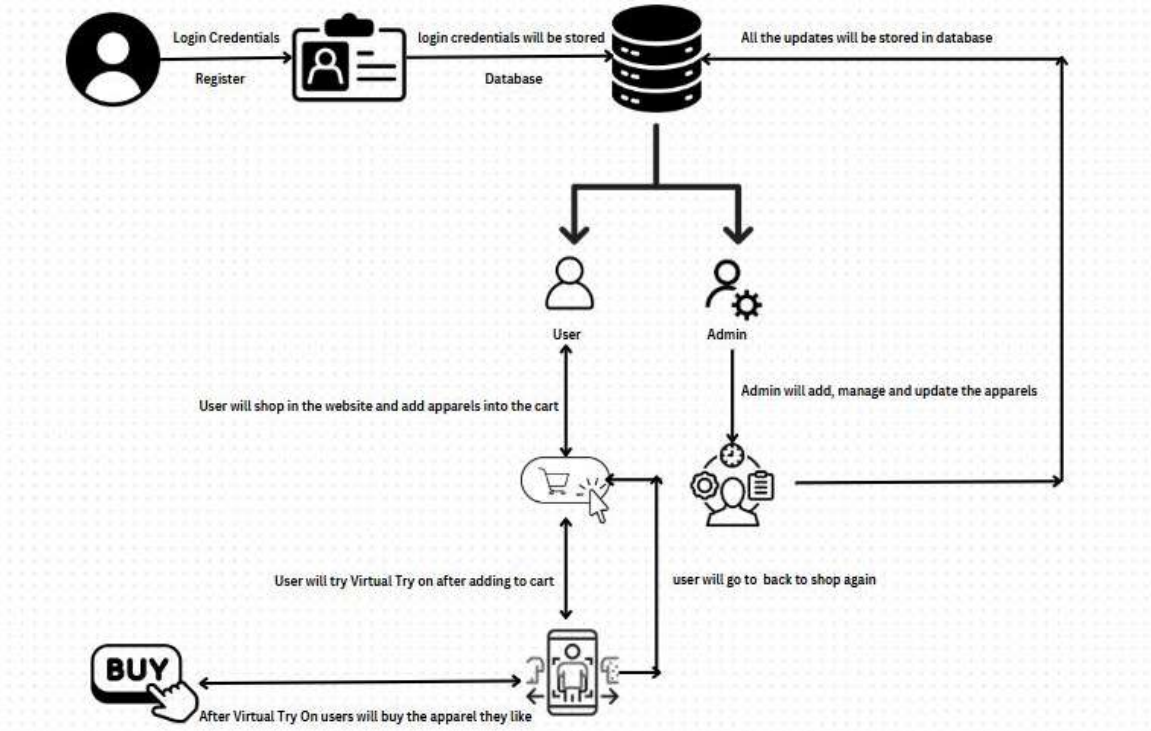
V. SYSTEM ARCHITECTURE



1. Admin Module

Purpose: Manages the product catalog for the virtual trial room.

Functionalities:

- Login: Secure access for admins.
- Add Product: Upload new clothes (category, name, cost, image).
- Update Product: Modify price or category.
- Delete Product: Remove outdated products.

2. User Module

Purpose: The user module allows a user to interact with the system for virtual trials and purchases.-

Functionalities:

- Register: The creation of an account for a personalized experience.
- Login: Restricted access to the trial and cart.
- Add to Cart: Select and review items.
- Try On with AR: A virtual trial for garments and accessories.

3. AR Module

Purpose: To overlay garments/accessories on live video feed.

Functionalities:

- Live Video: Capture live feed from a webcam or a camera.
- Detection of the Body and Face.
- Haar cascades for body detection.
- Dlib to detect facial landmarks.

4. Video Processing Module

Purpose: Detects and superimposes garment/accessory items on the video frames.

Functionalities:

- Video capture: Live feed captured via OpenCV

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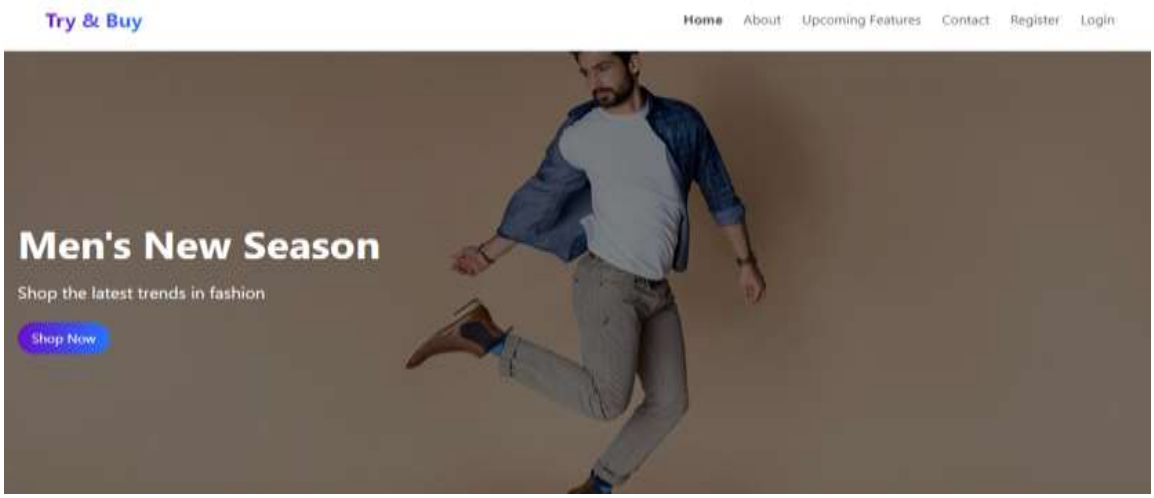
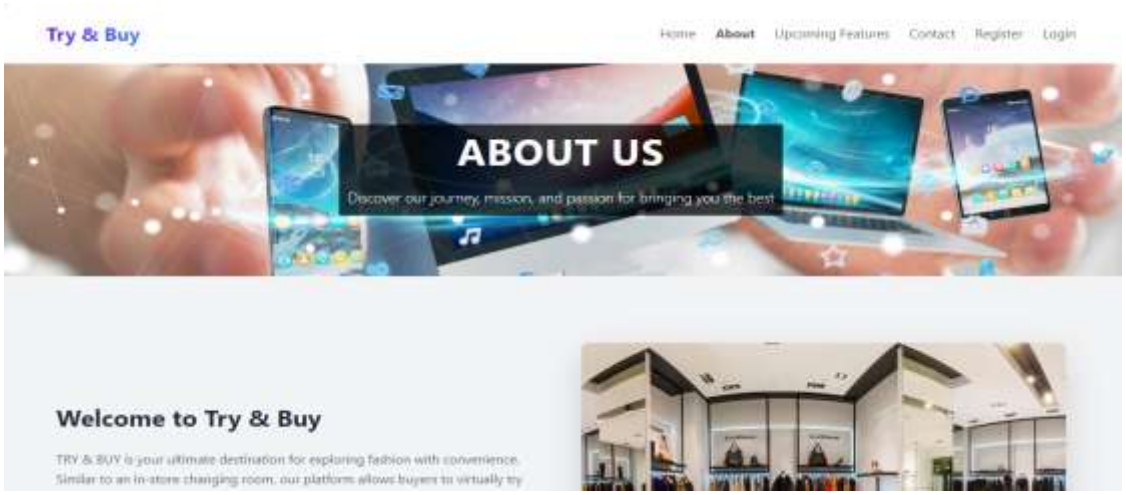
- Frame processing: Detection algorithms applied to video frames.
- Real-time rendering: Overlay updated on each new Superimposed frame.

VI. OUTPUT

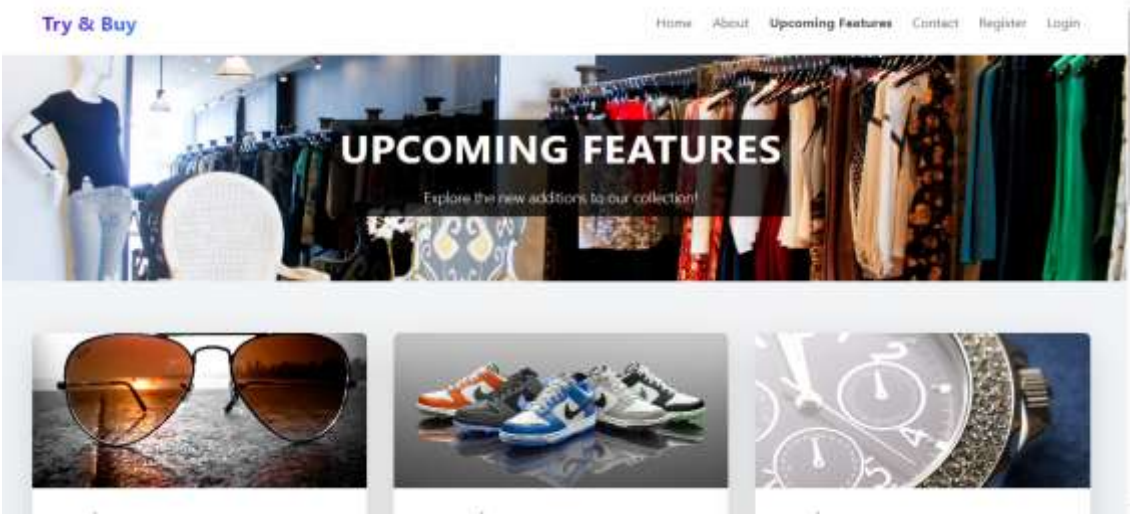
Home Page: This is the main page.



About Page: Here information about this project will be there.



Upcoming features page: In here information on upcoming features will be there.



Register page: Users will register with their credentials.

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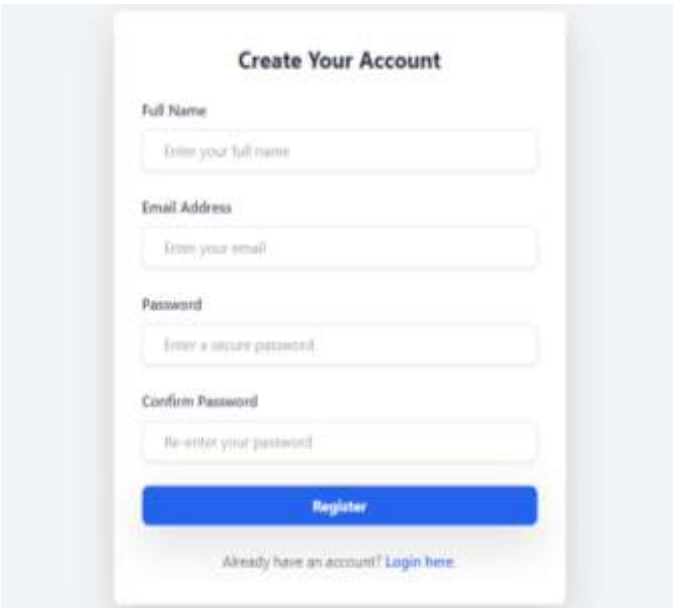
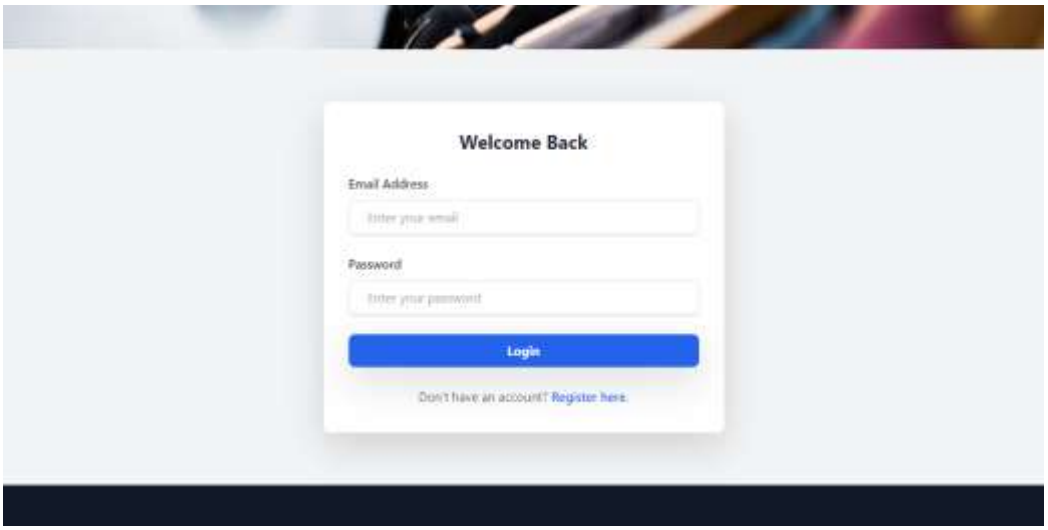
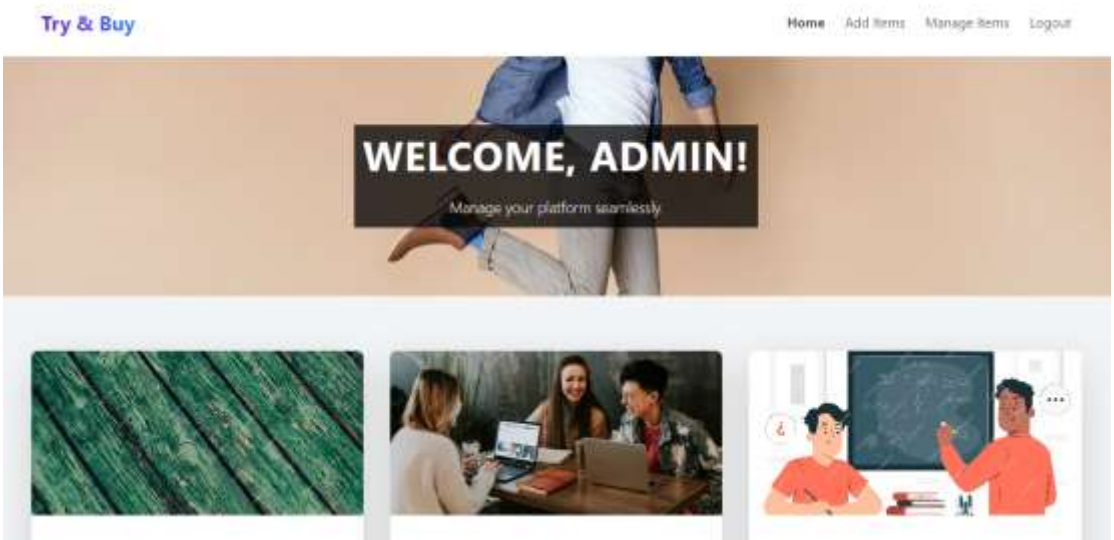


Login page: Users will log in here.



User home page: After Admin's successful login, this page will be displayed.



Add clothes page: The Admin can add clothes and clothes details.

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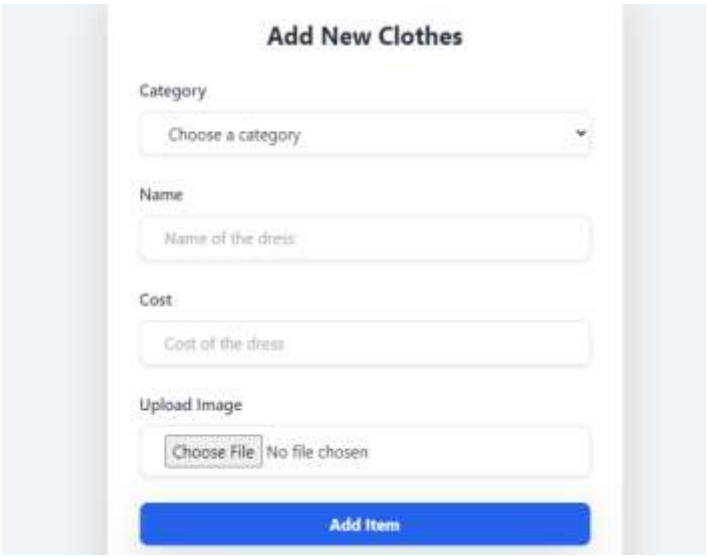
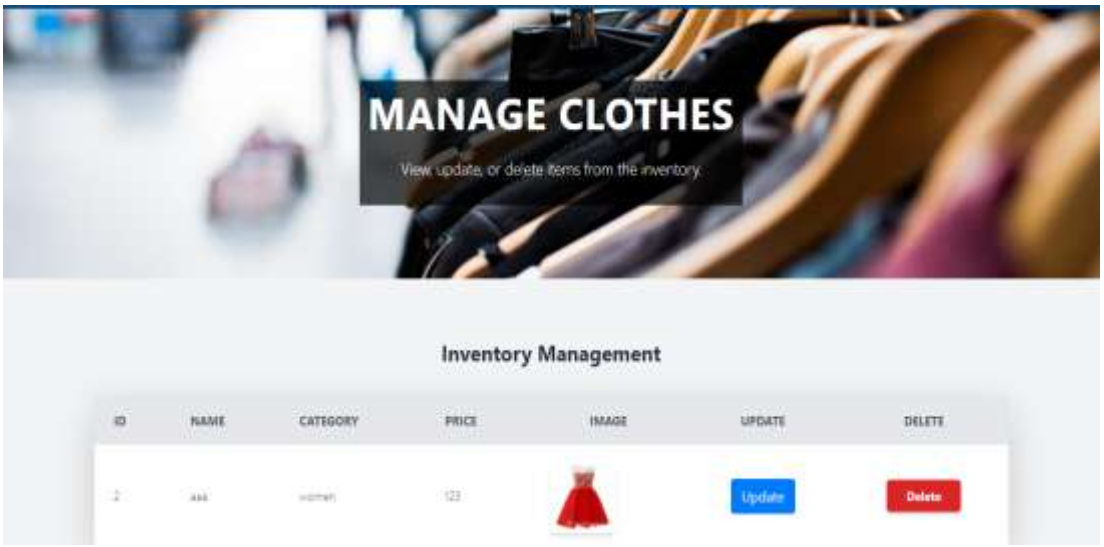
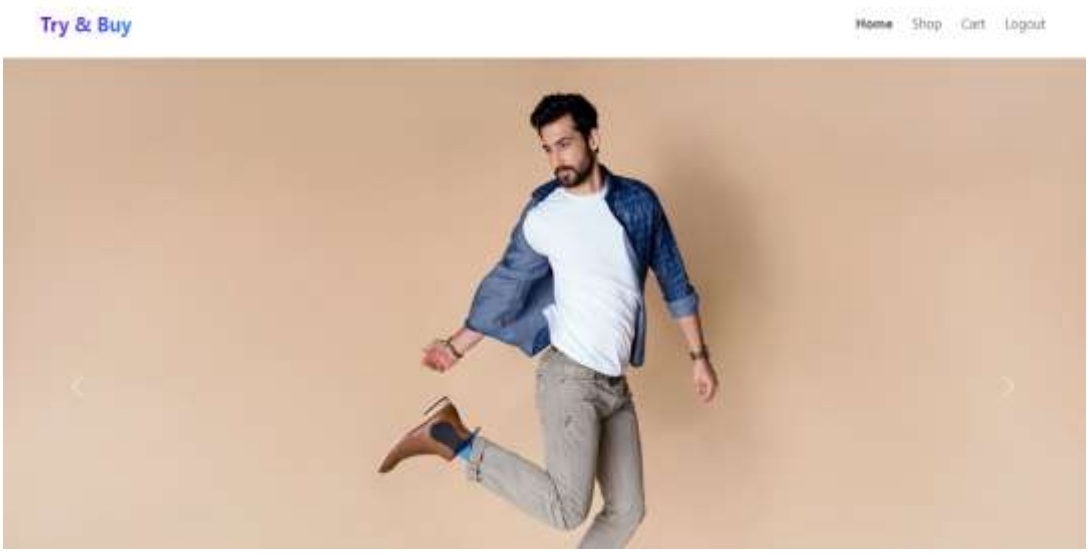


Manage clothes page: Admin can manage cloth details. They can update and delete.



User home page: After the user's successful login this page will be displayed.



Shop page: All clothes and their information will be there. Users can make it add to the cart.

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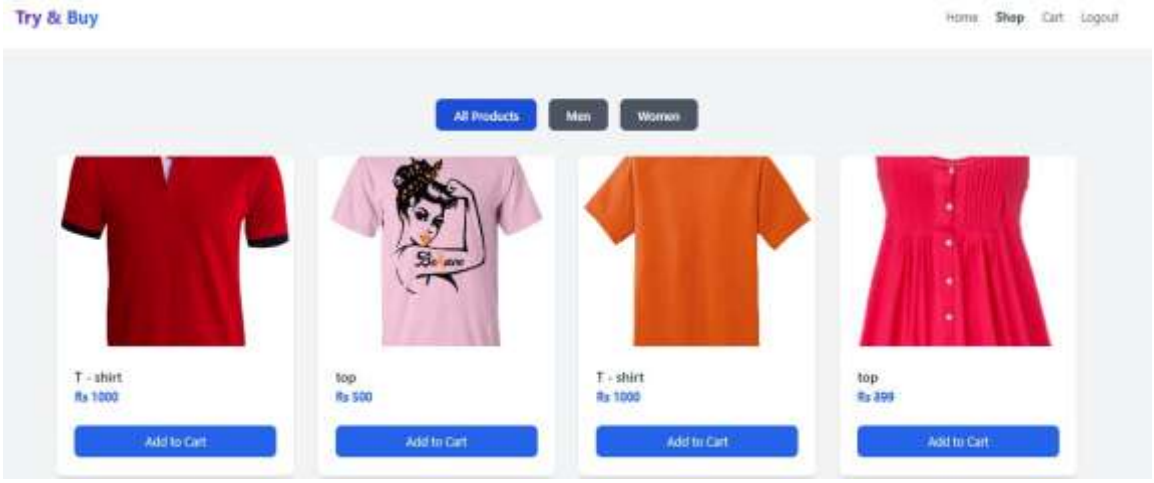
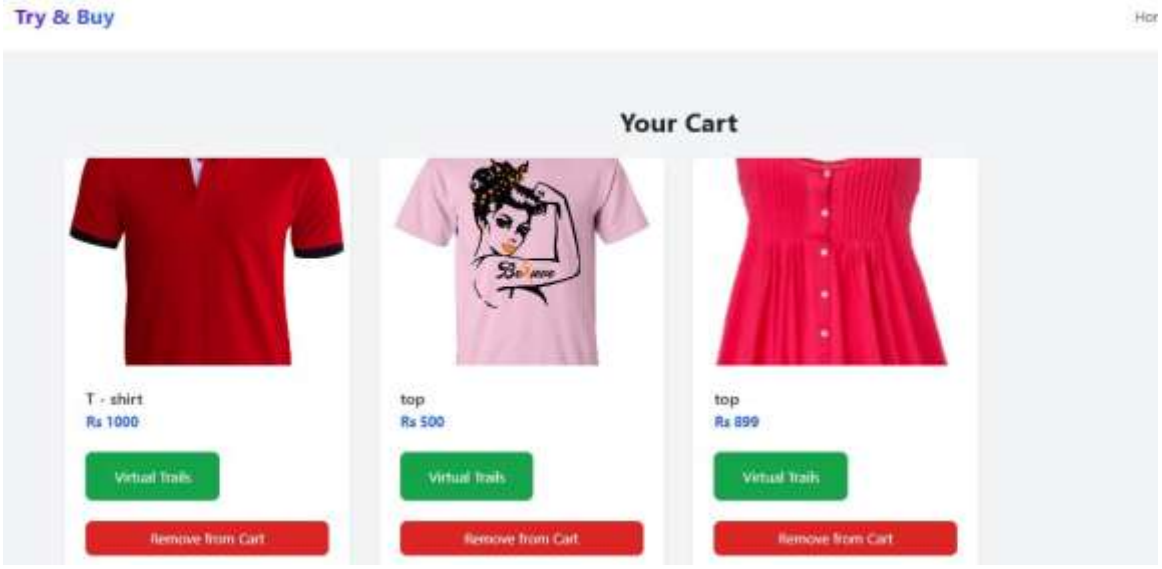
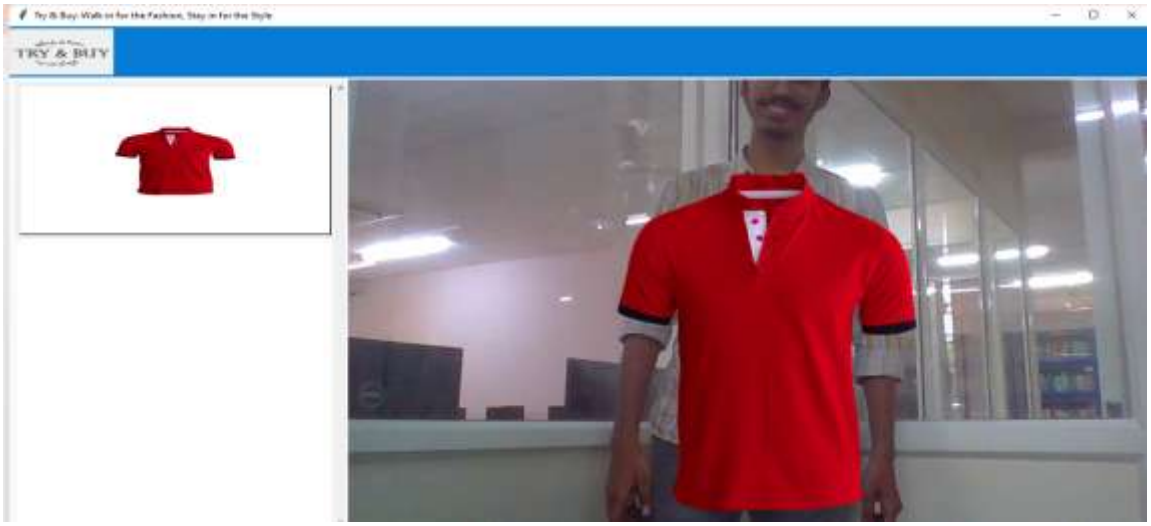


Cart page: Users Can view the clothes that are added and also he can also select clothes for the AI trial.



AI Trail room page: In here users can virtually trial on the cloth.



VII. CONCLUSION

The AI-powered Virtual Garment Trial Room project addresses the timely challenge of how to fit clothes and accessories on the customers in the e-commerce store before they make a purchase decision. The proposed system combines augmented reality with real-time body and face tracking to create an interactive shopping

experience without the use of expensive systems or complicated setups. The application of modern image processing techniques including body part recognition with Haar cascades and Dlib and garment image insertion using sprite overlay techniques is a novel approach that allows clothes to be put on the user's image. This modernizes the shopping experience by decreasing returns and increasing customer happiness. In addition, the system's elasticity supports posing a neural net for accurate pose estimation and texture refinement in the future. On a final note, this project combines computer vision, augmented reality, and machine learning to develop a cost-effective solution that makes both physical and online shopping effective – paving the way for the future of virtual shopping experience.

VIII. REFERENCES

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