TRUSTFIT- VIRTUAL TRY-ON WITH AI-DRIVEN TECHNIQUES

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Keywords:

Virtual try-on, image-based fashion synthesis, pose estimation, human segmentation, cloth mask, cloth warping, convolutional neural networks (CNN), e-commerce visualization, AI-driven fitting, texture preservation.

Introduction:

Trust-Fit is a 2D virtual try-on system that enables users to visualize how garments appear on them realistically. The system integrates pose estimation, human segmentation, cloth masking, and agnostic image generation to align clothing items accurately with body posture. By separating the person's body from clothing and re-synthesizing the composite image, Trust-Fit achieves natural fitting and texture preservation. The proposed approach enhances the realism of online fashion visualization, reduces the need for physical trials, and improves user engagement in e-commerce environments through efficient and AI-driven virtual fitting techniques.

Trust-Fit is a two-dimensional virtual try-on framework that lets users preview how garments appear on their own bodies while preserving realistic fit and fabric detail. The system combines human pose estimation, semantic segmentation, cloth masking and geometric warping, followed by image synthesis that blends the warped cloth with the person image in a visually coherent manner.

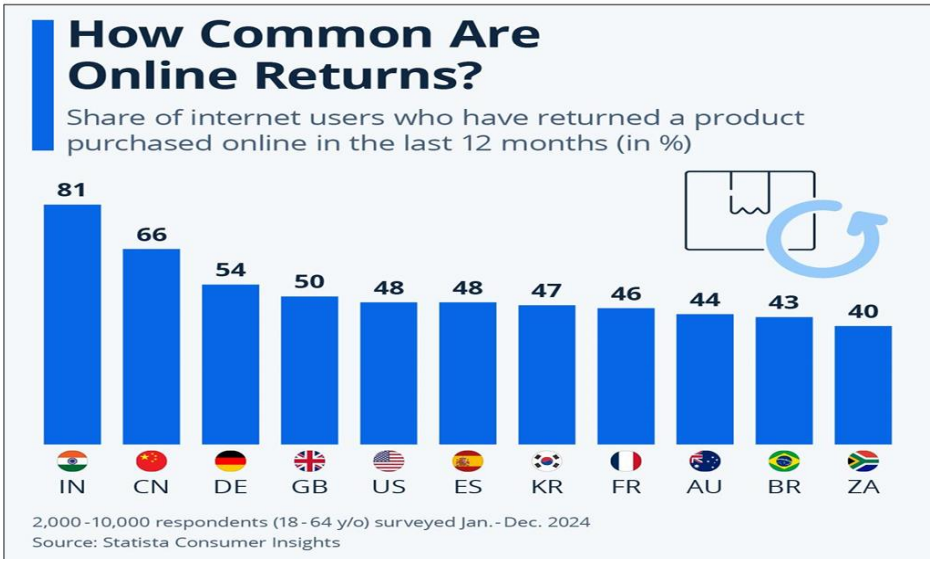

Figure 1: **Current Return Rates across Global**

Objectives:

1. To implement pose estimation and segmentation for extracting human body and clothing regions.
2. To generate an agnostic person representation for realistic clothing synthesis.
3. To perform cloth masking and overlay for seamless image blending.
4. To enhance realism and fitting accuracy using deep learning and image processing.

Methodology:

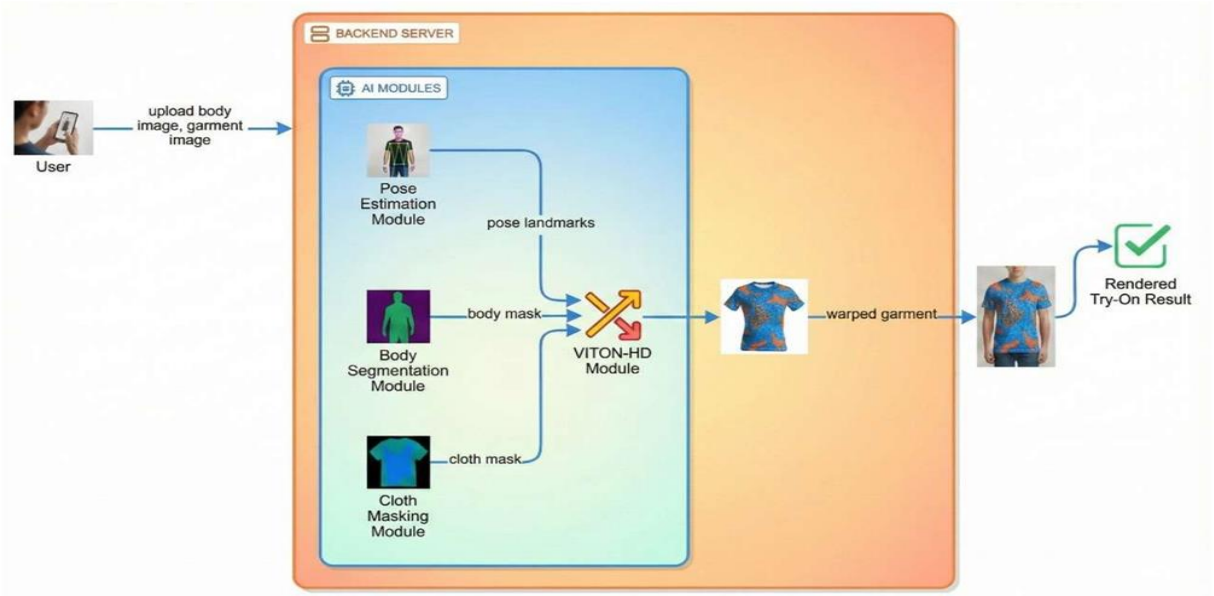

Figure 2: **System Architecture**

1. **Agnostic Person Image Generation:**
   Existing clothing in the input image can interfere with realistic overlay. Trust Fit generates an “agnostic” person image by removing current clothing and preserving only the user’s body shape, skin, and pose.
2. **Pose Estimation**:
   Accurate pose estimation is crucial for realistic garment alignment. Trust Fit utilizes Open pose to detect key human landmarks such as face, shoulders, elbows, fingers, hips. These landmarks provide a precise skeletal representation of the user, allowing the system to align the target garment correctly, even under dynamic or unconventional poses.
3. **Segmentation and Cloth Masking**:
   To overlay garments cleanly, the system performs precise person segmentation using U²-Net. This network separates the human body from the background and identifies regions corresponding to existing clothing. A cloth mask is generated from this segmentation, highlighting areas where new garments should be applied.
4. **Garment Warping and Overlay:**
   The final step involves aligning the target clothing image to the user’s pose using advanced warping techniques. Trust Fit employs thin-plate spline transformations or appearance flow methods to deform the garment appropriately, ensuring that it conforms to the user’s body contours and preserves natural folds and wrinkles.

Result and Conclusion:

1. The pose estimation process achieved an average detection accuracy of over 95% using the pre-trained Open Pose model.
2. Human segmentation achieved high consistency, effectively distinguishing person boundaries with minimal errors.
3. The garment warping process using Thin Plate Spline (TPS) transformation maintained natural alignment between body contours and garment shape.
4. Average processing time per image was approximately 2–3 seconds, depending on system hardware, which is acceptable for a real-time prototype setup.

Figure 3: **INPUT IMAGE AND GARMENT IMAGE**

Figure 3: **OUTPUT IMAGE**

In conclusion, TrustFit demonstrates that AI-driven 2D virtual try-on systems can significantly enhance online shopping experiences by enabling users to visualize garments before purchase. The system successfully combines computer vision, deep learning, and geometric transformation techniques to deliver a practical and user-friendly solution for virtual clothing trials.

References:

[1] S. Choi et al., "VITON-HD: High-Resolution Virtual Try-On via Misalignment-Aware Normalization," Proc. IEEE/CVF Conf. Comput. Vis. Pattern Recognit. (CVPR), 2021, pp. 1028–1037.
[2] Chang et al., "DP-VTON: Toward Detail-Preserving Image-Based Virtual Try On Network," IEEE Int. Conf. Acoust., Speech Signal Process. (ICASSP), 2021, pp. 1234 1238.
[3] Chen et al., "FashionMirror: Co-Attention Feature-Remapping Virtual Try-On with Sequential Template Poses," IEEE/CVF Int. Conf. Comput. Vis. (ICCV), 2021, pp. 1234 1243.
[4] T. Islam et al., "SVTON: Simplified Virtual Try-On," Brunel University, 2022, pp. 1 10.

Future Scope:

The future scope of this project includes:

1. Real-time 2D virtual try-on for static images and live webcam input.
2. Accurate pose estimation and landmark detection for proper garment alignment.
3. Effective segmentation and agnostic image generation for neutral body representation.
4. Preservation of texture, folds, and realistic garment overlays.
5. Modular system design enabling easy updates and scalability.