FlexPose: Pose Distribution Adaptation with Limited Guidance

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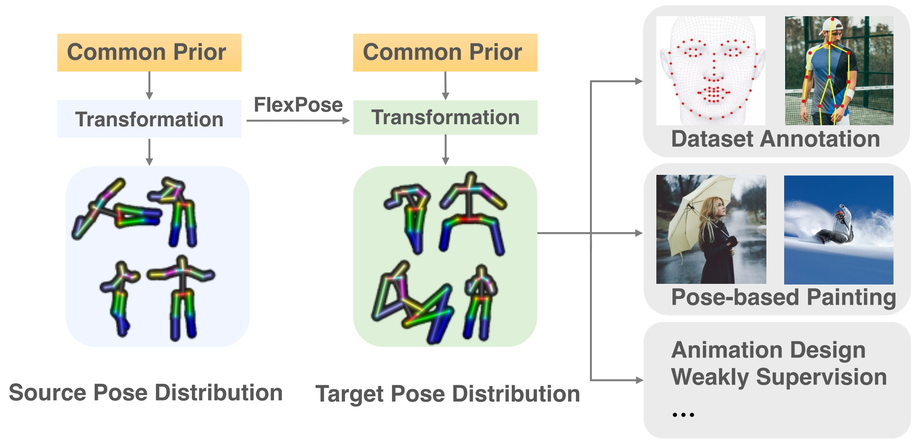
Problem

How can poses be adapted between different domains?



Key Observations

- Different human poses share a similar hinge-structure prior, and this common knowledge can be well modeled by generative models.
- Transformation between different domains can be achieved with limited data with strict regularization.

FlexPose Framework

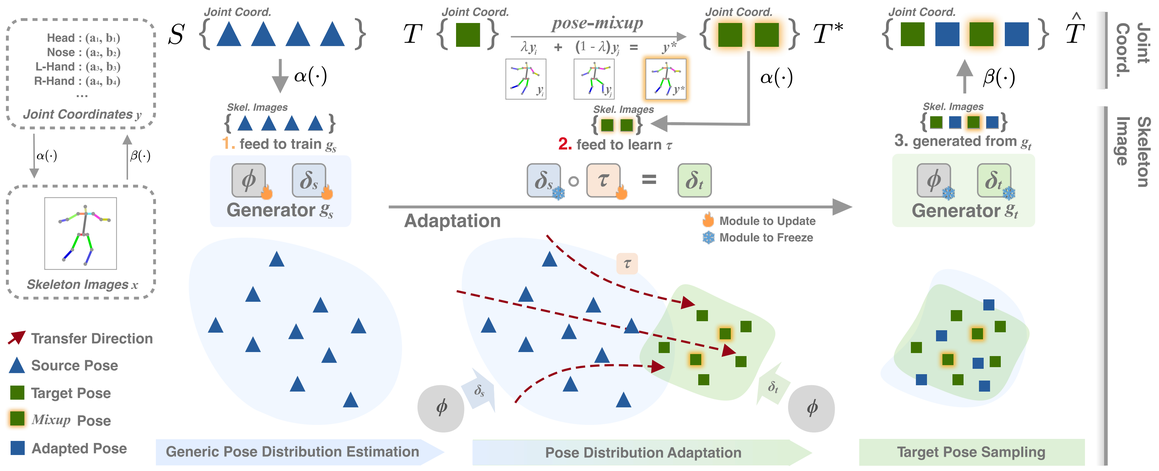


Figure 1. An overview of proposed FlexPose framework.

Our framework consists of three phases:

Generic Pose Distribution Estimation. We learn a generator on the original pose set to estimate the pose distribution.

Pose Distribution Adaptation. Given the limited target annotation set, we transfer learned generator to fit the pose distribution of the target pose domain. Considering the limited knowledge from target pose annotation , we introduce three regularization, ***Linear***, ***Sparse*** and ***Pose-mixup***, to avoid reaching a collapse solution.

Target Pose Sampling. The transferred generator can flexibly synthesize any number of fake pose annotations by randomly sampling in the latent space.

Qualitative Evaluation

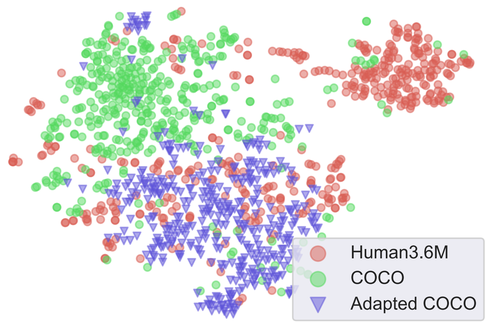


Figure 2. t-SNE visualization of human poses before and after adaptation.

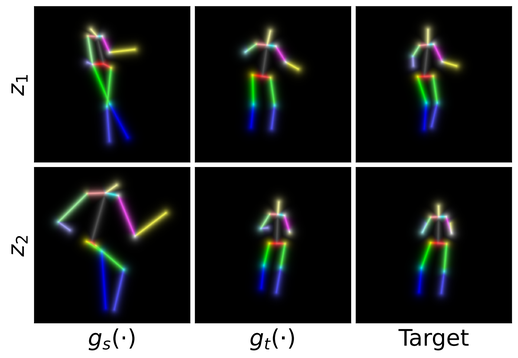


Figure 3. Visualization of pose adaptation.

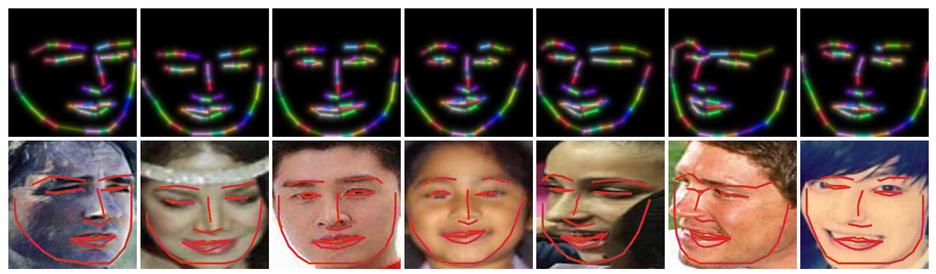


Figure 4. Visualization of human face landmark annotation on WFLW dataset.

Quantitative Evaluation

Method	Target	Source	MSE (↓)	PCK (↑)
Baseline	H3.6M	COCO	17.86	0.015
FreezeD		COCO	20.60	0.081
AdaGAN		COCO	14.88	0.395
LoRA		COCO	13.85	0.430
FlexPose		COCO	**13.19**	**0.585**
Baseline	S-H3.6M	COCO	5.47	0.685
FreezeD		COCO	7.63	0.003
AdaGAN		COCO	5.36	0.455
LoRA		COCO	5.02	0.512
FlexPose		COCO	**3.79**	**0.770**
Baseline		3DHP	12.66	0.000
AdaGAN		3DHP	7.23	0.215
FreezeD		3DHP	6.28	0.206
LoRA		3DHP	6.15	0.314
FlexPose		3DHP	**5.98**	**0.467**
Baseline		SURREAL	11.18	0.000
FreezeD		SURREAL	11.38	0.006
AdaGAN		SURREAL	6.63	0.228
LoRA		SURREAL	6.52	0.337
FlexPose		SURREAL	**6.47**	**0.499**

Table 1. Results on human pose annotation task.

Method	Target	Source	MMD^2 (↓)	FD (↓)
FreezeD	H3.6M	COCO	0.081	3.77
AdaGAN		COCO	0.052	2.67
LoRA		COCO	0.035	1.36
FlexPose		COCO	**0.029**	**0.80**

Table 2. The results of distribution distance measurement.

Method	Target	Source	MSE (↓)	PCK (↑)
Baseline	WFLW	300-VW	18.78	0.679
AdaGAN		300-VW	11.95	**0.785**
FreezeD		300-VW	11.66	0.779
LoRA		300-VW	11.77	0.760
FlexPose		300-VW	**11.64**	0.766

Table 3. Results on human face annotation task.

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