Disentangled Person Image Generation

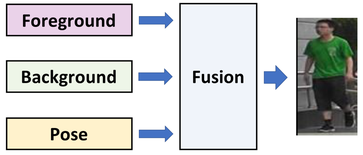
Liqian Ma[1] Qianru Sun[2] Stamatios Georgoulis[1] Luc Van Gool[1,3] Bernt Schiele[2] Mario Fritz[2]

[1]KU Leuven [2]MPI for Informatics [3]ETH Zürich

Project page: https://homes.esat.kuleuven.be/~liqianma/CVPR18_DPIG/

Introduction

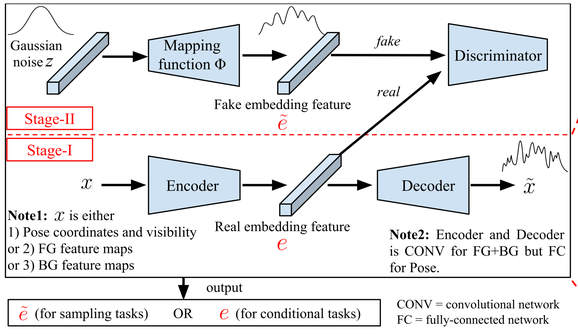
- **Motivation:** Learn image generation model for persons that explicitly represents foreground, background, and pose.
- **Task:** Synthesize person images, while independently controlling foreground, background, and pose, in a *self-supervised* way.
- **Key idea:** *Disentangle* person images into the aforementioned components, and then combine.

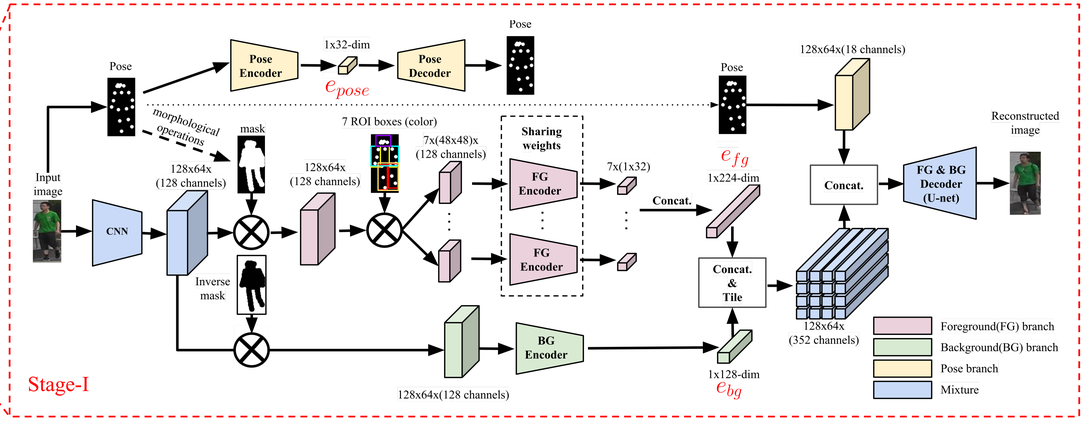


- **Contributions:**

1) A new task of generating person images by disentangling the input into weakly correlated factors.
2) A two-stage framework to learn manipulatable embedding features.
3) A technique to match the distribution of real and fake embedding features through adversarial training.
4) An approach to generate image pairs for re-ID.

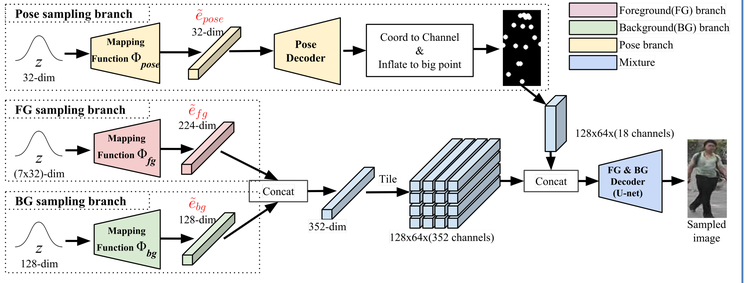
Two-stage learning framework





- **Stage-I:** Learn the disentangled embeddings in a reconstruction pipeline.
- **Stage-II:** Learn the mapping function from Gaussian space to embedding space for each factor.

Sampling phase (testing)



- **Sampling phase:** Sample foreground, background and pose from Gaussian noise to compose new person images.

[1] Ma *et al*. Pose Guided Person Image Generation. NIPS'17.
[2] Fan *et al*. Unsupervised person reidentification: Clustering and fine-tuning. Arxiv' 17.

Generation results

- **Sampling results**

Market-1501: Sampling different factors

DeepFashion: Appearance and Pose sampling

- **Person re-ID results**

1) Our Virtual Market (VM) dataset.

2) Person re-ID evaluation.

Model	Training data	Rank-1	mAP
Res50	CUHK03 (labeled)	0.300	0.115
Res50	Duke (labeled)	0.361	0.142
Res50	VM	0.338	0.134
Res50+PUL	VM+Market	0.369	0.156
Res50+PUL+ KISSME	VM+Market	0.375	0.154

- **Inverse interpolation**

- **Pose guided person image generation**

Model	DeepFashion		Market-1501			
	SSIM	IS	SSIM	IS	Mask-SSIM	Mask-IS
PG2[1]	0.762	3.090	0.253	3.460	0.792	3.435
Ours	0.614	3.228	0.099	3.483	0.614	3.491