Weakly Supervised Body Part Segmentation with Pose based Part Priors
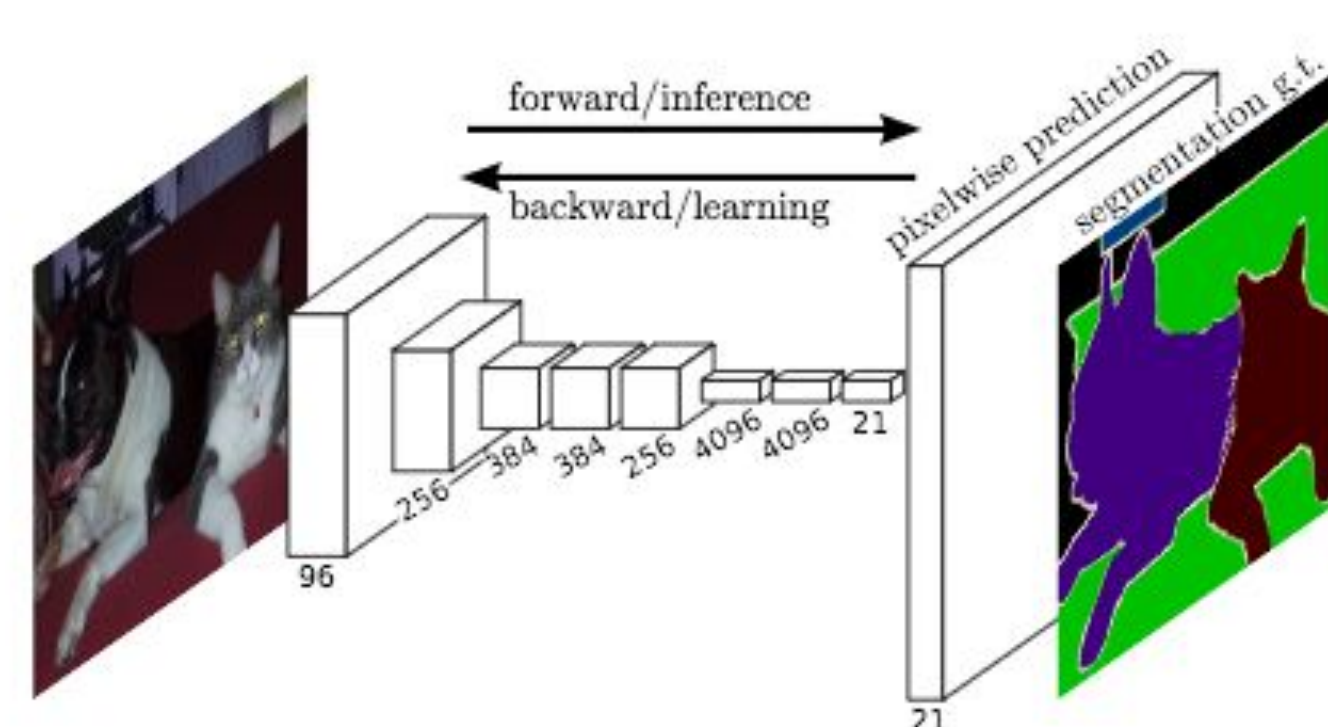
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Body Part Segmentation

Given an image, predict the semantic segmentation mask for each body part.

Fully-supervised Methods

Fully Supervised Training: Mask supervision

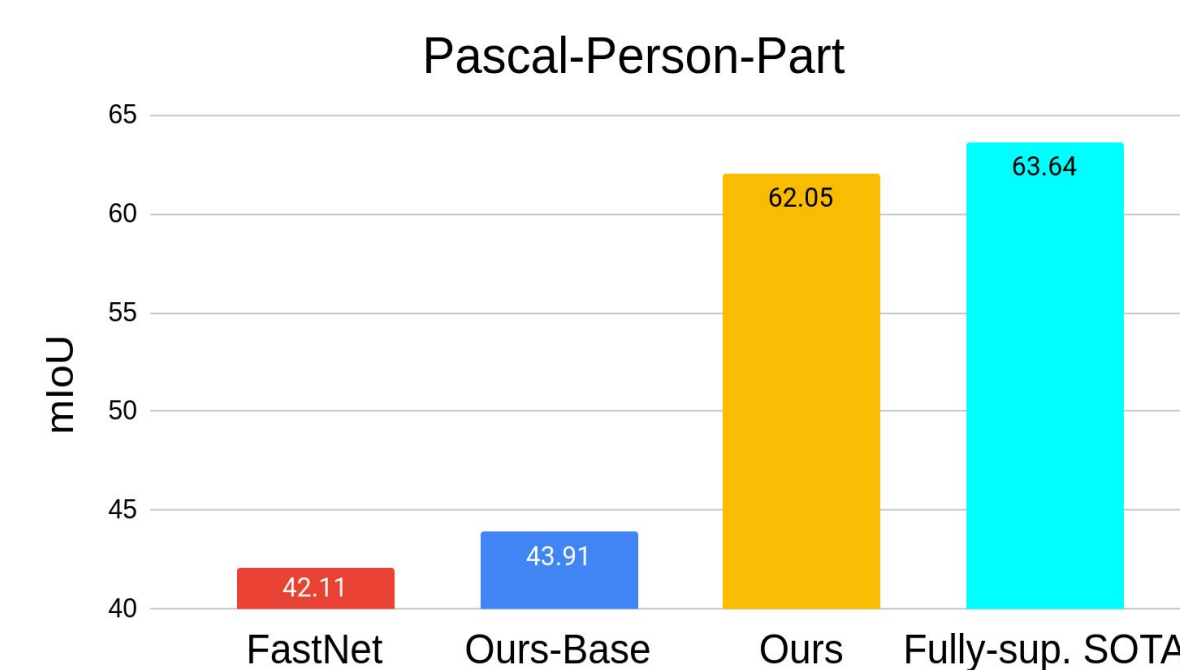Weakly Supervised Training: Pose supervision

- High cost in generating body part annotations
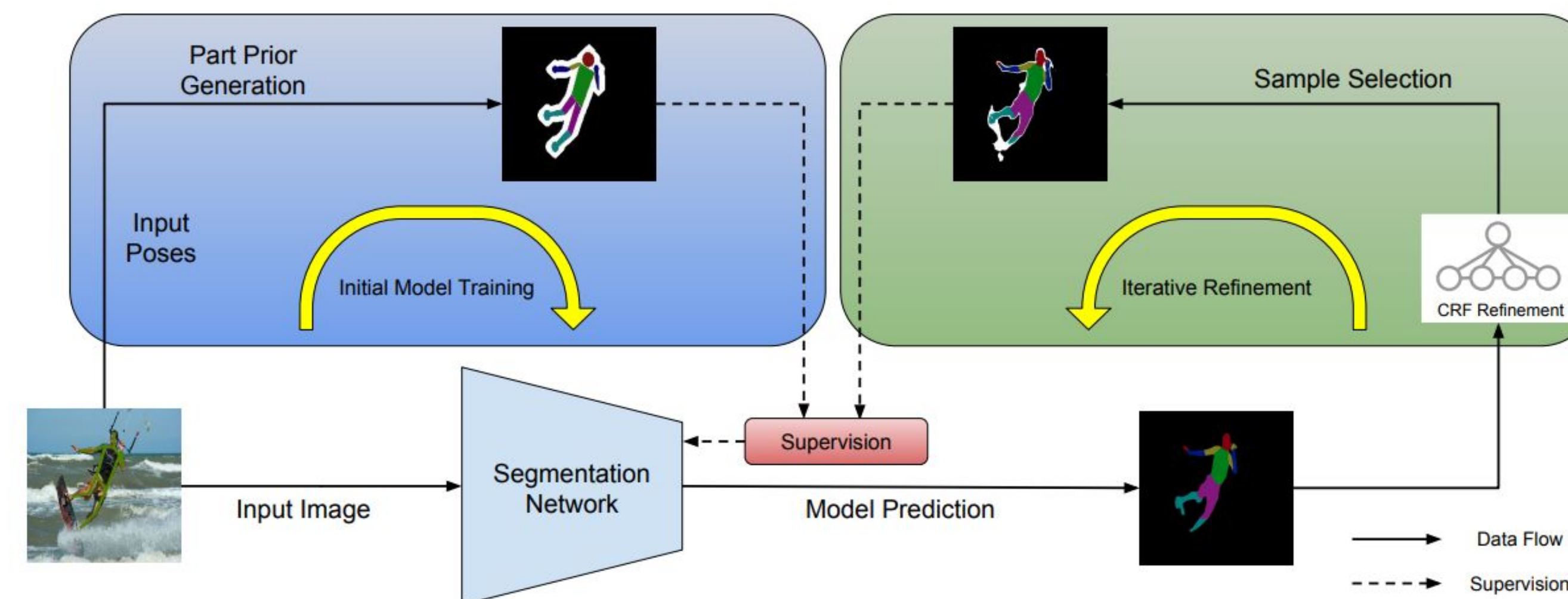- Abundant existing weak supervision (e.g., human pose)

Contributions

A weakly supervised approach for body part segmentation

- With extra data, obtain comparable performance to fully-supervised methods
- Generalizable to face parsing

Pascal-Person-Part

## Iterative Refinement based on Part Priors

Iterative Refinement based on Part Priors

- Part priors: Convert sparse pose into dense part priors
- Supervision: no loss on the uncertain areas shown in the white color
- Iterative refinement: iteratively fill in the uncertain areas

- Part priors
  - Projected from sparse poses based on predefined geometric rules
- Supervision
  - Applied on foreground $$L_s = \sum_{i \in F \cup B} \sum_{c=0}^{C} \ell(f_i(c), y_i(c))$$ pixels F and background pixels B

Extension to Face Parsing
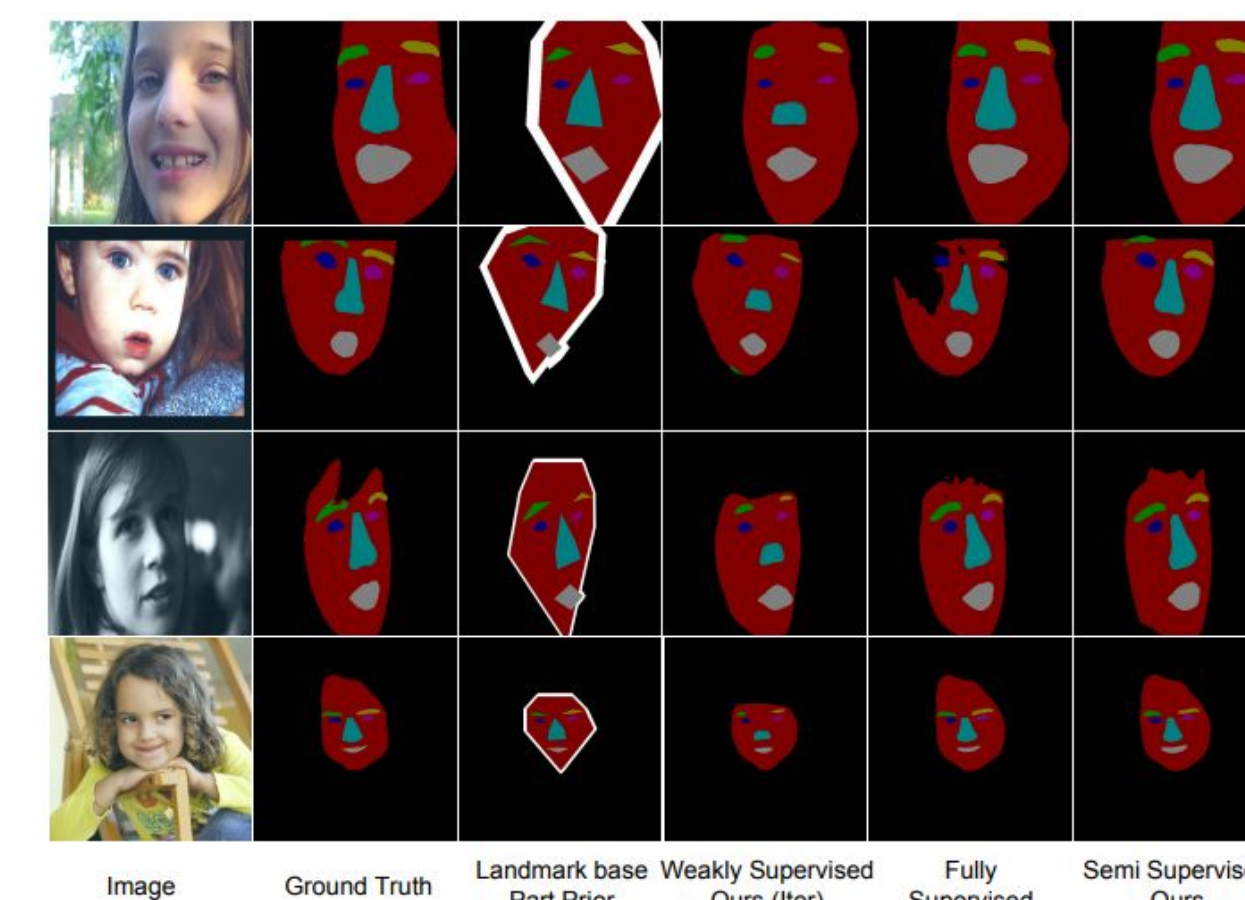
- The proposed framework can be extended to other keypoint supervised part segmentation tasks, such as face parsing.
- We show the face "part prior" and the parsing results on the Helen and AFLW datasets.

Quantitative Results

Results on Pascal-Person-Part

Methods	Supervision	mIoU	Head	Torso	U-Arm	L-Arm	U-Leg	L-Leg	Bkg
LIP [22]	Fully	59.36	83.3	62.4	47.8	45.6	42.3	39.5	94.7
LG-LSTM [40]	Fully	57.97	82.7	61.0	45.4	47.8	42.3	38.0	88.6
Graph LSTM [41]	Fully	60.16	82.7	62.7	46.9	47.7	45.7	40.9	94.6
DeepLab [18]	Fully	63.64	84.6	66.9	56.0	54.2	45.5	43.4	94.9
Ours (Part prior)	Weakly	40.91	54.9	35.1	34.2	32.4	19.0	24.5	86.2
FastNet [3]	Weakly	42.11	61.6	37.8	32.7	29.2	20.8	25.0	87.1
Ours (Part prior supervision)	Weakly	43.91	50.6	47.0	31.8	29.5	29.3	27.9	87.0
Ours (Base, only PASCAL data)	Weakly	53.54	76.1	54.8	39.6	36.5	37.9	36.1	93.9
Ours (Iter, only PASCAL data)	Weakly	54.72	76.7	55.6	40.2	38.4	38.6	38.9	94.6
Ours (Base, with COCO data)	Weakly	60.35	78.3	59.6	46.6	45.4	46.6	50.0	95.8
Ours (Iter, with COCO data)	Weakly	62.05	79.6	62.0	48.1	48.5	48.7	51.8	95.8

Qualitative Results