Virtual Try-on

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Problem Statement: What is problem you are trying to solve?

- During the times of pandemic, one should often remain socially distant. A try on cloth at a clothing store is often worn by several people which should be avoided.
- Our Virtual try-on model tries to augment the cloth on to the person and shows as if the person is wearing the cloth.
- Additionally, we can integrate our model to online stores for better user experience which may lead to better sales.

Motivation: Why is the problem interesting to AIVC community ?

- In our project, there are various visual techniques and models involved which can also be used in other projects or serve as an intermediary step.

Eg: Combination of pose maps and segmentation maps can be used to build games which involves character transformation etc. It can also be used in behaviour detection and predictions.

Applications: What are some applications to the solution of the problem ?

- One of the main application would be in clothing store.
- Instead of trying on individual cloth every time, user can just select or swipe(may be a functionality we can implement) 100s of cloths and check on the his/her preference.
- As specified earlier, online clothing stores such as amazon, macy’s etc could give better shopping experience by letting user try on a cloth before buying them.

Challenges: What are the main research challenges to solving this problem ?

- In terms of development, the segmentation map generation requires edge maps. Generating an edge map in python is a challenging task.

- There is no full fledged pipeline for the entire process. Segmentation generator is also developed in tensorflow 1.x and rest of the models in 2.x

Prior Work: How have prior researchers tried to solve this problem ? Where have they succeeded ?

- Several papers such as “Toward characteristic preserving image-based virtual try-on network” have tried to use just the segmentation map which was able to better preserve the fine texture details of prints, logos and other non-repetitive patterns.
- Other papers such as “VITON-GAN: Virtual Try-on Image Generator Trained with Adversarial Loss” use VITON-GAN to generate the final outputs. VITON-GAN generated hands and arms in the output more clearly in occlusion cases.

Limitations: Where have they failed ?

- In order to maintain the person's shape, several approaches provide a coarse body shape mask as a cue to synthesize the image, but fail to reproduce the body parts elaborately (e.g., hands).
- By infrequent poses, garments with complex non-repetitive textures, which prove to be more challenging in the optimization step
- Maintaining the body pose and cloth alignment at final stage is where most models fail.
- VITON-GAN generated hands and arms more clearly. However, arm generation failed when the model's original clothing was half-sleeve and the tried-on clothing was long-sleeve
- As the resolution increases, the artifacts in the misaligned areas between the warped clothes and the desired clothing regions become noticeable in the final results.

Proposed Approach: How do you propose to address these limitations and solve the problem ?

Our approach involves mainly 4 stages.

1. **Pre-processing:** In this stage we try to eliminate torso and arm (excluding the wrist). This would involve using the output of pose map and a segmentation map to feed as input to another neural network to perform the task.
2. **Segmentation Generation:** Segmentation generator is a Neural network which takes output of above step, pose map and the reference cloth as input and gives us a segmentation map as an output in which the person is wearing the cloth.
3. **Clothes deformation:** In this step, we deform our reference cloth as per the person's pose. Cloth map, output from the first step and pose map along with reference cloth is used in a geometric matching module to deform the cloth as required.
4. **Try-on synthesis:** In our final step we try to combine all, i.e output of the segmentation generator and and wrapped cloth along with output of first step, is fed into a ALIAS generator (Alignment Aware Segment Normalization). This enables the preservation of semantic information, and the removal of misleading information from the misaligned regions.

Contributions: What are the main scientific contributions of your work ?

- Since its a development focused project, we try to integrate all the process and develop an app or web application based on the existing paper.
- We intend to make this as an end to end project, with a neat user interface, better visualisation so the user would be more willing to use this as a product.

Evaluation: How will you evaluate your proposed approach ?

- We intend to host our model on to the cloud and can evaluate our model by checking the processing speed, server client latency and model inference latency.
- We also plan on checking the FPS of the application for evaluating our model’s performance.

Benefits: What are the benefits of your approach ?

- With all modules integrated, we would be having a complete pipeline and can just give a query image or a video, to get the results directly.
- Also with a good user interface, we can give the user a better shopping experience.

Expected Deliverable: What is the main expected outcome of this project ?

- Final deliverable would be an end to end application, i.e either a webapp or a mobile application.
- We plan on using cloud services like AWS Sagemaker, AWS Lambda and Amazon API Gateway to name a few to follow serverless architecture. This would help us to utilize the model easily by the application irrespective of the platform on which it is deployed.

Feedback from Mentor:

Since this is a development based project our focus would be mainly to get a complete end to end application.

We are also focusing on improving the model performance by migrating from tensorflow 1.x to 2.x.

Edge map generation script which is in matlab, should be converted to python to integrate with our application.

Planning to host it on AWS and running it remotely will also be considered as part of this project.