SAMSUNG AI Center - Cambridge

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Object landmark discovery through unsupervised adaptation

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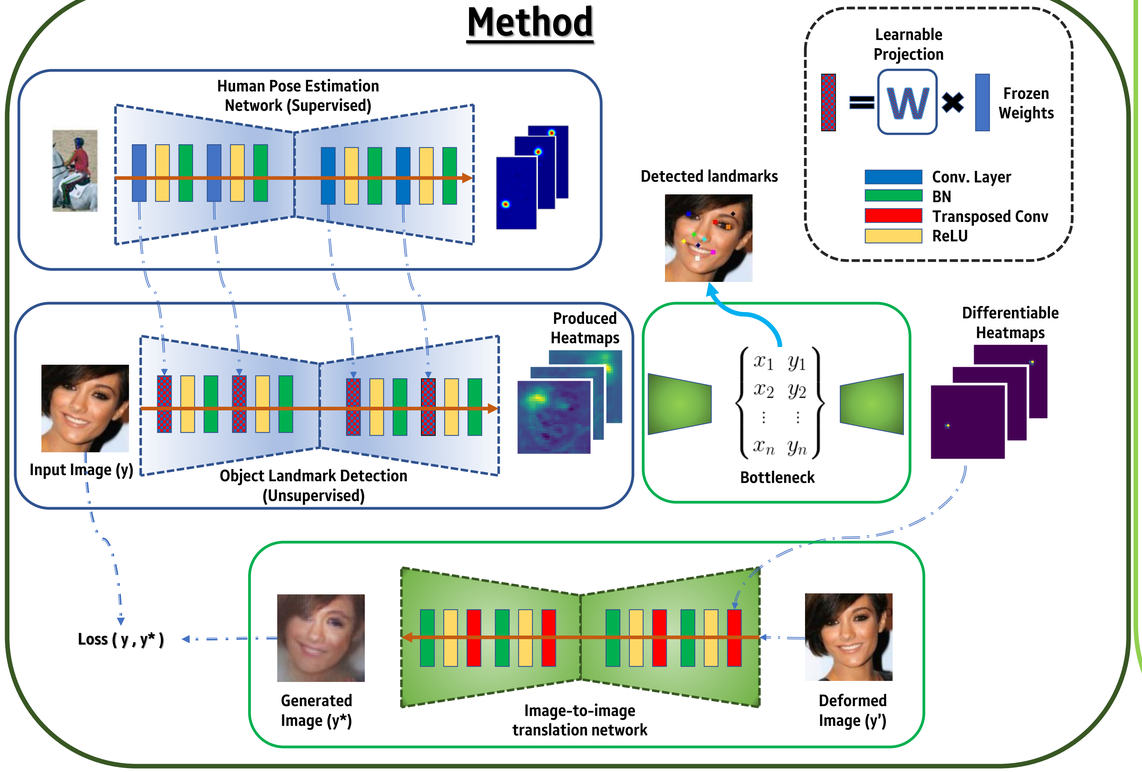
https://github.com/ESanchezLozano/SAIC-Unsupervised-landmark-detection-NeurIPS2019

Summary

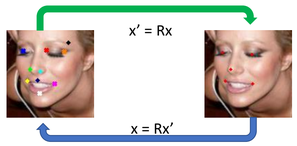
1. **Goal is** to learn an object detector w/o supervision through conditional image generation
2. We propose an **incremental learning** approach to unsupervised learning of object landmark detectors
3. Much constrained learning with **~10% parameters**
4. Novel evaluation that includes measuring the **consistency of** the discovered **landmarks**
5. We compare **three approaches** to unsupervised learning
   i. End-to-end training (scratch)
   ii. Fine-tuning from a pre-trained network
   iii. Incremental learning

Method



Evaluation

Forward

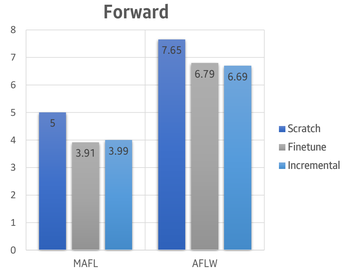


Backward

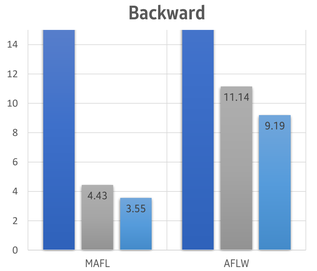
Consistency

$$e_i = \|\Psi^i_{\theta_\mathcal{Y}}(A(\mathbf{y})) - A(\Psi^i_{\theta_\mathcal{Y}}(\mathbf{y}))\|$$

Forward: Scratch/Finetune/Proposed



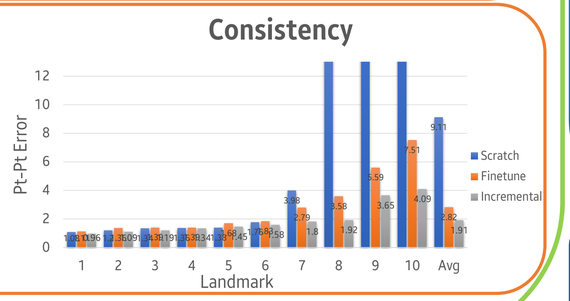
Backward: Scratch/Finetune/Proposed



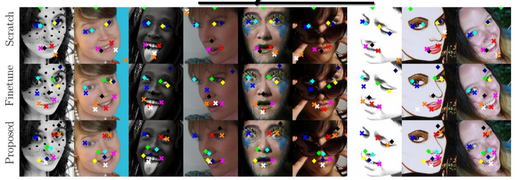
Forward: Comparison s.o.t.a.

Method	MAFL	AFLW
Supervised		
TCDCN [45]	7.95	7.65
MTCNN [44]	5.39	6.90
Unsupervised		
Thewlis [35]($K = 30$)	7.15	-
Jakab [13]†	3.32	6.99
Jakab [13]††	**3.19**	6.86
Zhang [43]($K = 10$)	3.46	7.01
Shu [31]	5.45	-
Sahasrabudhe [30]	6.01	-
Ours		
Baseline	5.00	7.65
Finetune	3.91	6.79
Proposed	3.99	**6.69**

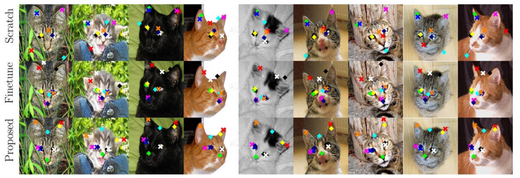
Consistency



Body -> Face



Body -> Cats



Body -> Shoes

Face -> Body

References

Thewlis et al. Unsupervised learning of object landmarks by factorized spatial embeddings. *ICCV'17*

Jakab et al. Unsupervised learning of object landmarks through conditional image generation. *NeurIPS'18*

Zhang et al. Unsupervised discovery of object landmarks as structural representations. *CVPR'18*