WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Virtual Try-On Based on Image and Video Using Deep Learning and Computer Vision

Ms. Sakshi Eknath Patil [1], Ms. Mariya Bano [2], Ms. Rutuja Naresh Dhamal [3]

Department of Information Technology VPKBIET Baramati
Savitribai Phule Pune University, Maharashtra, India
[1] sakshipatil2918@gmail.com, [2]mariyabano269@gmail.com, [3]rutujadhamal263@gmail.com
DOI : https://doi.org/10.55248/gengpi.5.1124.3227

ABSTRACT: -

This study explores deep learning techniques for virtual try-on technology, allowing consumers to visualize how garments fit without physical trials. We analyze methods using photos, varied poses, and videos, focusing on StyleGAN2-based approaches for generating life like virtual try-ons. By merging images of a person and a garment through pose-conditioned latent space interpolation, our method produces high-resolution, realistic simulations. Key challenges like dataset bias and preserving garment features are addressed, with an emphasis on improving customer satisfaction through accurate garment fit across body types.

KEYWORD: - Deep Learning, Computer Vision, Image based try-On, Video based Try-On, E-Commerce, 3D Clothing Simulation, Fashion AI, Dataset bias.

1 | INTRODUCTION: -

Online clothing buying has become a popular and normal activity for millions of individuals throughout the world, with the global fashion market exceeding $3 trillion. One significant advancement is the proliferation of virtual try-on systems, which allow shoppers to see how garments fit and look on them without having to put them on in person. This technology improves the online buying experience and has prompted fashion businesses to look at new ways to sell and improve the customer experience.

The application of artificial intelligence (AI) and deep learning (DL) in fashion has proved critical in making virtual try-ons more accurate and realistic. Traditional technologies like Photoshop fail to produce realistic results for garment photographs due to issues such as body positions and texturing. However, new deep learning models are useful.

Despite the significance of virtual try-ons, there are insufficient detailed assessments of how these technologies work and their impact on the fashion business. This study addresses that gap by examining the most recent deep learning-based virtual try-on models, discussing their benefits, limitations, and prospects for future advancements.

2 | LITERATURE SURVEY FOR VIRTUAL TRY-ON:

In 2022, Benjamin Fele, Ajda Lampe, Peter Peer, Vitomir Struc [24]. Examined the study of a Context-Driven Image-Based Virtual Try-On Network that enhances virtual try-on systems by resolving posture issues and garment occlusions. The technology consists of a two-stage pipeline: a Body-Part Geometric Matcher (BPGM) for matching apparel to body postures and a Context-Aware Generator (CAG) for creating high-quality try-on photos by including contextual data like body segmentation. Key findings indicate that C-VTON surpasses cutting-edge models in both quantitative measures (FID and LPIPS scores) and human perceptual evaluations, particularly in posture preservation and clothing realism.

In 2023, Tasin Islam,Alina Miron, xohui liu and Yongmin li [2]. This paper presents a brief overview of deep learning-based virtual try-on (VTO) technology, which improves online shopping by allowing customers to digitally try on clothes and see how they will fit and look on them. The poll focuses on three types of VTO models: image-based models, which add clothing to static photographs, multi-position models, which change both the user's stance and clothing, and video-based models, which make movies of individuals wearing different outfits. The research also tackles significant VTO difficulties, such as preserving garment details, retaining facial identification, and eliminating dataset biases. Furthermore, the review emphasizes VTO's favorable influence on increasing consumer happiness, decreasing return rates, and improving the performance of online shops.

In 2022, Ghodhbani et al [25]. Deep learning is used by virtual try-on systems to recognize and synthesize fashion. Even with these developments, issues like texture preservation, garment realism, and dataset constraints still exist. To improve accuracy and client satisfaction in the fashion sector,

better models and a wider range of datasets are required.The focus of this research was on pose transfer, synthesis, and fashion detection in image-based virtual try-on models. Important datasets, performance indicators, and the development of deep learning techniques in virtual try-on applications are all covered.Deep learning-powered virtual try-on technology makes it possible for clothes to fit customers realistically when they shop online. Managing a variety of body types, positions, and occlusions present challenges. The most recent models, such as ClothFlow, CP-VTON, and VITON, have sophisticated pose transfer and fashion synthesis. But there are also drawbacks, such as biased datasets and uneven texturing.

In 2023, Santosh Adhikari , Bishnu Bhusal , Prashant Ghimire and Anil Shrestha [1]. The VOGUE Virtual Try-On study describes a method for producing realistic garment try-on photographs using a StyleGAN2 algorithm. This approach enables a garment from one image to be seamlessly applied to another image of a person while retaining the individual's identity and body shape. By maximizing the blending of two images in the latent space, the approach effectively transfers garment characteristics like texture and shape while preserving the person's facial features and body proportions. VOGUE employs unpaired data, which means it does not require photographs of the same person wearing different clothing, making it more adaptive and scalable than earlier models. It also employs pose-conditioned StyleGAN2 to generate high-resolution pictures, considerably boosting the realism of the try-on results when compared to previous methods such as ADGAN and CP-VTON.

3| METHODOLOGIES: -

1.Face Detection:

Detects the user’s face from the image or video to isolate it and avoid overlaying garments on the face. Tools like OpenCV or Mediapipe can be used here.

2. 3D Reconstruction:

Converts the 2D input (user's image or video) into a 3D model, helping to place clothing items in a realistic manner. This could use techniques like Multi-view 3D reconstruction or Photogrammetry.

4.Body Size Estimation:

Estimates the user's body size and measurements using visual data. Machine learning models like Pose Estimation or Deep Learning can assist in detecting body landmarks and approximating body size.

5.Clothing Keypoints Detection:

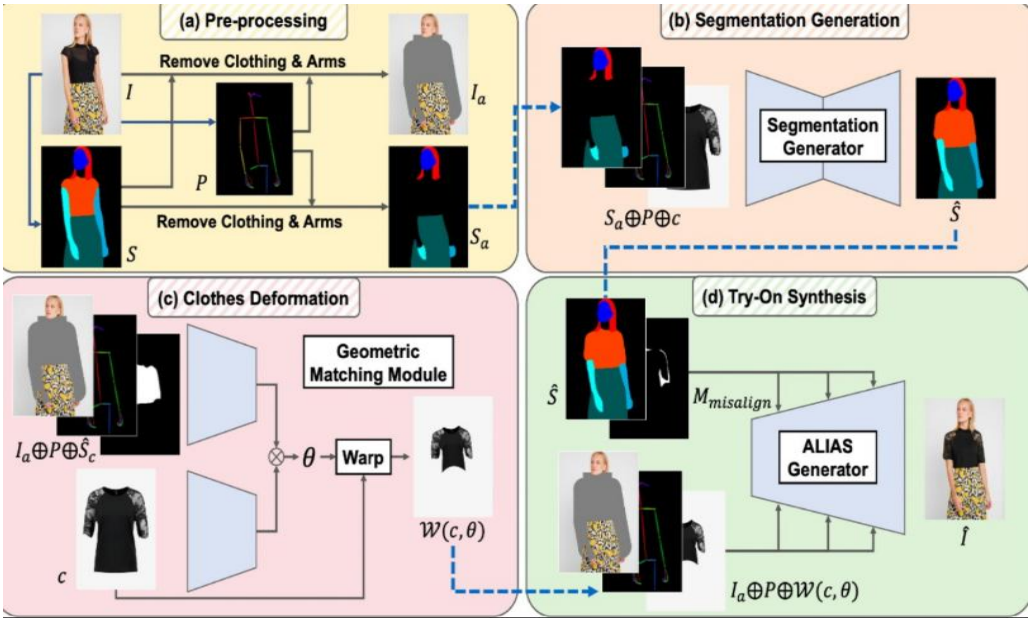
Detects important points on the clothing items (e.g., shoulders, waist) for proper alignment and fitting. Keypoint estimation techniques are used to detect landmarks on clothing similar to human pose estimation.

6.Fitting Parameters Estimation:

Once the keypoints are detected, fitting parameters like scaling, rotation, and positioning are calculated to match the clothing to the user's body using Affine Transformations.

7.Scene Mixing:

Combines all elements (clothing, 3D body, and face) into a single frame to present a seamless try-on experience. This can use image blending and overlay techniques.



4 | CONCLUSION: -

It highlights the significant advancements in image and video based virtual try-on technology, particularly through the integration of sophisticated deep learning methodologies that enhance user experiences

in online shopping. Key findings include the introduction of a two-stage pipeline that effectively resolves posture and garment occlusion issues, the categorization of Virtual Try-On models that address garment detail preservation and facial identification, and the demonstration of StyleGAN2's effectiveness in producing high-quality garment try-on images using unpaired data. Despite these advancements, challenges such as preserving fine garment details, addressing dataset biases, and ensuring robustness across diverse body types remain. Future research should focus on developing comprehensive datasets and refining algorithms for pose transfer and garment synthesis to fully realize the potential of Virtual try On systems in online retail.

5 | REFERENCES: -

[1] Kathleen M Lewis, Srivatsan Varadharajan, Ira Kemelmacher-Shlizerman, "*VOGUE:Try-On by StyleGAN Interpolation Optimization*" Google Research ,MIT CSAIL, University of Washington, 2023.

[2] Tasin Islam,Alina Miron, xohui liu and Yongmin li, "*Deep Learning for Virtual Try-On: A Comprehensive Survey"*, 2023.

[3] Jayawardana M.D.D.T., Herath R.A.D.C., Saajidh M.I.M., Perera H.D.A.P., "*Virtual Fitting Room and AI based Online Clothing Store*", International Journal of Computer Applications (0975 – 8887) Vol.184– No.38, December 2022.

[4] S. Adhikari, B. Bhusal, P. Ghimire, and A. Shrestha. Viton-it, "*Virtual try-on using image translation*", arXiv preprint arXiv:2310.04558, 2023.

[5] S. Choi, S. Park, M. Lee, and J. Choo, "*High-resolution virtual try-on via misalignment aware normalization*", In Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp.14131–14140, 2021.

[6] Tasin Islam, Alina Miron, xohui liu and Yongmin li. "*Deep Learning for Virtual Try-On: A Comprehensive Survey*", IEEE DOI :10.1109/ACCESS.2024.3368612., 2023.

[7] H. Yang, R. Zhang, X. Guo, W. Liu, W. Zuo, and P. Luo. *"Towards photo realistic virtual try-on by adaptively generating-preserving image content"*, In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 7850–7859, 2020.

[8] F. Zhao, Z. Xie, M. Kampffmeyer, H. Dong, S. Han, T. Zheng, T. Zhang, and X. Liang*. "M3d-vton: A monocular-to-3d virtual try-on network"*, In Proceedings of the IEEE/CVF International Conference on Computer Vision, pp. 13239–13249, 2021. 11.

[9] Tasin Islam, Alina Miron, Xiaohui Liu, Yongmin Li*. "StyleVTON: A multi-pose virtual try-on with identity and clothing detail preservation",* Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, UK,2024.

[10] W.J. Tsai and Y.-C. Tien. *"Attention-based video virtual try-on"*, In Proceedings of the 2023 ACM International Conference on Multimedia Retrieval, pp. 209–216, 2023.

[11] Z. L. Tan, J. Bai, S. M. Zhang, and F. W. Qin. *" Nl-vton: a non-local virtual try-on network with feature preserving of body and clothes"*, Scientific Reports, 11(1):19950, 2021.

[12] H. Yang, X. Yu, and Z. Liu. *"Full-range virtual try-on with recurrent tri-level transform",* In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 3460–3469, 2022.

[13] T. T. Tuan, M. R. Minar, H. Ahn, and J.Wainwright. *"Multiple pose virtual try-on based on 3d clothing reconstruction",* IEEE Access, 9:114367–114380, 2021.

[14] Z. Xie, Z. Huang, X. Dong, F. Zhao, H. Dong, X. Zhang, F. Zhu, and X. Liang. *"Gp-vton: Towards general purpose virtual try-on via collaborative local-flow global-parsing learning"*, In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 23550–23559, 2023.

[15] Z. Xie, Z. Huang, F. Zhao, H. Dong, M. Kampffmeyer, X. Dong, F. Zhu and X. Liang. *"Pasta-gan++: A versatile framework for high-resolution unpaired virtual try-on"*, arXiv preprint arXiv:2207.13475, 2022.

[16] J. M. Sohn, S. J. Lee, and D.-E. Kim. *"An exploratory study of fit and size issues with mass customized men's jackets using 3d body scan and virtual try-on technology",* Textile Research Journal, 2020.

[17] X. Zhong, Z. Wu, T. Tan, G. Lin, and Q. Wu. *"Mv-ton: Memory based video virtual try-on network"*, In Proceedings of the 29th ACM International Conference on Multimedia, pp. 908–916, 2021.

[18] L. Zhu, D. Yang, T. Zhu, F. Reda, W. Chan, C. Saharia, M. Norouzi, and Kemelmacher Shlizerman. *"Tryondiffusion: A tale of two unets"*, In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 4606–4615, 2023.

[19] R. SK, J. AB, V. SD, K. TS, and P. Agarwal. *"Detail-preserving video based virtual try-on (dpv-vton) ",* In Proceedings of the 2023 8th Inter national Conference on Multimedia and Image Processing, pp. 57–66, 2023.

[20] H.-W. Shen, T.-J. Liu, C.-M. Fan, and K.-H. Liu. *"Wbtp-vton: Whole body and texture preservation based virtual try-on network "*, In 2021 IEEE International Conference on Consumer Electronics-Taiwan (ICCE-TW), pp. 1–2. IEEE, 2021.

[21] B. Ren, H. Tang, F. Meng, R. Ding, P. H. Torr, and N.Sebe. *"Cloth inter active transformer for virtual try-on ",* ACM Transactions on Multimedia Computing, Communications and Applications, 2021.

[22] R. Rombach, A.Blattmann, D. Lorenz, P. Esser, and B. Ommer. *"High resolution image synthesis with latent diffusion models ",* In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 10684–10695, 2022.

[23] C. Ge, Y. Song, Y. Ge, H. Yang, W. Liu, and P. Luo, "*Disentangled cycle consistency for highly-realistic virtual try-on*", Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp.16928–16937, In 2021.

[24] Benjamin Fele, Ajda Lampe, Peter Peer, Vitomir Struc. ,"*C-VTON: Context-Driven Image-Based Virtual Try-On Network*", Proceedings of the IEEE/CVF Conference on Computer Vision ,January 2022.

[25] Ghodhbani et al., "*You Can Try Without Visiting: A Comprehensive Survey on Virtually Try-on Outfits*",Springer,August 2022.