# SUPPLEMENTAL MATERIAL FOR POSE2BODY:POSE-GUIDED HUMAN PARTS SEGMENTATION

*Anonymous ICME submission*

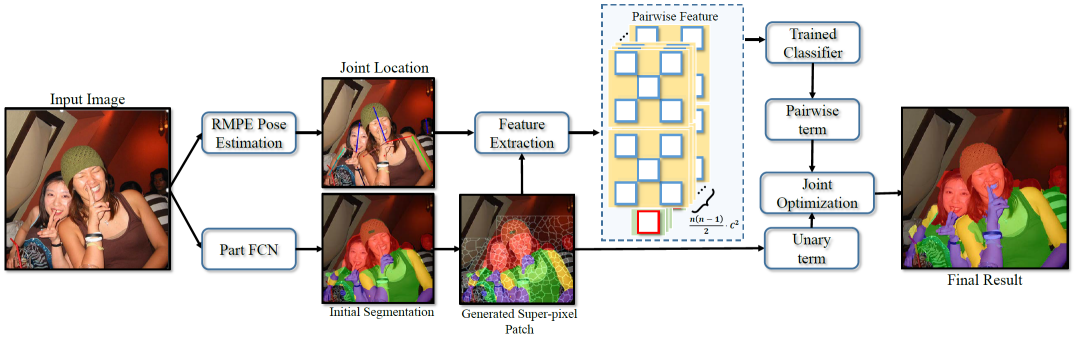


**Fig. 1**: Our human parts segmentation pipeline. Starting from the left, the input image is fed to RMPE Pose Estimation framework [1] and DeepLab [2] semantic segmentation framework to compute the estimated human joint location and human parts score map respectively. Then we target on minimize a CRF based energy function composed of data term and smooth term to acquire the final segmentation result.

## 1. PIPELINE ILLUSTRATION

The segmentation pipeline of our algorithm is shown in Fig. 1.

## 2. ADDITIOINAL EXPERIMENT AND RESULTS

To further demonstrate the effectiveness of the added pose information, we conduct experiments on selected 763 images from the whole dataset, where each image has at least one human body with both joints of arms and legs detected. Our results show that our method dramatically surpasses the previous state-of-the-arts over 5% regarding the average mIOU. Moreover, when we takes closer look, the mIOU accuracy among legs and arms is much better than previous method, and that thanks to the strong constraint provided by pairwise term from added pose information.

Despite the gain on the average perform, our technique can still fail in several cases same as previous techniques. Fig. 2 shows a typical example where the torso is covered a patterned quilt that has the same color of the cradle. While FCN [3] and Xia et al [4] cannot distinct background from human parts, Ours and DeepLab [2] is slightly better, and ours reveals more details.

In our design, semantic parts are associated with one or two joint type as shown in Table 1.

Please see Fig. 3 and Fig. 4 for addional segmentation results.

**Table 1**: List of semantic part pair and their common joint

| semantic part pair | Common Joint |
|---|---|
| head & torso | neck |
| upper arm & torso | left/right shoulder |
| upper arm & lower arm | left/right elbow |
| upper leg & torso | left/right ankle |
| upper leg & lower leg | left/right knee |

| Method | Head | Torso | U-arms | L-arms | U-legs | L-legs | Background | Ave. |
|---|---|---|---|---|---|---|---|---|
| FCN | 75.00 | 51.19 | 28.81 | 31.90 | 33.19 | 26.93 | 95.70 | 48.96 |
| DeepLab | 75.00 | 51.19 | 28.81 | 31.90 | 33.19 | 26.93 | 95.70 | 48.96 |
| Xia et al. | 74.14 | 52.36 | 38.95 | 36.12 | 36.73 | 30.27 | 95.35 | 51.99 |
| Our | **76.25** | **54.43** | **40.29** | **41.52** | **41.98** | **39.03** | **96.23** | **55.68** |

**Table 2**: Mean IOU(mIOU) of human semantic part segmentation on selected image dataset. Selected images has at least one human body with both joints of arms and legs detected. It shows that our method achieves the highest mIOU in all human parts thanks to the strong constraint from additional pose information.

## 3. REFERENCES

[1] Haoshu Fang, Shuqin Xie, Yu-Wing Tai, and Cewu Lu, "Rmpe: Regional multi-person pose estimation," *2017 IEEE International Conference on Computer Vision (ICCV)*, pp. 2353–2362, 2017.

[2] Liang-Chieh Chen, George Papandreou, Iasonas Kokki-

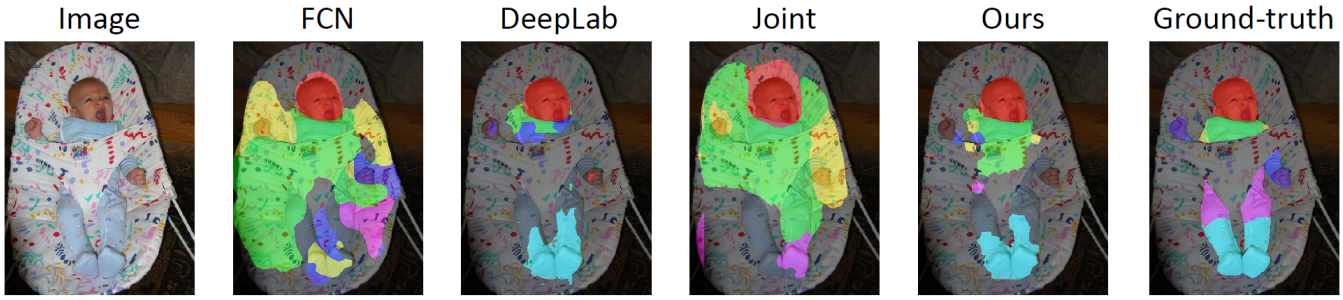


**Fig. 2**: Our semantic segmentation failure result on VOC PASCAL-Person-part. Due to the existence of heavy occlusion, our method estimates a wrong label for the chest of the baby.

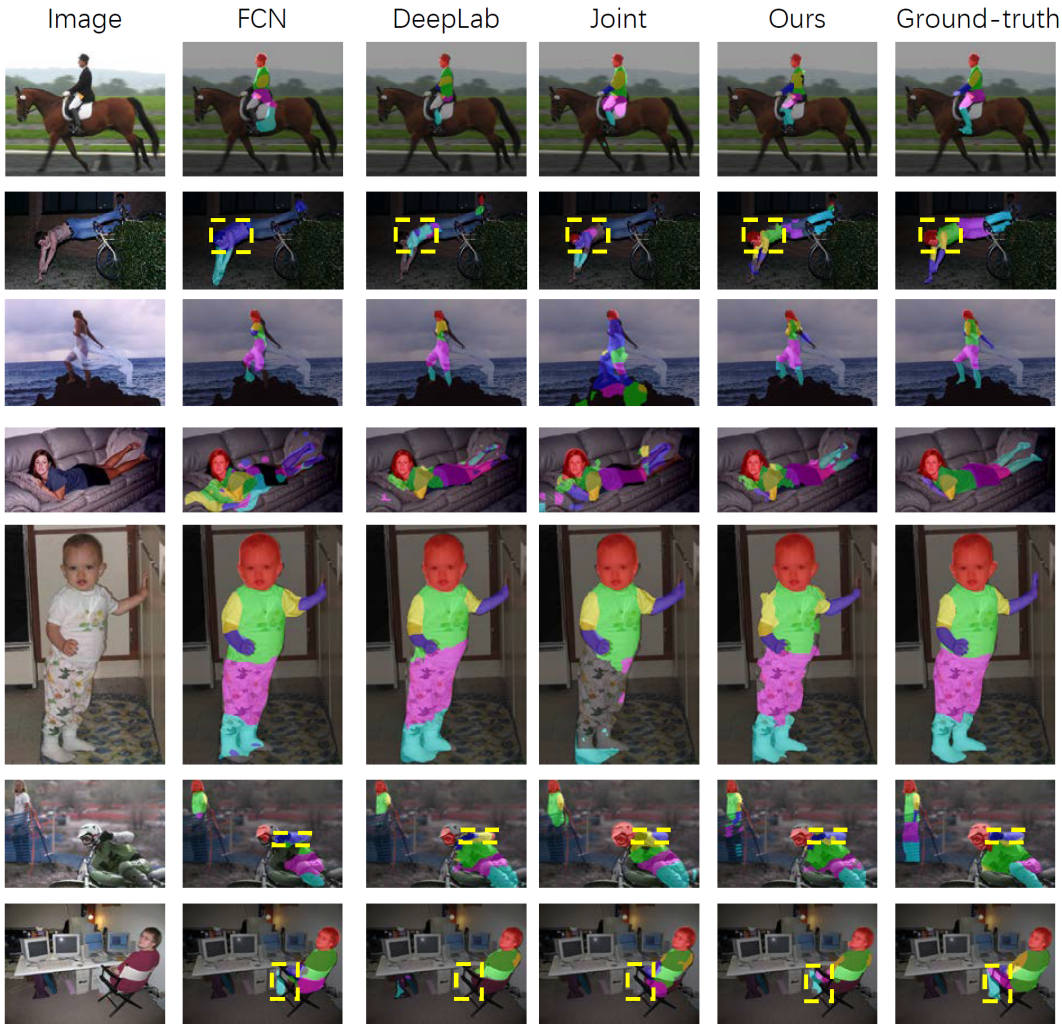


**Fig. 3**: Our additional semantic segmentation results.

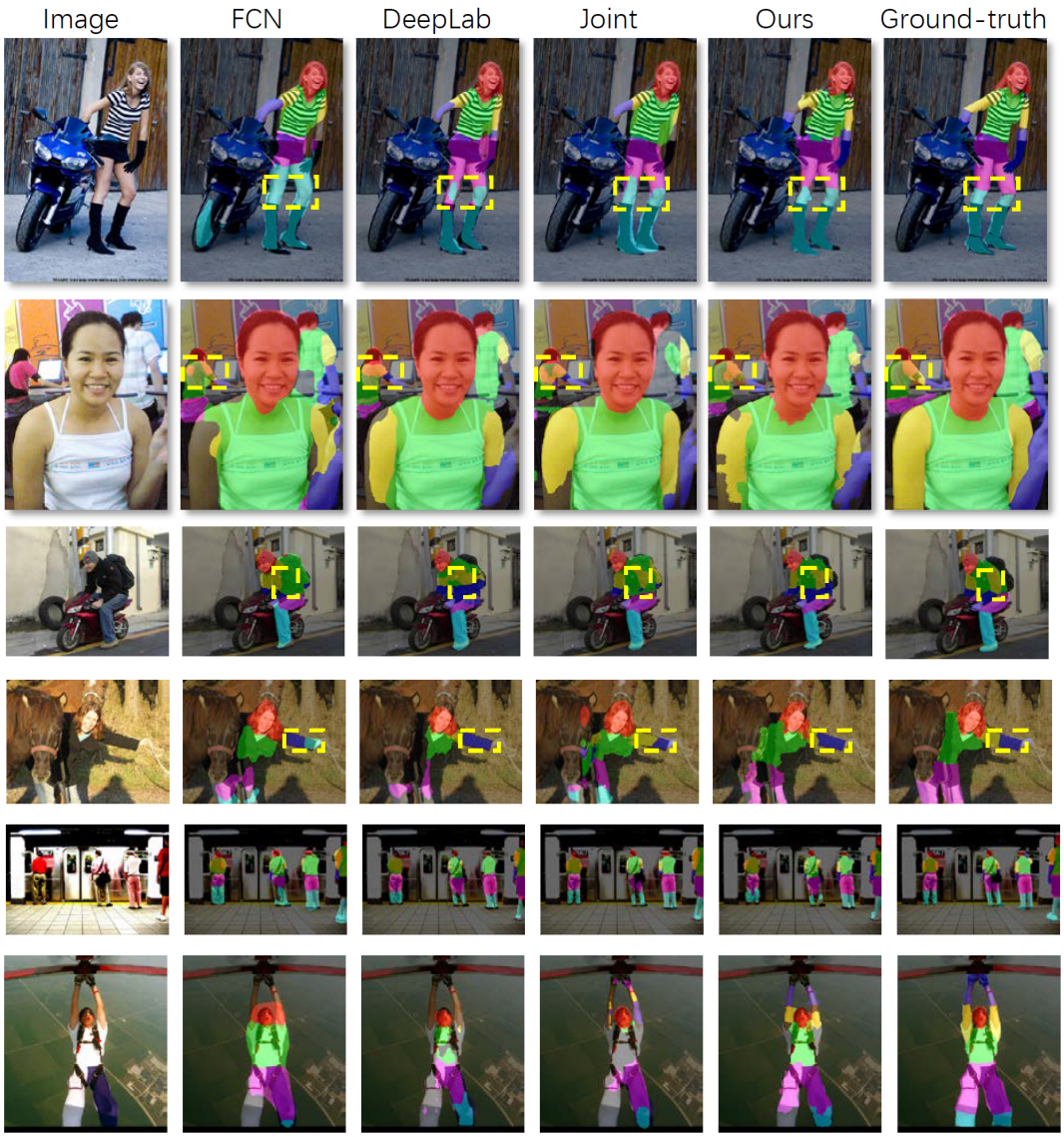


**Fig. 4**: Our additional semantic segmentation results..

nos, Kevin Murphy, and Alan L. Yuille, "Deeplab: Semantic image segmentation with deep convolutional nets, atrous convolution, and fully connected crfs," *IEEE transactions on pattern analysis and machine intelligence*, 2017.

[3] Evan Shelhamer, Jonathan Long, and Trevor Darrell, "Fully convolutional networks for semantic segmentation," *2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 3431–3440, 2015.

[4] Fangting Xia, Peng Wang, Xianjie Chen, and Alan L. Yuille, "Joint multi-person pose estimation and semantic part segmentation," *2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 6080–6089, 2017.