

AI-Based Virtual Try-On System Using Computer Vision

¹Mr.Khan Ayimaan, ²Mr.Mohammed Arsalaan, ³Mr.Kubade Swayam, ⁴Mr.Mahimkar Sami,
⁵Ms.Nousheen Shaikh, ⁶Mr.Ali Karim Sayed

^{1,2,3,4}Student AIML, ⁵Lecture AIML, ⁶HOD AIML Anjuman-I-Islam's A.R.Kalsekar Polytechnic, New

Panvel

¹Kmr32246@gmail.com, ²arsalaanshaikh2007@gmail.com, ³skk48322@gmail.com,

⁴mahimkarsami@gmail.com, ⁵nousheen.shaikh@aiarkp.ac.in, ⁶alikarim.sayed@gmail.com

Project Guide: **Ms. Nousheen Shaikh**

Head of Department: **Prof Ali Karim Sayyed**

ABSTRACT:As we see today, people are getting more lazy and want to do everything while sitting on the couch. Nowadays, many buy groceries, cutlery, and more online. They even stop going to stores to buy clothes and choose to shop for clothes on the internet. But this causes some problems for the buyers. For example, when a person buys clothes in a store, they can see the cloth and try it on to check how it fits and looks. But when they buy online, they sometimes get clothes that do not look good on them or do not fit right. To fix this, we made a new kind of software that helps solve this problem. This software uses what is called Virtual Try-on. It allows the buyer to see how a piece of clothing will look on their body before they buy it. The software works with image processing and pose detection. We used Python, OpenCV, and Den-Pose (Pipeline) to build this project. The main goal of this project is to give better service to the customer..

KEYWORDS: Virtual Try-On, Computer Vision, Image Processing, Pose Detection, Artificial Intelligence

INTRODUCTION: These days, everyone is so busy that they often choose things that are easy or just act a little lazy in their everyday lives. Something big that's changed recently is how fast online shopping has gotten. It's become super easy to buy stuff now, people can just look, pick, and order

things right from their own homes. But even with how easy it is, online shopping still has its issues, particularly when you're trying to buy clothes.

It's really hard for people to buy clothes online

because they can't try them on first. In physical stores, you can actually try things on to see how they fit and look. But online, you just have to go by pictures and size charts. This often makes things confusing and frustrating, which leads to a lot of product returns. When these things come back, it's not just that customers don't have a great experience, but also businesses end up spending more money..

So, to fix this problem, they came up with something called Virtual Try-On. You can try on clothes on a digital picture with this tech, instead of putting them on for real. It takes an image, and using computer vision, it puts the clothes you picked right onto a picture of a person. That way, you can actually see what the outfit would really look like.

We're working on a project to create a system that can take a picture of someone, figure out what they look like, and then put clothes on them in the picture. Here, you can either put up your own picture or pick one we already have. After that, just choose the clothes you want to see on yourself. After that, the system makes a final picture that shows the user in the clothes they picked.

So, the main point of this project is to make online shopping better, so it's more engaging, quick, and easy to use. When you can see what clothes really

look like, it makes it easier for customers to pick the right things. This also means fewer items get returned, and people feel more sure about buying clothes online

LITERATURE REVIEW: The number of virtual try-on solutions available today exceeds all possible counts of existing options. " Most of them, though, have really valuable equipment or are built in a complicated way. The virtual systems fail to identify body movements and facial features which need to be tracked. The research method that we used in the past required thorough literature review studies and practical world investigation, but this method became too difficult for newcomers to use because it required excessive computer resources. Our system uses computer vision software to keep things simple for users of any age, effectively removing any complications. The basic image processing method would serve as the initial step for these systems. The system required users to select their desired clothing from an existing clothing catalog to see how it would appear on their individual image. The initial models lacked accuracy because they were unable to adapt to different body dimensions and clothing types. Virtual passing applications have been developed by researchers who used Python along with OpenCV programming tools to create functional systems.

PROBLEM STATEMENT: In recent years, online shopping has become an essential part of people's daily lives due to increasing work pressure and busy schedules. Many individuals prefer purchasing products online instead of visiting physical stores, as it saves time and effort. E-commerce platforms provide a wide range of clothing options, attractive offers, and home delivery services, making them highly convenient for users. However, despite these advantages, online clothing shopping still faces a major limitation that affects the overall user experience.

The primary problem in online clothing shopping is the inability of customers to try garments before making a purchase. In traditional retail stores, customers can physically try on different outfits in fitting rooms to check their size, fitting, comfort, and appearance. This direct interaction helps them make confident and accurate decisions. In contrast, online platforms only provide static images, descriptions, and size charts, which are often insufficient to determine how a particular garment will look on an individual.

Due to this limitation, customers frequently face issues such as incorrect fitting, unsuitable styles, or unexpected appearance of the clothing after delivery. This leads to dissatisfaction and increases the rate of product returns. High return rates not only affect customer trust but also create additional logistical and financial burdens for businesses. Therefore, there

is a strong need for an effective solution that can bridge the gap between physical and online shopping experiences.

To address this issue, a Virtual Try-On system is proposed, which allows users to preview how specific clothing items will appear on their body before purchasing them. The system uses computer vision and image processing techniques to digitally overlay garments onto a user's image. By uploading a photo and selecting desired clothing, users can generate a visual representation of themselves wearing the outfit.

Another challenge in existing systems is that many virtual try-on solutions require high computational resources and complex configurations, making them difficult for general users to operate. This project aims to overcome these limitations by developing a simple, efficient, and user-friendly system that can be used by individuals without technical expertise. The proposed solution focuses on improving usability while maintaining acceptable accuracy and performance.

Overall, the goal of this project is to enhance the online shopping experience by increasing reliability, reducing product returns, and helping users make better purchasing decisions through an interactive and realistic visualization system.

PROPOSED SYSTEM: The system provides users with a software tool which enables them to experience virtual clothing try-ons through an easy-to-use interactive system. Its purpose is to simplify online shopping by showing customers how various clothing items will appear when worn through its virtual try-on feature. The user of this system has two options for image input which include uploading an existing image or taking a photo through their device's camera. The system begins its processing after the user submits an image because it uses pose detection methods to identify the user's body stance and movement. This step helps the system understand the structure and orientation of the person in the image. The system uses body detection to transform the chosen clothing item into a fitting model which matches the user's physical proportions and body outline. The system verifies that the clothing matches the user through accurate fitting and realistic appearance assessment on their digital image. The system creates an output image which displays the user in their chosen outfit through virtual try-on technology. The preview provides users with a visual representation of how the clothing will appear when worn in actual situations. The system delivers a virtual try-on experience which achieves three essential goals through its user-friendly design and efficient operation and authentic virtual try-on technology. The system streamlines product selection for users while building their shopping confidence

and improving their entire online purchasing journey.

SYSTEM ARCHITECTURE: The architecture of the proposed AI-Based Virtual Try-On system follows a structured pipeline model that processes user input through multiple stages to generate a realistic output. The system consists of several layers including input layer, preprocessing layer, pose estimation layer, segmentation layer, and output generation layer. Initially, the user uploads an image along with the selected garment. The preprocessing layer prepares the images by resizing and converting them into suitable formats. The pose estimation layer detects key body landmarks such as shoulders and hips, which are used to determine garment alignment. The segmentation layer, powered by a U-Net model, generates a mask to identify the region where the garment should be applied. Finally, the blending layer combines the garment image with the user image to produce a realistic try-on output. This layered architecture ensures modularity, scalability, and efficient processing of the system.



ALGORITHMS USED: The proposed system utilizes a combination of computer vision and deep learning algorithms to achieve accurate virtual try-on results. The pose estimation algorithm is used to detect human body landmarks and calculate garment dimensions based on body structure. The U-Net segmentation algorithm is implemented to generate a

pixel-level mask that determines the region where the garment should be applied. Additionally, histogram matching is used to adjust color differences between the garment and the user image to improve realism. Finally, an image blending algorithm is applied to merge the garment with the user's image using pixel-wise operations. These algorithms work together to ensure proper alignment, realistic appearance, and smooth integration of the garment onto the user's body.

TOOL AND TECHNOLOGIES: In this project, several tools and technologies are used to build an effective Virtual Try-On system. The main programming language used is Python, as it is simple, flexible, and widely used for image processing and machine learning applications. For handling image-related tasks, the OpenCV library is used, which helps in processing images, resizing them, and performing various computer vision operations. To detect the user's body posture and key points, MediaPipe is used. It is a powerful framework that identifies body landmarks and helps the system understand the position and structure of the human body. This plays an important role in fitting the clothing correctly on the user's image. Additionally, a GUI-based software interface is developed to make the system user-friendly. It allows users to easily upload their images, select clothing items and view the final output without needing any technical knowledge. All these tools work together to detect body features accurately and generate a realistic virtual try-on result, making the system simple, efficient, and easy to use.

RESULT: The results of the proposed Virtual Try-On system show how the system successfully generates a virtual preview of clothing on a user's image.

Figure 1: Input Image of Person
First, the input image of the person is provided by the user. This image is used as the base for the virtual try-on process.



Figure 2: Garment Image

Next, the garment image is selected by the user. This represents the clothing item that will be tried on virtually.



Figure 3: Output Image

After processing both images, the system generates the final output image where the selected clothing is virtually fitted onto the user's body.

The results clearly show that the system is able to combine the person image and garment image effectively to produce a realistic preview. The output helps users understand how the outfit will look on them before making a purchase.

WORKING FLOW: The working flow of the proposed system follows a step-by-step process to generate the virtual try-on output. Initially, the user uploads a personal image along with a selected garment image. The system preprocesses both images to ensure compatibility. Next, pose estimation is performed to detect body landmarks and understand the orientation of the user. Based on these keypoints, the garment is resized and aligned accordingly. The processed images are then passed through a deep learning segmentation model to generate a mask. This mask is refined using smoothing techniques to improve visual quality. Finally, the garment is blended with the user's image to produce the final output. This systematic workflow ensures accuracy, efficiency, and a user-friendly experience.

ADVANTAGES: The Virtual Try-On system offers several advantages that significantly improve the overall online shopping experience. One of the main benefits of the system is its ease of use. The interface is designed in such a way that even users with minimal technical knowledge can easily interact with it. Users simply need to upload their image or select a predefined one and choose a clothing item, after which the system automatically generates the output.

This simplicity makes the system accessible to a wide range of users, including beginners.

Another important advantage of the system is time efficiency. In traditional shopping, customers often spend a considerable amount of time visiting multiple stores and trying different outfits. Even in online shopping, selecting the right product can be time-consuming due to uncertainty about fitting and appearance. The Virtual Try-On system allows users to quickly visualize how a garment will look on them within seconds. This reduces the need for repeated trials and helps users make faster purchasing decisions.

The system also plays a significant role in reducing product return rates. One of the major problems in online clothing shopping is that customers often receive items that do not meet their expectations in terms of fitting or style. By providing a visual preview before purchase, the system helps users choose clothes more accurately. This leads to fewer incorrect purchases and minimizes the need for returns, which benefits both customers and e-commerce businesses by saving time, effort, and cost.

Furthermore, the Virtual Try-On system enhances the overall user experience by making online shopping more interactive and engaging. Instead of relying only on static images, users can see a personalized preview of how the clothing will appear on their own body. This increases user confidence and satisfaction while shopping. Additionally, the system contributes to a more reliable and modern shopping environment by integrating advanced technologies such as computer vision and image processing. Overall, it provides a convenient, efficient, and user-friendly solution for improving digital shopping experiences.

LIMITATIONS: Despite its various advantages, the Virtual Try-On system has certain limitations that affect its overall performance and accuracy. One of the major limitations of the system is that the virtual fitting may not always be perfectly accurate. Since the system relies on image processing and computer vision techniques, it cannot completely replicate real-world fitting conditions. Factors such as fabric texture, stretchability, and actual body measurements are difficult to simulate digitally, which may result in slight differences between the virtual output and real-life appearance.

Another limitation of the system is its dependency on the quality of input images. For accurate results, the system requires clear, high-resolution images with proper lighting and minimal background noise. If the uploaded image is blurred, low in resolution, or contains complex backgrounds, the system may struggle to detect body features correctly. This can

lead to improper alignment of the clothing and reduce the overall quality of the final output.

The system may also face challenges when dealing with complex body poses or unusual angles. Pose detection algorithms work best when the user is standing in a normal, straight position. However, if the image includes tilted postures, overlapping body parts, or dynamic poses, the system may not accurately identify key body points. As a result, the virtual clothing may appear misaligned or unrealistic, affecting the user's experience.

Additionally, the system currently operates primarily on 2D images, which limits its ability to provide a fully realistic representation of clothing. It does not account for depth, body movement, or real-time interaction, which are important factors in real-world fitting. These limitations highlight the need for further improvements, such as the integration of advanced 3D modeling, real-time processing, and more robust algorithms to enhance the accuracy and realism of the Virtual Try-On system.

FUTURE SCOPE: The Virtual Try-On system has significant potential for future improvements and technological advancements. As the field of computer vision and artificial intelligence continues to grow, the system can be further enhanced to provide more accurate and realistic results. One of the major future developments includes transforming the system into a real-time virtual try-on solution. Instead of uploading static images, users will be able to use their device camera to see live previews of clothing on their body. This will make the experience more dynamic and closer to real-world fitting. Another important area of improvement is the development of a mobile application. Currently, the system may be limited to desktop-based usage, but converting it into a mobile app will increase its accessibility and usability. With the growing use of smartphones, a mobile-based Virtual Try-On system can reach a larger audience and provide users with the convenience of trying clothes anytime and anywhere. This will make online shopping even more efficient and user-friendly. In addition, advancements in artificial intelligence and machine learning can significantly improve the accuracy of the system. Future versions can use deep learning models to better understand body shapes, clothing textures, and fitting patterns. This will allow the system to generate more realistic outputs that closely match real-life appearances. Improved algorithms can also handle different body types, lighting conditions, and complex poses more effectively. Furthermore, the integration of Augmented Reality (AR) can take the system to the next level by creating an immersive and interactive shopping experience. With AR technology, users can virtually try on clothes in a 3D environment and view them from different angles in

real time. This will provide a more engaging experience and increase user confidence in their purchasing decisions. Overall, the future scope of the Virtual Try-On system is vast, with opportunities to evolve into a highly advanced, intelligent, and widely used solution in the e-commerce industry.

CONCLUSION: In conclusion, the Virtual Try-On system successfully addresses the major problem of not being able to try clothes while shopping online. The project demonstrates how computer vision and image processing techniques can be used to provide a virtual preview of clothing on a user's image. It achieves its goal of making online shopping easier, more reliable, and user-friendly. By helping users make better decisions and reducing product returns, the system has a positive impact on both customers and businesses. Overall, this project highlights the potential of technology in improving the online shopping experience.

BIBLIOGRAPHY: The development of the AI-Based Virtual Try-On system is supported by various learning resources, research materials, and technical documentation available across different platforms. These sources played a significant role in understanding the concepts of computer vision, deep learning, and image processing. Various online tutorials related to computer vision and image processing were referred to during the development of this project. These tutorials provided fundamental knowledge about image manipulation techniques such as resizing, filtering, color conversion, and masking using Python-based libraries. They helped in building a strong foundation for implementing the core functionalities of the system. YouTube tutorials also served as an important learning resource, especially for practical implementation. Several educational channels provided step-by-step guidance on using OpenCV and MediaPipe frameworks. These tutorials helped in understanding real-time pose detection, body landmark extraction, and image processing workflows in a simple and visual manner. In addition, multiple articles and blogs related to Virtual Try-On technology were studied to understand existing systems and their working methodologies. These resources provided insights into current industry trends, challenges, and advancements in AI-based fashion technology. They also helped in identifying research gaps and improving the overall design of the proposed system. Official documentation of Python libraries and frameworks such as TensorFlow, OpenCV, MediaPipe, and Streamlit was also extensively used. These documentations provided detailed information about functions, APIs, and implementation techniques. They were particularly useful in debugging, optimizing performance, and integrating different modules of the system effectively. Overall, these resources collectively contributed to the

successful development of the project by providing both theoretical knowledge and practical implementation guidance.

REFERENCES:

1. <https://ijsrem.com/download/smart-ai-assisted-spectacles-for-visually-impaired-individuals-real-time-object-detection-and-feedback-system>
2. <https://ijsrem.com/download/hand-gesture-control-gaming-and-mouse-navigation-system>
3. <https://ijsrem.com/download/auto-adjusting-rear-view-mirror-enhancing-safety-and-driving-experience>
4. <https://ijsrem.com/download/placement-prediction-system-using-machine-learning>
5. <https://ijsrem.com/download/monument-detection-using-yolo>
6. S. Thakur, P. Itankar, P. Gujar, A. K. Sayed, V. Pandey and S. Agrawal, "ER-ADENN: Design and Implementation of EEG-based Emotion Recognition using Adaptive Dropout Enabled Neural Network," 2025 3rd International Conference on Advancement in Computation & Computer Technologies (InCACCT), Gharuan, India, 2025, pp. 320-325, doi: 10.1109/InCACCT65424.2025.11011425.
keywords: {Training; Emotion recognition; Adaptation models; Adaptive systems; Accuracy; Sensitivity; Neural networks; Brain modeling; Classification algorithms; Optimization; Emotion recognition; SEED; DEAP; Adaptive dropout enabled network; climbing algorithm},

<https://ieeexplore.ieee.org/document/11011425>