EMORY

QTM 447 Advanced Machine Learning

Pixel to Person: Garment Transfer with UNet Segmentation

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Abstract

Introduction

Clothing segmentation has become a prominent topic at the intersection of computer vision and fashion. Various models have been developed to perform this task, with the advent of convolutional neural networks and large annotated datasets serving as key breakthroughs.

In this project, we aim to explore semantic clothing segmentation using U-Net, focusing on pixel-wise classification of images into distinct clothing and body classes.

Then, we will take it one step further and integrate segmentation results into image synthesis or virtual try-on applications.

Dataset

We used the Clothing Co-Parsing Dataset, including 1,000 of 820*550 PNG image of individuals wearing various clothing, segmentation mask pairs, and 59 object classes.

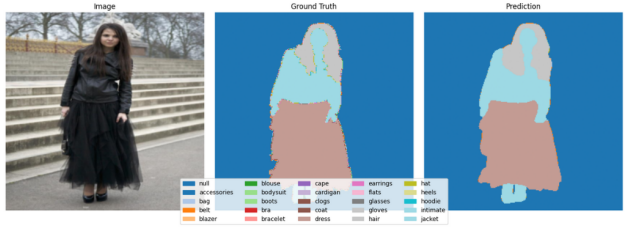

Fig.1 U-net Clothing Segmentation(index=1)

Methods/Approach

We developed a UNet-based segmentation model to enable a virtual try-on system that transfers garments from one person to another. The model predicts pixel-level clothing masks, allowing specific garments (e.g., jackets or hats) to be extracted from a source image and resized to fit the corresponding region on a target person. By blending the extracted garment into the target image based on predicted segmentation masks, we demonstrate a simple yet interpretable pipeline for virtual garment transfer.

Limitations /Future Directions

1. The training data labels often fail to accurately capture fine-grained garment details and lack sufficient variety across clothing types. Additionally, the dataset is biased toward female clothing, limiting the model's generalization.
2. A large portion of image pixels are labeled as 'null' (background), which inflates validation accuracy. However, the specific regions of interest—such as detailed garment boundaries—are often poorly segmented despite the overall performance appearing adequate.

Results

Fig.2 Visual Try On (label='coat',index=8)

Model Performance running 30 epoch:
Train Loss=0.1320, Train Acc=96.48%
Val Loss=0.4726, Val Acc=90.79%

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