Virtual Try-On: Project Milestone Report

Francesco Martucci, Felicia Puzone, Francesco Sala
{*243215, 312722, 253589*} @studenti.unimore.it

Abstract
Our project will be focusing on designing a 2D image-based virtual try on system. Virtual try on consists in generating an image of a reference person wearing a given try-on garment. This kind of problem has been widely investigated due to its relevance in the fashion market. VTON is also interesting as it is a challenging problem requiring a multi-layered approach incorporating at least both a geometric transformation module to warp the selected garment and a generative try-on module that creates the realistic try-on images.

The project also includes a content-based retrieval system, that extracts some descriptors from the garment picture and finds similar items from a repository.

The objective of the project will be for the system to more easily adapt to less professional and noisier photos.

Contents

1 Introduction

1.1 Problem statement

Our project will be focusing on designing a 2D image-based virtual try on system. Virtual try-on consists in generating an image of a reference person wearing a given try-on garment.

1.2 Related works

In order to solve this problem we have analyzed already existing literature and their approaches to the same problem.

The CP-VTON paper identifies four main requirements that need to be accomplished by a virtual try-on system:

- warping the garment according to the body shape and pose of the target person;
- transferring the texture of the garment on the target person without losing important details;
- merging the image of the target person with the warped result in a plausible way; and
- render light and shades of the final image correctly, to ensure realism.

One of the most important advancements made by the CP-VTON architecture is the

introduction of a warping module that computes a learnable Thin-Plate Spline transformation that warps the garment in a reliable way.

We obtained access to the Dress-Code dataset, collected by AImageLab, which, given its size, may potentially boost the efficacy of our system.

We also noticed that, in recent years, that there have been a lot of improvements to the quality of the generated images through the introduction of transformer-based modules. This approach followed by the DualBrach paper to solve the virtual try-on problem with great results, as such we will also attempt to implement a similar transformer-based architecture.

1.3 General approach

Our system will be subdivided into different modules each one designed to solve specific step of the process.

- pre-processing: this module handles all which regards the image enhancement (denoising, light adjustement, ...), performs the background removal task;
- person representation: this module performs pose estimation and the semantic segmentation of the person into their body parts;
- warping module: this module implements a geometric transformation that envelops the body shape of the subject with the fabric of the clothing item;
- try-on: as the last module in the pipeline, this part generates a new image by composing the warped garment over the subject and should ensure the satisfaction of the requirements stated in the above section.

2 Technical Approach

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In order to get across the inner workings of each module we will separate this section into subsections related to each one.

2.1 Pre-processing

As the objective of the system is to be adaptable to dirty and noisy input images, in the pre-processing phase great care should be taken to clean such inputs. As such the pre-processing module performs different methods of input refinement.

A first denoising pass is performed utilizing the bilateral filter, after which the image goes through a light adjustment procedure which entails contrast stretching.

After these operations we perform the background removal. This is because we thought that a potential point of improvement within the virtual try-on pipeline could be the removal of the background before going deeper into the network as the background information may hinder the performance the subsequent modules. To perform such a task we are looking and comparing multiple already existing solutions such as:

- U-Net: fine-tuning a pre-trained U-Net model using the Tik-Tok dataset;
- Detectron2: fine-tuning on Dress-Code the Detectron2 segmentation module released by Facebook.

We will compare the results and choose the best one according to state-of-the-art evaluation metrics (DICE etc...).

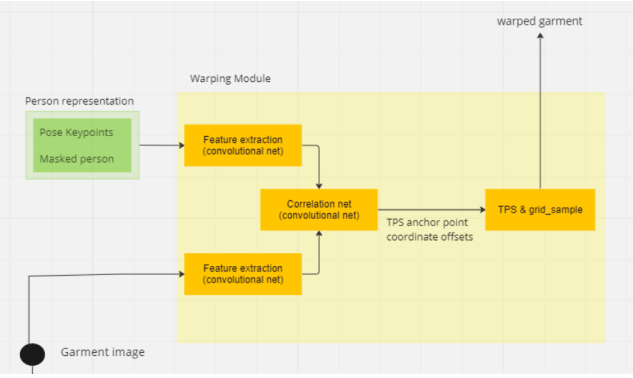
2.2 Person representation

This module deals with the semantic segmentation of the subject and their keypoints extraction, which will be used to as features for the warping module.

Regarding the segmentation problem we have, as of now, identified the Detectron2 segmentation module as the main candidate to solve it.

Instead, for the keypoint extraction problem we are comparing the DensePose module (from Detectron2) and the OpenPose module.

2.3 Warping module



The warping module takes as inputs the person representation feature vector and the garment image and, based on the keypoints and the segmantation mask, it warps the garment fitting it to the body shape of the subject.

The output is the set of the TPS parameters, which are used to geometrically transform the clothing item.

2.4 Generative module

3 Section

Small description

3.1 Subsection

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5 Conclusions

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