Project Synopsis
on

Wardrobe Projection

Submitted as a part of course curriculum for

Bachelor of Technology
in
Computer Science

Submitted by
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DECLARATION

We hereby declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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CERTIFICATE

This is to certify that Project Report entitled "**Wardrobe Projection**" which is submitted by **Prachi Verma (2000290120109) and Pragati Tomar (2000290120110)** in partial fulfilment of the requirement for the award of degree B. Tech. in Department of Computer Science of Dr A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Date: 12-Nov-2022

Supervisor Signature

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ABSTRACT

Clothes are one of the top-selling products online, where demand for online shopping has skyrocketed in recent years. The issue with buying clothing online is that before making a purchase, customers cannot try the items on to see whether they are right for them.

As a result, buyers find that trying on garments electronically is incredibly convenient. There have been several studies done on virtual try-ons using images. But the majority of them concentrate on attire and people from the front.

They emphasize the person's and the clothing's front views. However, some approaches are available for different angles but we will work to increase the number of viewing angles for the attire and individuals.

In order to enable virtual try-on without restricting the view direction of people or the target clothing, we wish to design a system that leverages photographs in a better way.

It will allow users to create a clearer photo of themselves wearing the intended clothing by uploading both their personal photo and the intended clothing shot.

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INTRODUCTION

One of the most popular items sold online, where online shopping has been increasingly popular in recent years, is clothing. However, one drawback of internet buying is that buyers cannot try on clothing to see if it fits them before making a purchase.

Also, some people feel uneasy putting on apparel in changing rooms after the COVID-19 outbreak. Even when things return to normal, customers may still want completely redesigned experiences, since once modified, behaviors will not be the same as before.
As a result, consumers find that virtually trying on clothing is convenient.

Wardrobe projection refers to trying on digitally created garments or accessories in a virtual environment. That means you can see how those items look on you, allowing you to know if something is a good fit without physically trying it on. Hence, this technology could let you try on clothing without having it shipped or even leaving your house.

Our project aims to make it possible for users to virtually try on clothing. When users upload both their own and the clothes' photograph, we will be able to create a shot of the subject wearing the clothing. Other virtual try-on techniques emphasize the person's and the clothing's front views. Our approach, however, will be capable of handling front and slightly turned-view orientations, which means it can also project different angled-clothes on different angled-human image.

This makes it easier for customers to try on clothing, which encourages buying interest and keeps costs down for clothing retailers.

Additionally, users may have the option of camera when he/she wants to try on a cloth so that the uploading time of photo is saved. .

Apart from all this, we may add some recommendation system of clothes for the user.

PROBLEM STATEMENT

Problem statement is that majority of the currently available methods employed in 2D virtual try-on networks tend to blur the details on clothing or interface area.
For instance, using CAGAN model (one of the machine learning algorithms) alone introduces the blurriness in the output image of the user with the intended clothing.
Moreover, it has been observed by us that most of the approaches used till date for the digital try-on only focus on the users front view.

OBJECTIVE

- **To allow user trying on clothes virtually**

We will create a clearer photo of user wearing the intended clothing by uploading both their personal photo and the intended clothing shot.

- **To increase the number of angles in which the user can upload their photograph**.

For instance, users can provide their images even with the side angles besides the front views.

- **To implement real time image capturing of the users.**

SCOPE

- No-contact try on
  It's expected that some people feel uneasy putting on apparel in changing rooms after the COVID-19 outbreak. Even when things return to normal, customers may still want completely redesigned experiences, since once modified, behaviors will not be the same as before.
- Virtual Cloth Try-On Using Augmented Reality
- Virtual Try on Network for Clothing Business Industry
- Future of E-commerce

LITERATURE REVIEW

Learning-Based Animation of Clothing for Virtual Try-On.
Igor Santesteban. Miguel A. Otaduy Dan Casas.
(2019)

Virtual try-on uses a computer programme to model the mechanics of clothing in touch with the body while simulating a variety of body forms and movements. The creases that come from the existing data-driven technologies deform in a way that appears linear because they largely rely on linear methodologies. The needs of virtual try-on are met by garment animation, which simulates the deformation of a specific garment in relation to body shape and movements. Other techniques do not realistically distort the garment to accommodate for variations in body shape. We are able to separate the many causes of cloth deformation with the help of our two-level approach. Using nonlinear regression models, we calculate the garment fit as well as the creases in the garment.[1]

VTNFP: An Image-based Virtual Try-on Network with Body and Clothing Feature Preservation
Ruiyun Yu1. Xiaoqi Wang1. Xiaohui Xie2
(2019)

The new virtual try-on network generates photo-realistic images given the images of a person and a target clothing item. A key innovation of VTNFP is the body segmentation map prediction module, which provides critical information to guide image synthesis in regions where body parts and clothing intersect. Experiments with a fashion dataset demonstrate that it generates better results than state-of-the-art methods. Virtual try-on images are increasingly popular in online ecommerce and real-time AR applications, but they require additional information to build 3D models. For a synthetic image to be realistic and effective, it.has to meet the following criteria:

1) the posture and body shape of the person should be preserved, and body parts. 2) Clothing items not intended to be replaced, such as trousers, should well fit to the intended body part.of the person. 3) The texture and embroidery details of the target clothing should be retained as much as possible.[2]

Image Based Virtual Try-on Network from Unpaired Data
Assaf Neuberger. Eran Borenstein. Bar Hilleli. Eduard Oks. Sharon Alpert
(2020)

Outfit-VITON helps visualize how a composition of clothing items selected from various reference images form a cohesive outfit on a person. The training phase requires only single images, eliminating the need for manually creating image pairs. An online optimization step takes care of intricate details such as intricate textures and logos.[3]

CP-VTON+: Clothing Shape and Texture Preserving Image-Based Virtual Try-On
Matiur Rahman Minar1 , Thai Thanh Tuan1 , Heejune Ahn1 , Paul L. Rosin2 , and Yu-Kun Lai2

(2019)
Regarding various human positions and clothing styles, recently proposed Image-based virtual try-on (VTON) techniques face a number of difficulties. First, incorrect clothing-agnostic human representations, mismatched input images for clothing-human matching, and incorrect regularization transform settings all contribute to the fact that clothing warping networks frequently produce extremely deformed and misaligned warped clothing. Second, blending networks may not successfully maintain the leftover clothing if the incorrect

depiction of people and poor composition-mask generation training. To solve these problems, we suggest CP-VTON+ (Clothing shape and texture Preserving VTON), which greatly surpasses the most recent techniques both statistically and qualitatively.[4]

The role of virtual try-on technology in online purchase decision from consumers' aspect (2019)
The popularity of online shopping has increased, and customers' experiences have been improved by the development of internet technology. Virtual try-on is a tool that internet merchants have been utilising to boost sales (VTO). This paper's goal is to examine the effects of such technology on internet consumers'

Utilizing advanced partial least square (PLS) techniques, the purchase decision process towards buy intention, particularly from an integration of utilitarian, hedonic, and risk viewpoints.
Design, technique, and strategy — This study used a web-based survey approach to gather information from online retailers of clothing. In order to create the survey instrument, previously verified measurement items were modified. PLS with multi-group analysis were used to analyse the valid data that had been collected. PLS with multi-group analysis were used to analyse the data that were collected. Advanced PLS approaches were used, including assessments of out-of-sample prediction performance, measurement invariance of composite models, and examination of discriminant validity using the heterotrait-monotrait ratio.
Findings - The analysis of the suggested model's results shows that customers' perceptions of the utility, enjoyment, and privacy risk of VTO technology can influence their desire to make an online clothing buy. It has been discovered that perceived usability has an impact on perceived utility and helpfulness. Regarding the contribution of VTO technology to the entire decision-making process for intention to make an online purchase, the results similarly demonstrate no statistically significant variations between age groups and genders.
Originality/value - This research advances knowledge of the functions that VTO technology serves.[5]

The Role of Virtual Try-On and Physical Appearance in Apparel M-retailing.
Daria Plotkina1, Hélène Saurel2
(2019)

A typical m-commerce interface that displayed models with physical characteristics that weren't, only somewhat, or entirely identical to those of the customers was contrasted with augmented reality. To explain the influence of the application and the mediating role of perceived hedonic value (enjoyment) and utilitarian value (convenience, ease of use, and usefulness) on attitude toward the shopping technology and purchase intention, a theoretical framework based on the Technology Acceptance Model was adopted.
The VTO tool was found to be less pleasurable than conventional m-commerce interfaces as well as less convenient and useful than images of models with physical traits similar to those of customers in an online experiment (415 respondents) and qualitative research (49 respondents). There is discussion on the implications for managers and scholars.

The Internet has made it possible to purchase and use a wide range of products and services online instead of offline. 3D virtual try-on may replace physical fitting rooms as an effective tool to boost sales and decrease customer's return rates. The average sales per customer increased by 14,000 won (13USD) and the return rate decreased by 27% by filtering out incorrect sizes and fits. The author describes how Kolon FnC has developed a 3D virtual 'try-on' service to help customers shop for clothes online, and hopes that it will help boost online sales. Virtual try-on can help customers filter out incorrect sizes and fits to solve the thorny problem of.
consumers' inability to wear a garment online. This work is licensed under a Creative Commons attribution license.[6]

Effects of 3D Virtual ‘‘Try-On’’ on Online Sales and Customers’ Purchasing Experiences
HYUNWOO HWANGBO 1 , EUN HIE KIM2 , SO-HYUN LEE3, AND YOUNG JAE JANG 4
(2020)

The global clothing industry is expected to reach roughly USD 2 trillion by 2026. Virtual try-on technology allows a customer to visualize how a product would look on them before actually purchasing it. It saves time for users lost while donning different apparels and also helps curb the hesitation faced while shopping. Anthropometric data of the person can help the virtual-try on technology in telling how the apparel will actually look on the person i.e. if the apparel fits the person or not. This paper aims to perform a thorough literature review of both the areas of Virtual Try-on and Human Body Dimension Estimation.
Human Body Dimension Estimation Designers, architects, engineers, and others who create goods or processes have become increasingly aware of the need for anthropometric data on the people who use their products over time.
The bathrobe's fit can be approximate and yet serve its function, while the respirator mask must match closely to the geometry of the face to ensure proper contact and avoid leakage.
In the case of the bathrobe, information on height and a few body girth measurements for the target user group may be all that is required to give adequate body coverage for a satisfying interface.
For the respirator mask, however, complete three dimensional measurements of individual facial geometry may be necessary to obtain a correct fit.
Most measurements collected on the participants are done in posture of standing.[7]

Anthropometrical Virtual Try-on: A Survey on Virtual Try-ons and Human Body Dimension Estimation Rishabh Jain1 , Abhishek2 , Param Chauhan3 , Apoorvi Sood4 (2022)

The Augmented Reality Fashion Display aims to streamline the shopping process by removing all the troubles of trying on multiple clothes at a small trail room. The product is capable of identifying a person, displaying clothes and accessories like watches on them in real time. This technology can expand well beyond the scope of fashion stores and into the realm of fashion design itself enabling fashion designers to test their designs virtually before physically manifest them. The Smart Mirror allows users to try on a new attire in an augmented reality environment created using an Augmented Reality Technology. This product helps users to see how the apparels look in real-time without having to try them on manually. Many shopping stores and malls are using this mirror as an interactive display in trial rooms.

With the Virtual Fashion Mirror, retailers will shortly have a powerful new artillery in the battle to transform and renovate the in-store experience. In order to attract customers to use the Virtual Mirror, executives should place the mirrors at the center of the shop. Retailers must ensure their technology infrastructures are up to mark so as to fulfil interactive and rich-media experiences.[8]

Virtual Fashion Mirror
Jay Vishaal J Com. Deepthi Prakash. Sourav Ghosh. Stephen Niranjan B. (2020)

This paper presents a learning-based clothing animation method for highly efficient virtual try-on simulation. We use a recurrent neural network to regress garment wrinkles, and we achieve highly plausible nonlinear effects. At runtime, dynamic virtual try-on animations are produced in just a few milliseconds for garments with thousands of triangles. Cloth animation has become increasingly important in the field of computer graphics, as it allows us to produce believable folds and wrinkles when there is a strong correlation between body pose and cloth deformation. Data-driven methods rely on linear techniques, hence the resulting wrinkles deform in a seemingly linear manner (e.g., with blending artifacts) and therefore lack realism.

We have presented a novel data-driven method for animation of clothing that enables efficient virtual try-on applications at over 250 fps. Our two-level regression scheme independently models two distinct sources of deformation: garment fit, due to body shape, and garment wiriness. We believe our approach makes an important step towards bridging the gap between the accuracy and flexibility of physics-based simulation methods and the computational efficiency of data- driven methods.

[9]

From 2D Photos of Yourself to Virtual Try-On Dress on the Web (2021)

The rapid progress of computer vision, machine learning, and artificial intelligence combined with the growing urge for online shopping systems opened an excellent opportunity for the fashion industry. Many studies worldwide are dedicated to modern fashion-related applications such as virtual try-on and fashion synthesis. This paper presents an overview of the matter, categorizing 110 relevant articles into multiple sub-categories and varieties of these tasks. Fashion try-on and synthesis are two of the most under-studied areas of artificial intelligence (AI) in the field of fashion design. Each article is assigned to a category only if it explicitly reports relevant results for that application. Figure 1 shows how articles were processed in this research.

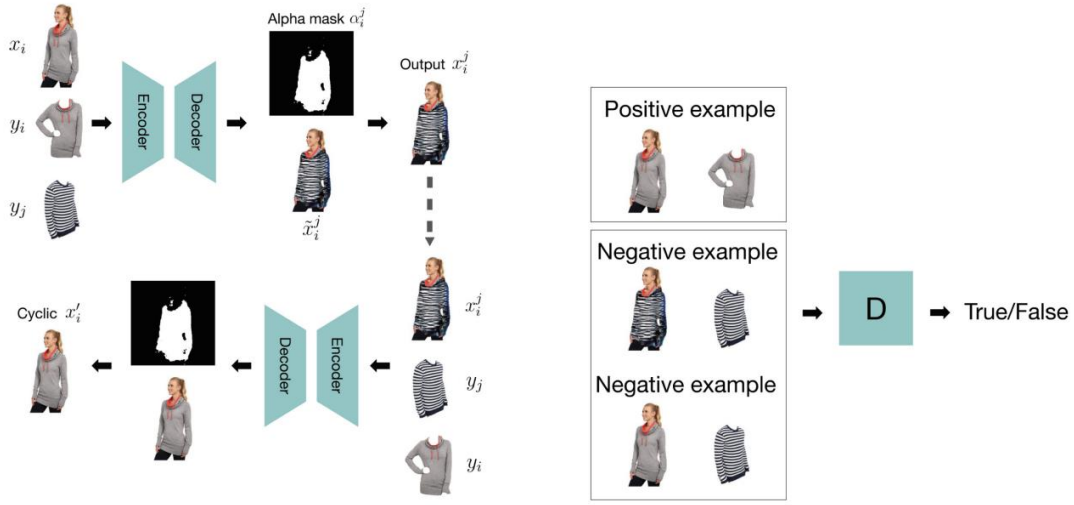
Machine learning and artificial intelligence are helping ease the transition from traditional stores to online shops with high-tech features such as virtual try-on and fashion synthesis systems. This article sheds some light on different applications related to these systems, tracked the research progress through the years, and illustrated the field's rapid growth.[10]

METHODOLOGY

By using VITON and CAGAN

VITON- VITON is divided into two stages. The network produces a rough result at the encoder-decoder generator step. Target clothing is warped with the mask during the refinement stage by estimating a thin plate spline (TPS) transformation with shape context matching. A network then blends the coarse image with the warped clothing to create the final output after the warping.

CAGAN -Based on Conditional GAN (CGAN), Conditional Analogy Generative Adversarial Network (CAGAN) was developed. When given an image of a person and an image of target clothing, CAGAN can produce an image in which the subject is wearing the target clothing. Furthermore, without labelling any data, CAGAN may also learn a segmentation mask representing the differences between the input and output human images.



(a) Generator of CAGAN (b) Discriminator of CAGAN

Fig1. Network of CAGAN

- First, CAGAN is used to produce a preliminary result and a binary mask of where to modify from a human image and a target clothing image.
- Second, simply the clothing is extracted using a transform network.
- In the meantime, the segmentation stage uses the mask and output from the previous step to create a better mask that indicates where the garments should be altered.
- The target's clothing is then changed using the mask.
- Our ultimate product is created by combining the changed clothing with the CAGAN result.

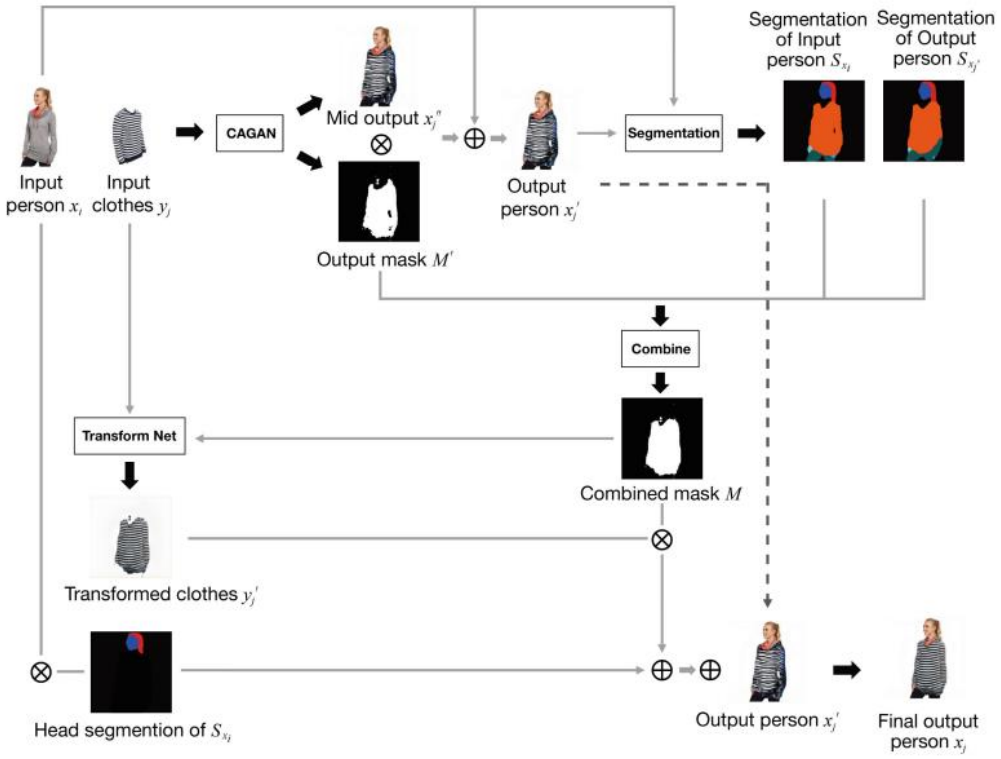


Fig2.Architecture Of Module

TECHNOLOGY USED

Machine Learning

Machine Learning, as the name says, is all about machines learning automatically without being explicitly programmed or learning without any direct human intervention. This machine learning process starts with feeding them good quality data and then training the machines by building various machine learning models using the data and different algorithms. The choice of algorithms depends on what type of data we have and what kind of task we are trying to automate.

As for the formal definition of Machine Learning, we can say that a Machine Learning algorithm learns from experience E with respect to some type of task T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E.

Deep Learning

Deep learning (also known as deep structured learning) is part of a broader family of machine learning methods based on artificial neural networks with representation learning. Learning can be supervised, semi-supervised or unsupervised.

Deep-learning architectures such as deep neural networks, deep belief networks, deep reinforcement learning, recurrent neural networks, convolutional neural networks and Transformers have been applied to fields including computer vision, speech recognition, natural language processing, machine translation, bioinformatics, drug design, medical image analysis, climate science, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance.

Convolutional Neural Network (CNN)

A convolutional neural network, or CNN, is a deep learning neural network sketched for processing structured arrays of data such as portrayals.
CNN are very satisfactory at picking up on design in the input image, such as lines, gradients, circles, or even eyes and faces.
This characteristic that makes convolutional neural network so robust for computer vision.
CNN can run directly on a underdone image and do not need any preprocessing.
A convolutional neural network is a feed forward neural network, seldom with up to 20.

GAN

Generative adversarial networks (GANs) are an exciting recent innovation in machine learning. GANs are generative models: they create new data instances that resemble your training data. For example, GANs can create images that look like photographs of human faces, even though the faces don't belong to any real person.

CONCLUSION

The fashion industry is experiencing a drastic change due to digital wardrobe projections, which is good for both buyers and sellers.
And we are working on making that better using Machine learning algorithms not only the front-view but also side views.
The users will also have the opportunity to explore choices, make adjustments, and try on a broader selection of items in less time, resulting in better conversion and spending.

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