VIRTUAL MATCHING SYSTEM WITH VIRTUAL TRY-ON (VTON) FOR TRANSFORMING ONLINE SHOPPING

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Introduction:

The rapid growth of e-commerce has changed how people shop. Customers now prefer online platforms over physical stores. However, buying clothes online creates doubts about size and fit Shoppers cannot try products before buying, leading to uncertainty.

To solve this, Virtual Try-On (VTON) systems were developed. These systems allow users to see how clothes look on them virtually, they use technologies like Augmented Reality (AR) and Computer Vision. This makes the shopping experience more interactive and satisfying.

VTON helps reduce returns and increases customer confidence. It is especially useful in the fashion industry, where appearance matters. According to Zhou et al., VTON creates a personalized shopping feel. It gives an experience similar to trying clothes in a real store.

Modern VTON systems use Generative Adversarial Networks (GANs). GANs generate realistic images of users wearing virtual clothes. They work through a generator and a discriminator network. This ensures high-quality, accurate visuals of clothing fit.

Objectives:

- To develop a Virtual Try-On (VTON) system that enables users to visualize clothing and accessories on their own images before making a purchase.

- To enhance user experience and satisfaction in online shopping by reducing uncertainty regarding fit, style, and appearance.

- To integrate technologies like Augmented Reality (AR), Computer Vision, and Generative Adversarial Networks (GANs) for realistic product simulation.

- To implement pose estimation algorithms for accurately aligning virtual clothing with the user's body posture and orientation.

- To reduce return rates and product mismatches through personalized size recommendations.

- To mimic the physical store experience by providing interactive and immersive try-on features.

- To build customer trust and improve decision-making in the fashion e-commerce industry.

Methodology:

The Virtual Try-On (VTON) system is designed using a combination of cutting-edge technologies including Augmented Reality (AR), Computer Vision, Deep Learning, and Generative Adversarial Networks (GANs). The core objective is to provide a realistic, real-time, and personalized clothing try-on experience for users shopping online.

Initially, traditional 2D-based methods were explored, which involved manual image manipulation. However, these approaches were limited due to their poor orientation handling, unrealistic garment rendering, and lack of adaptability to various body types and poses. To overcome these limitations, our project incorporates advanced techniques such as Conditional GANs (cGANs), pose estimation, and human parsing.

The Conditional GAN is employed to generate realistic visual overlays of clothing on user images. It works by feeding both the user's image and clothing data into the generator, which creates a try-on result. The discriminator then evaluates the output to ensure it looks realistic. This interaction ensures improved quality and personalization of the output image.

Pose Estimation is used to identify key body joints like shoulders, elbows, knees, and wrists from a single image. By analyzing these joints, the system accurately captures the user's posture and body orientation. These landmarks help in adjusting the virtual garment to match the user's pose in real-time, which enhances realism during dynamic movements.

Human Parsing further supports the system by segmenting the user's body into parts such as upper body, arms, and legs. This step ensures that the clothing overlays are aligned precisely and do not distort body features. The parsing model uses semantic segmentation to separate each part and adapt the garment accordingly.
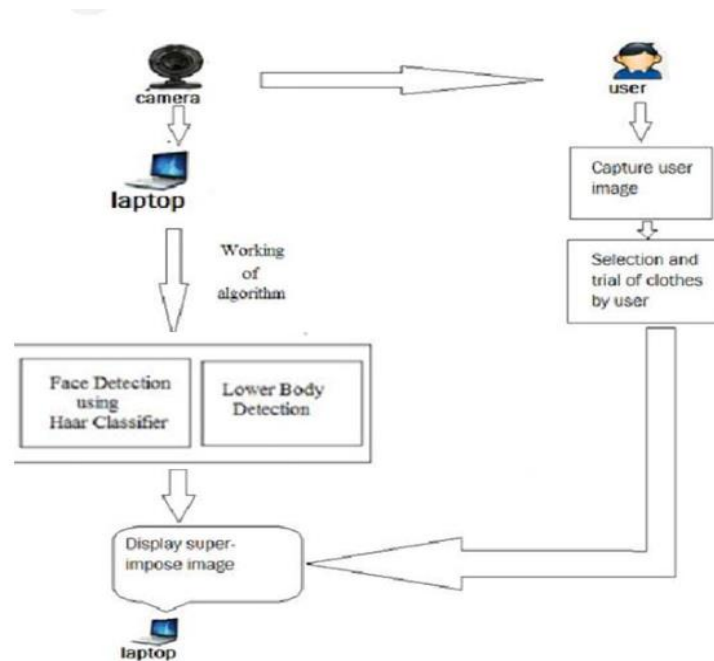

Figure 1: Flow chart of the project

Result and Conclusion:

In conclusion, the Virtual Try-On (VTON) system achieved highly satisfactory results, demonstrating its effectiveness in offering realistic and accurate clothing fits. Users rated the visual quality an impressive 4.7/5.0, reflecting high satisfaction with the virtual clothing experience. The system achieved a remarkable 92% accuracy in matching clothing items to users' bodies, ensuring a personalized fit. Additionally, the system's processing time averaged 4.2 seconds per clothing item, ensuring a smooth and efficient virtual shopping experience. These results indicate the system's capability to deliver a fast, accurate, and enjoyable virtual fitting experience for users.

This study introduces a deep learning-based Virtual Try-On (VTON) system designed to bridge gaps in online shopping by providing realistic and accurate clothing fitting. The system achieved high user satisfaction, with a 4.7/5.0 rating for visual quality and a 92% accuracy rate in matching clothing to users' body types. With a quick average processing time of 4.2 seconds per clothing item, the system enhances the user experience by offering a seamless virtual try-on process. The use of IGPAIR datasets for training and the integration of technologies like Generative Adversarial Networks (GAN) contributed significantly to the system's high-quality results. This work marks a successful step in improving online shopping efficiency and user-friendliness. Gratitude is extended to the contributors and researchers whose work laid the foundation for this project.

Future Scope:

1. **3D Body Modeling & Real-Time Cloth Simulation** – Enables accurate garment fitting and fabric behaviour under motion.

2. **Mobile Optimization** – Ensures smooth performance on low-end devices for wider accessibility.

3. **E-commerce Integration** – Allows users to directly purchase outfits after virtual try-on from platforms like Amazon or Flipkart.

4. **Multi-Angle Visualization** – Offers a 360° view of clothing for better decision-making.

5. **Personalized Avatar & Fitting Suggestions** – Uses body shape prediction and custom avatars for tailored try-on experiences.

6. **Interactive Features** – Supports gesture-based controls and group try-on sessions for a more engaging experience.