

CARE: Class Attention to Regions of Lesion for Classification on Imbalanced Data



Jixin Zhuang*
Jiabin Cai*
Ruixuan Wang
Jianguo Zhang
Weishi Zheng



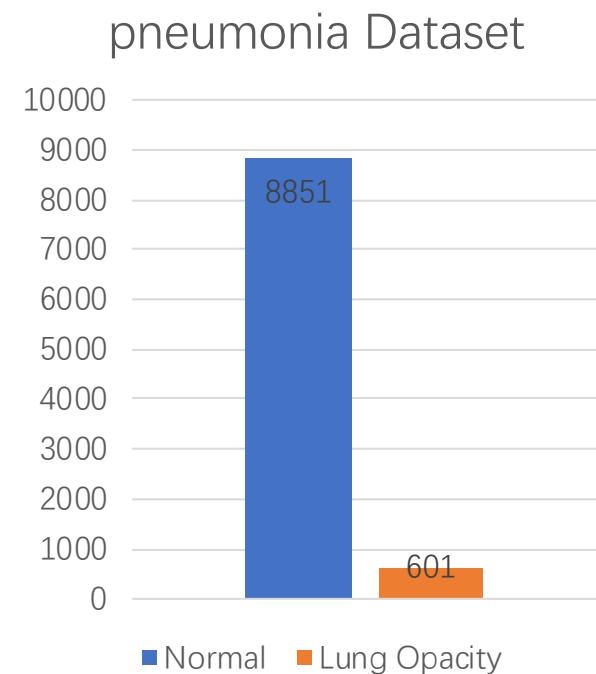
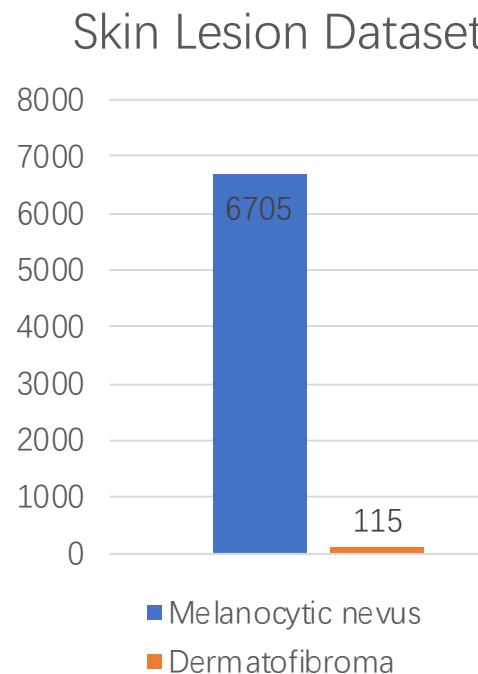
中山大學
SUN YAT-SEN UNIVERSITY



**University
of Dundee**

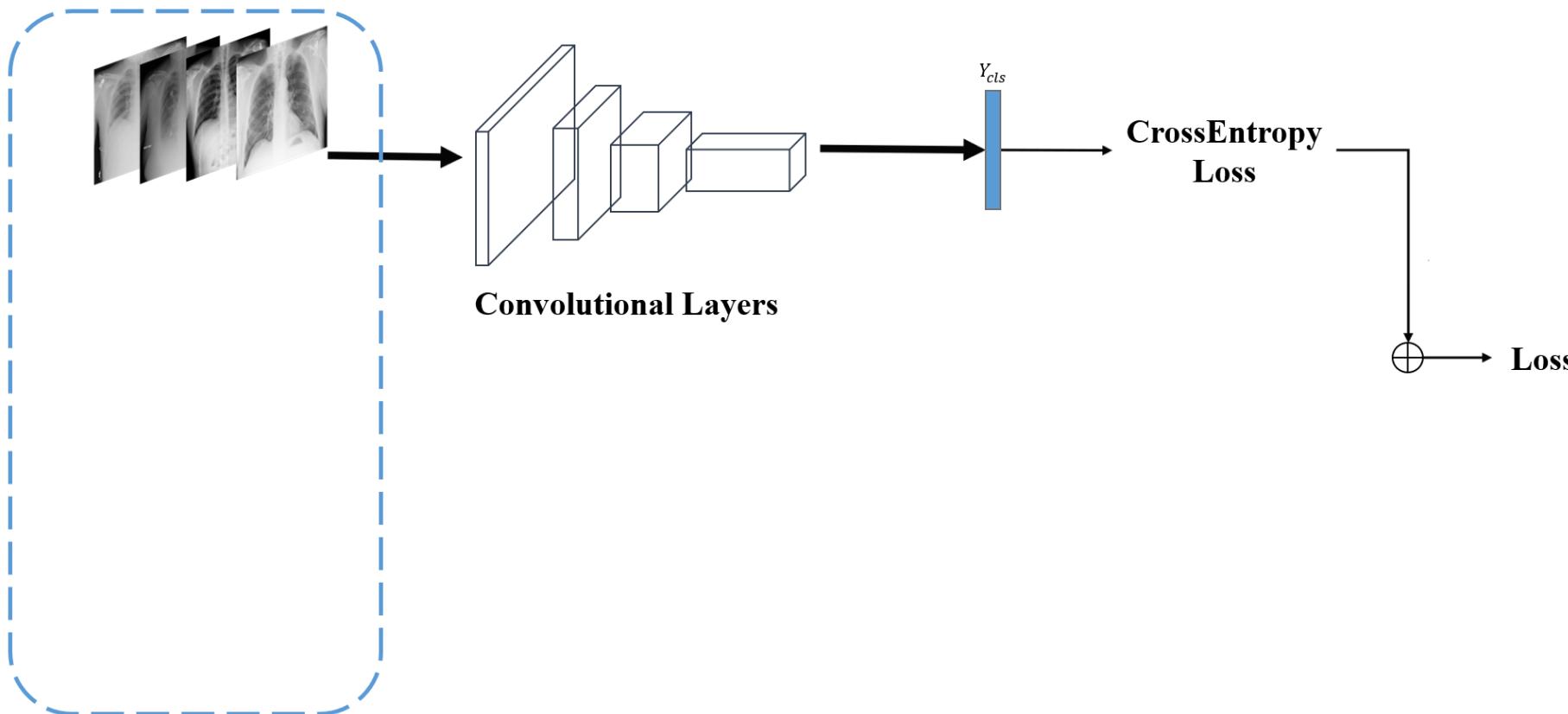
Introduction

To date, it is still an open and challenging problem for intelligent diagnosis systems to effectively learn from **imbalanced data**, especially with **large samples of common diseases and much smaller samples of rare ones**.



Framework

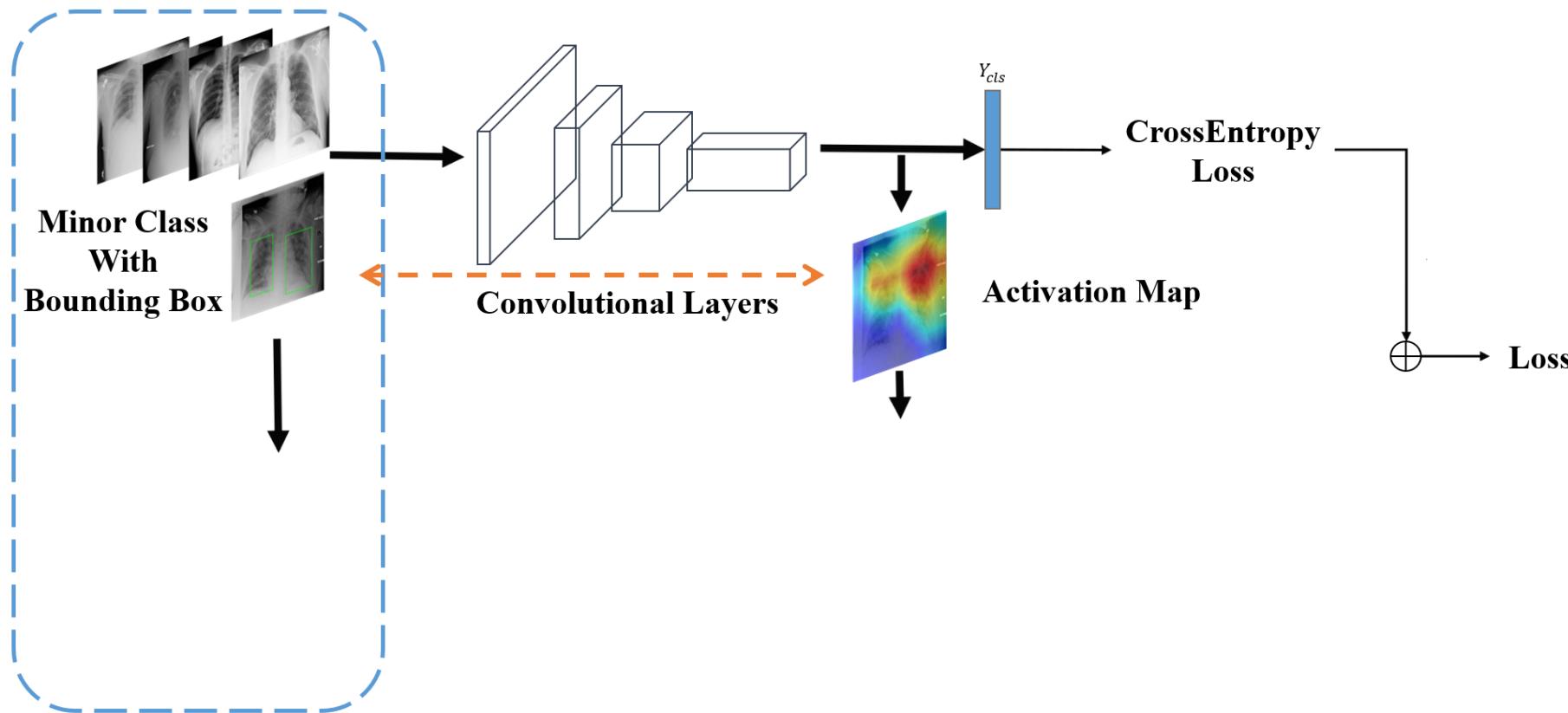
F-T-7



Attention Loss

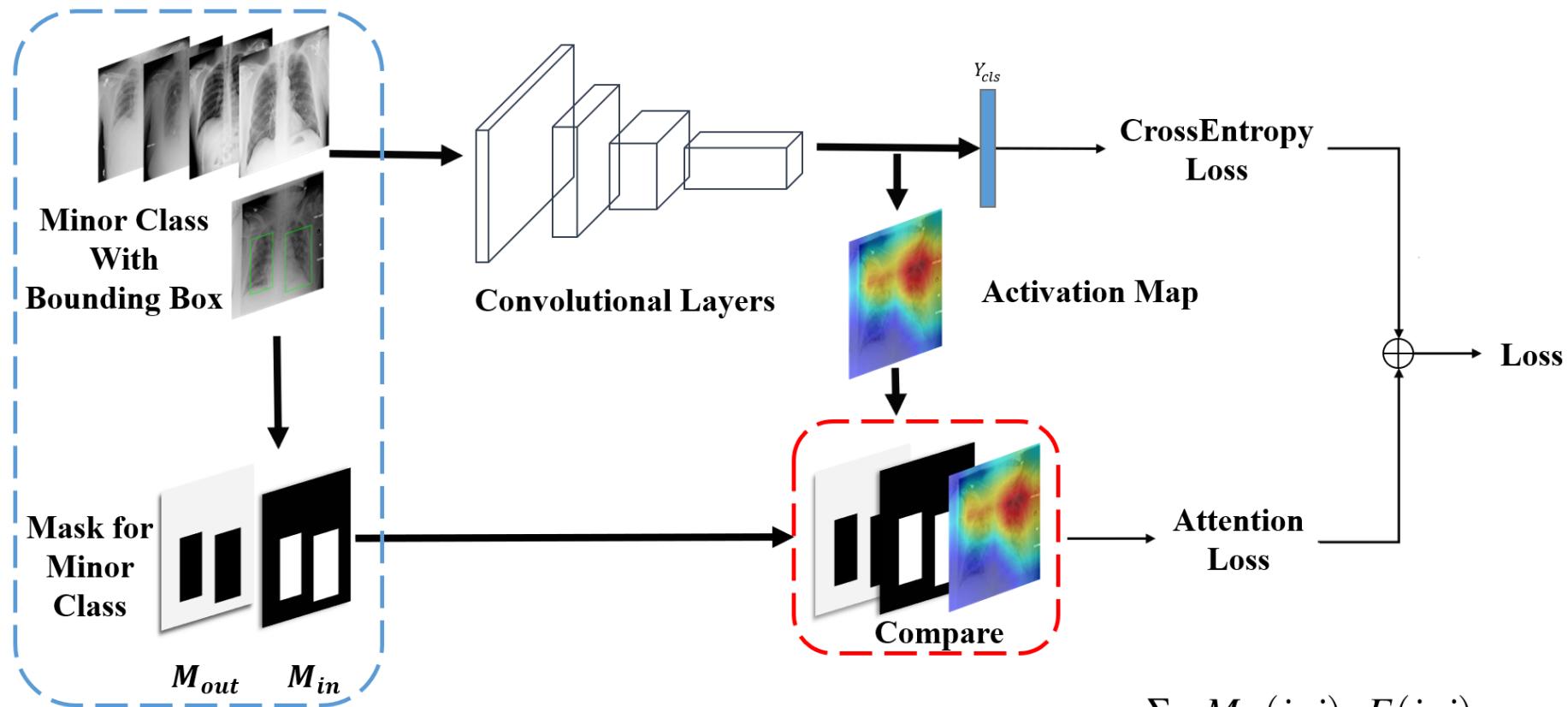
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Embed attention into the machine learning process



Attention Loss

Embed attention into the machine learning process



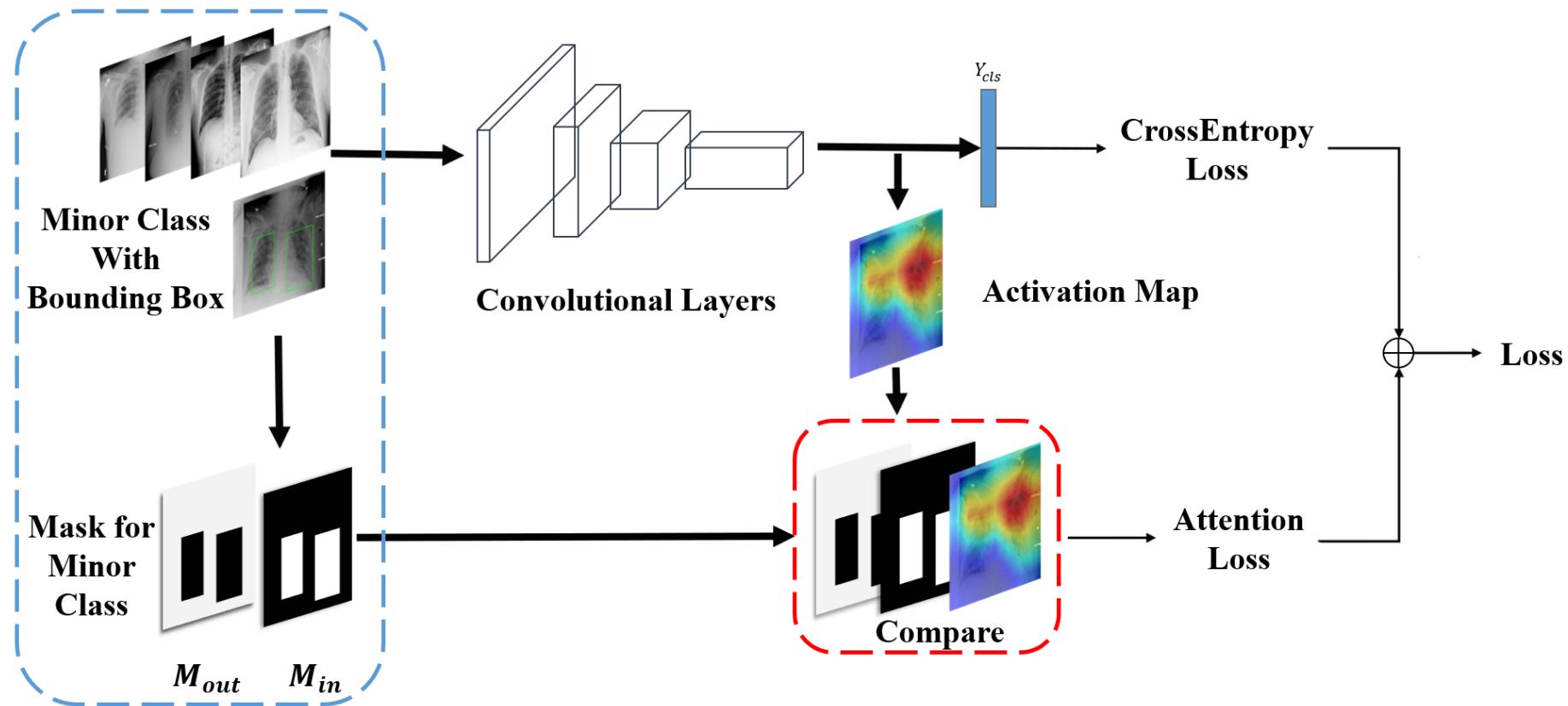
Attention loss : $L_a = L_{in} + \lambda L_{out}$, where

$$L_{in} = -\min\left(\frac{\sum_{i,j} M_{in}(i,j) \cdot F(i,j)}{\sum_{i,j} M_{in}(i,j)}, \tau\right)$$

$$L_{out} = \frac{\sum_{i,j} M_{out}(i,j) \cdot F(i,j)}{\sum_{i,j} M_{out}(i,j)}$$

Attention Loss

Embed attention into the machine learning process



- The inner loss L_{in} helps the classifier learn to attend to lesion regions.
- The outer loss L_{out} helps the classifier learn to decrease the attention outside lesion regions.

Experiments & Visual Insight

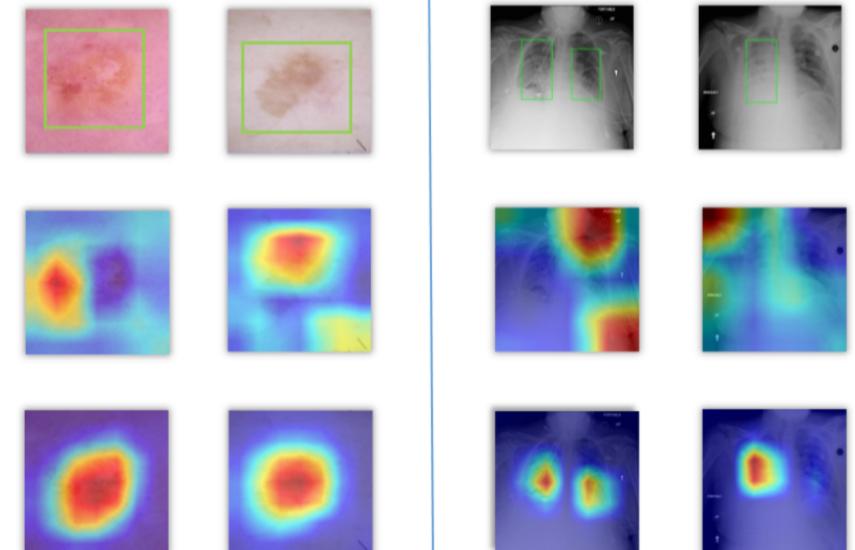
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CARE outperforms widely-used methods
for handling data imbalance

Penuomia Dataset			Skin Dataset	
Model	recall(%)	MCA(%)	recall	MCA(%)
baseline	7.41	56.77	47.83	75.75
CARE (ours)	31.12	63.29	52.17	76.16
CSL	11.11	57.88	61.91	80.21
CARE+CSL (ours)	45.04	65.23	65.22	81
FL	11.14	58.41	38.3	72.72
CARE+FL (ours)	49.44	66.72	40.28	74.06
DA	20.06	59.64	56.62	54.41
CARE+DA(ours)	45.18	65.97	60.32	56.22

CARE model can learn to
focus on lesion regions

images with
bounding box



without CARE

with CARE

Thank you!

Poster: F-T-7