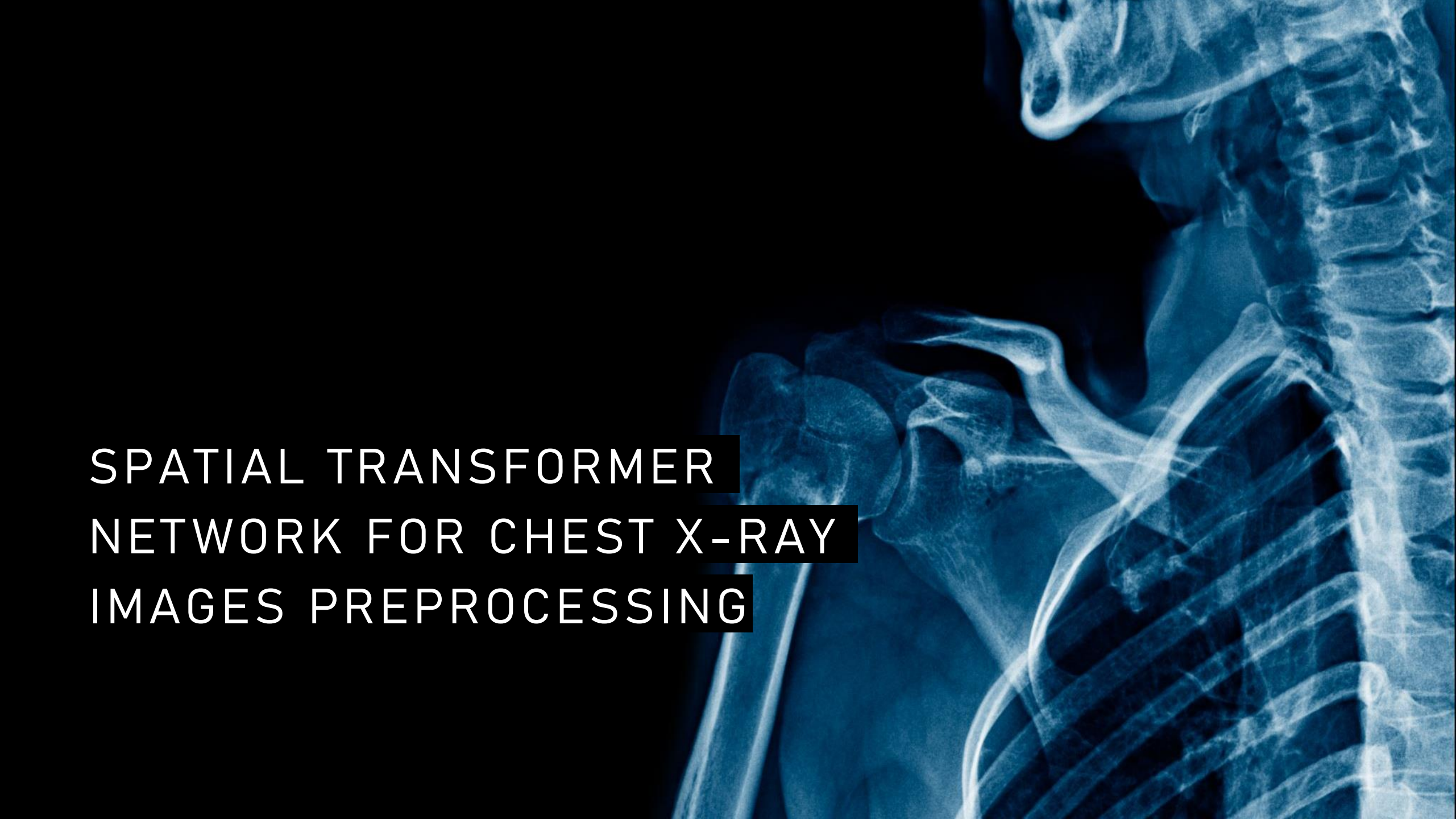
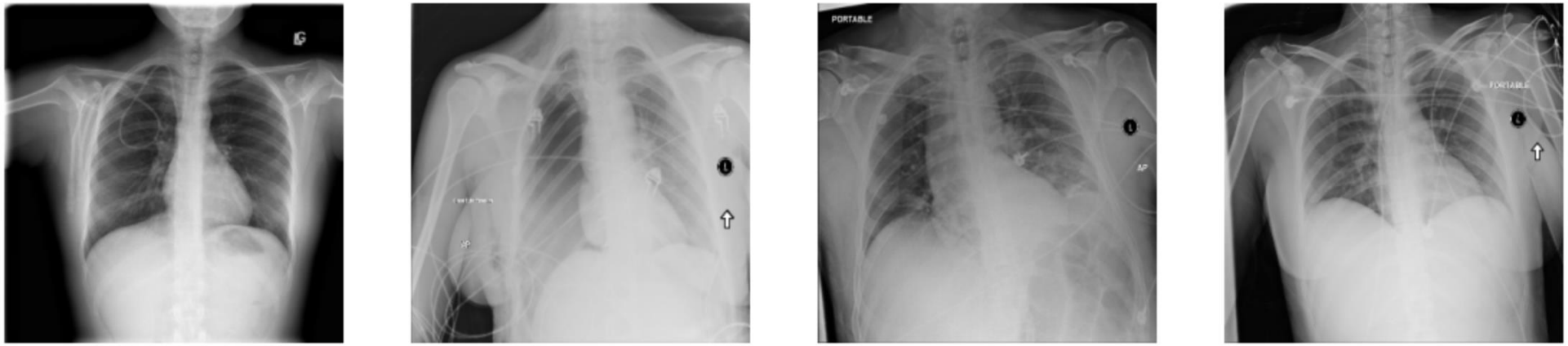
SPATIAL TRANSFORMER NETWORK FOR CHEST X-RAY IMAGES PREPROCESSING



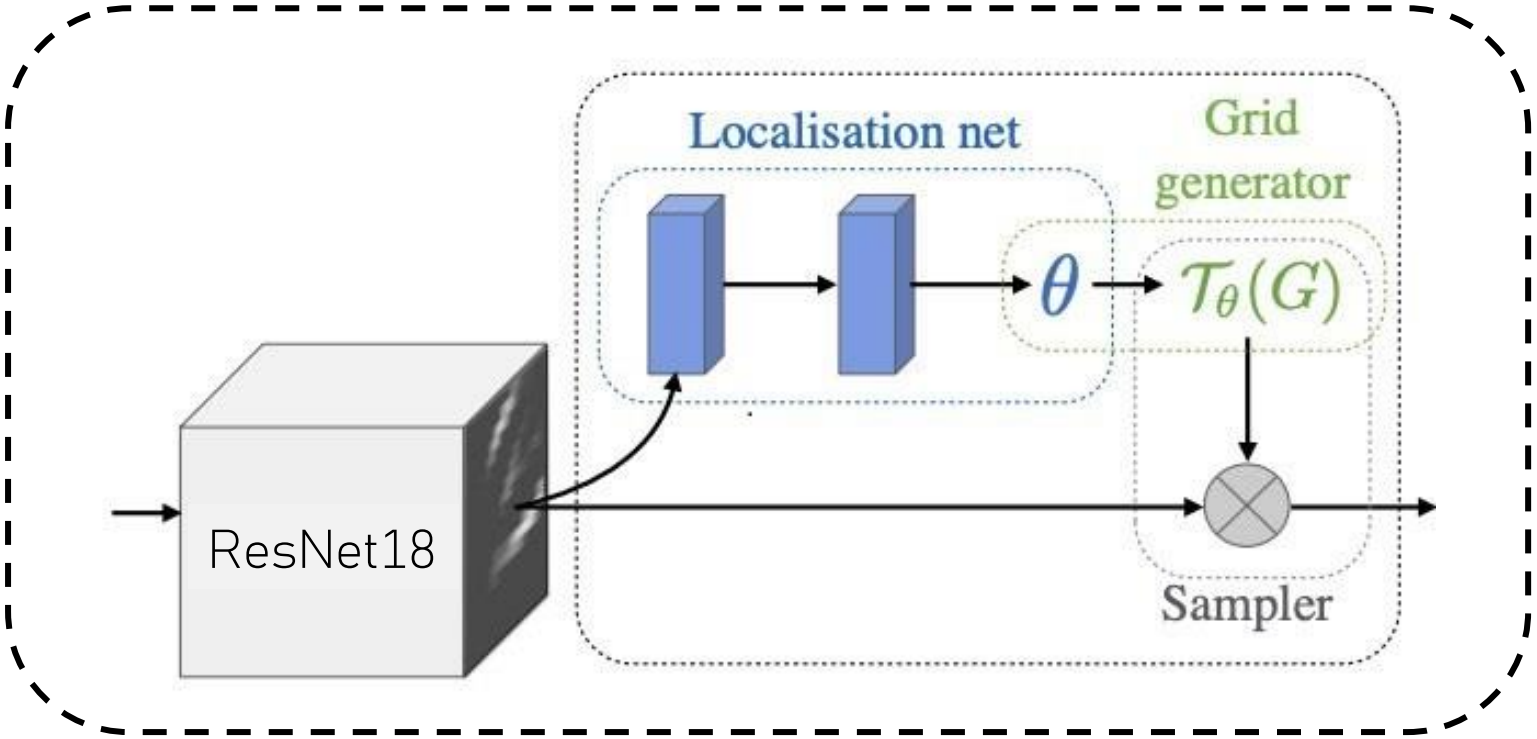
PROBLEM

- Disease classification based on X-Ray image is a common DL problem
- Datasets in the field are mostly gathered manually and are corrupted e.g. "ChestX-ray14" [1]



- Our hypothesis: aligned dataset would improve classification
- Our goal: use unsupervised learning approach to align the dataset by a proper affine transform for each image

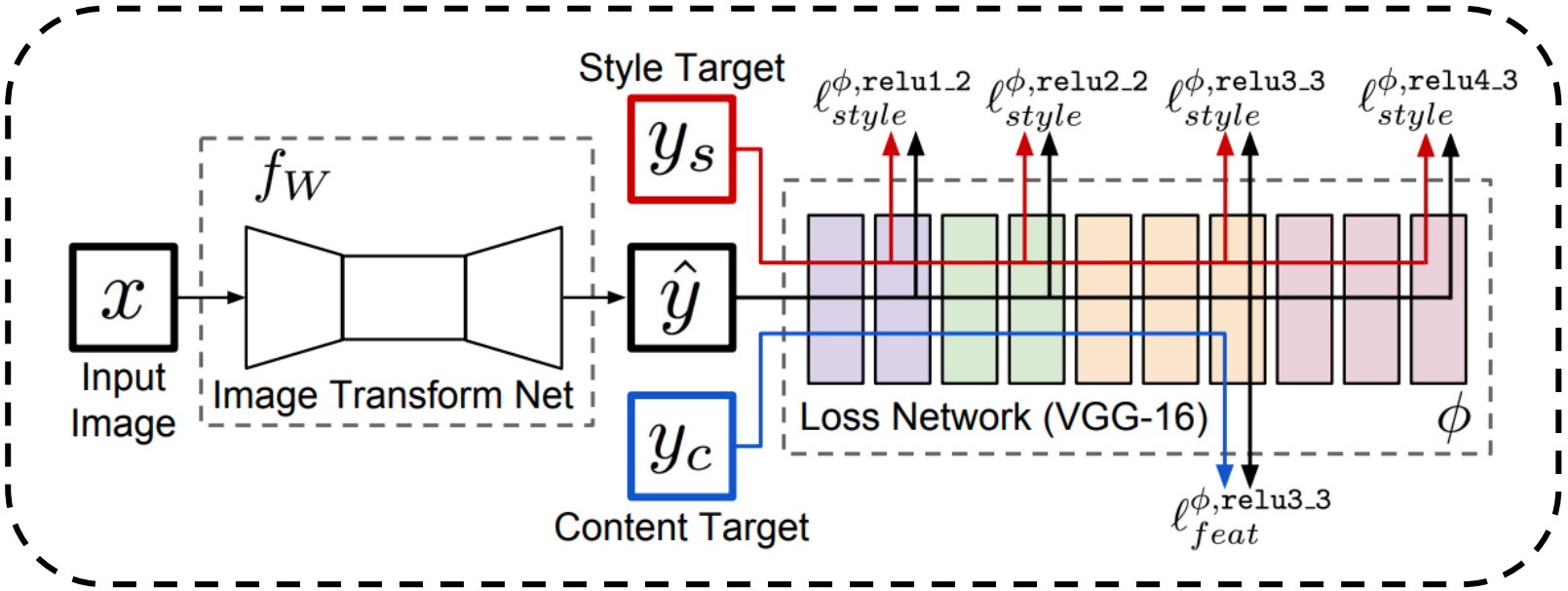
[1]: Wang et al. https://arxiv.org/pdf/1705.02315v5.pdf



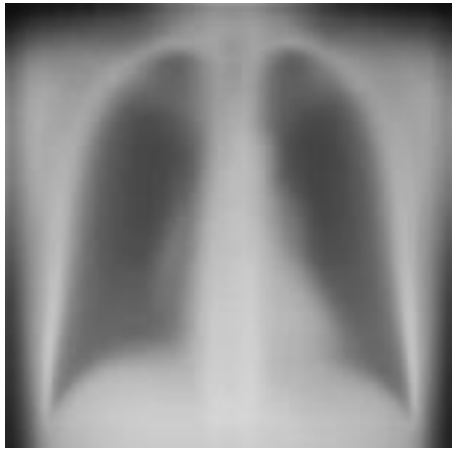
SPATIAL TRANSFORM

In order to find proper alignment parameters, we implement spatial transformer, following [2].

[2]: Jaderberg et al., Spatial Transformer Networks [https://arxiv.org/pdf/1506.02025v2.pdf]

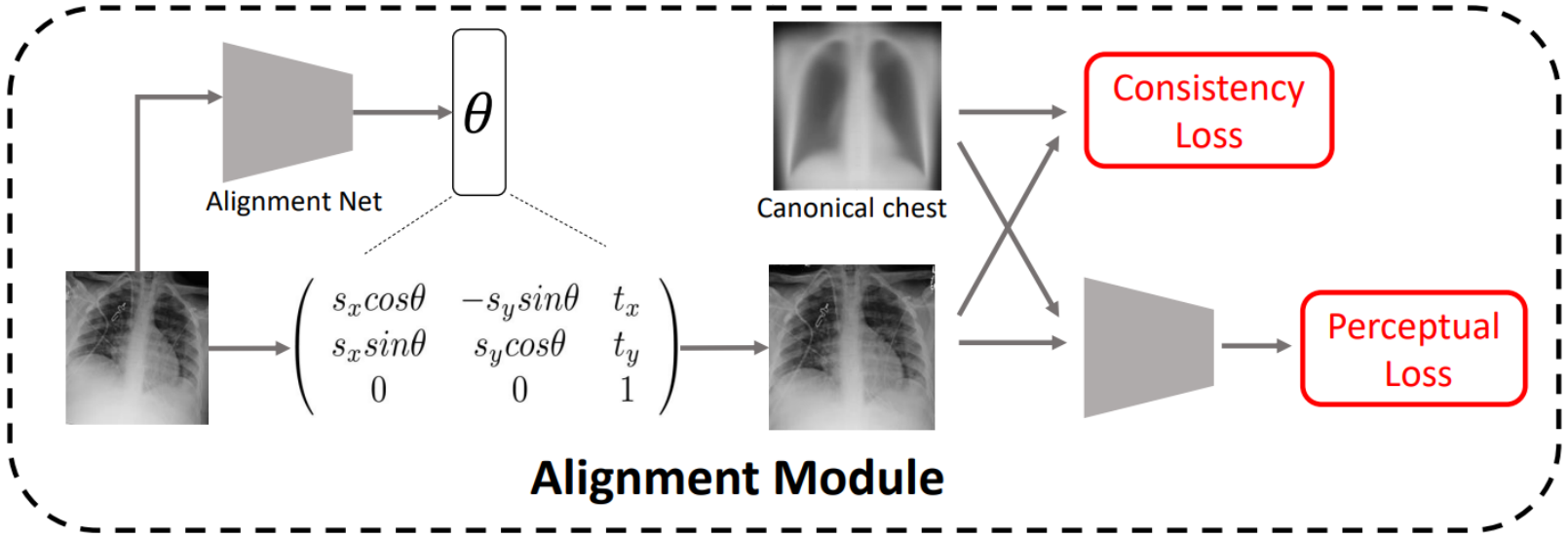


STYLE TRANSFER



Treating proper alignment as content target y_c we train our model following the procedure described in [3]. Here you as well can see our content target in case of chest x-ray images.

[3]: Johnson et al. Perceptual Losses for Real-Time Style Transfer and Super-Resolution [https://arxiv.org/pdf/1603.08155.pdf]



OVERALL TRAINING PIPELINE

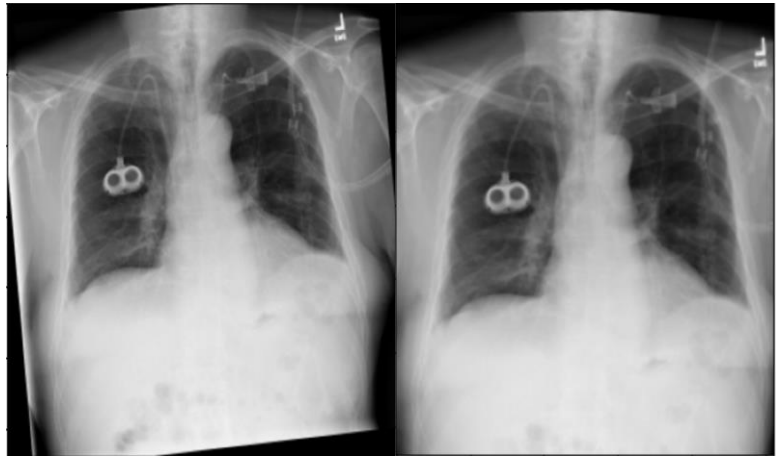
Finally, we obtain a network proposed in [4].

[4]: Liu et al. [https://openaccess.thecvf.com/content_ICCV_2019/papers/Liu_Align_Attend_and_Locate_Chest_X-Ray_Diagnosis_via_Contrast_Induced_ICCV_2019_paper.pdf]

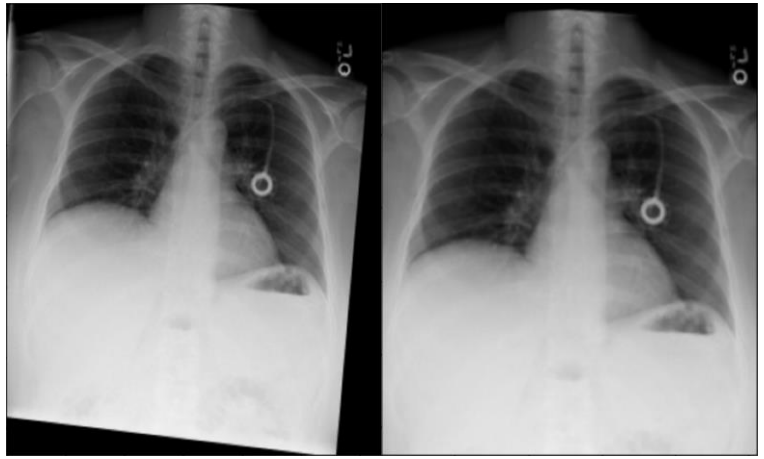
PROBLEMS AND SOLUTIONS

- The article mentioned above [4] does not provide implementation
- Our implementation word by word did not provide satisfactory results, therefore:
    1. We have experimented with deeper layers to obtain more accurate representation
    2. We tuned loss weights to prevent divergence
    3. We proposed different strategy to construct target representation
- And obtained the results as follows

Initial Aligned



Initial Aligned



Initial Aligned

Initial Aligned

RESULTS

Source code can be found at:

https://github.com/bizzare-hub/Chest-Xray-alignment-using-STN/tree/master

THANK YOU FOR ATTENTION