# PRCV 2024广域红外小目标检测挑战赛

# 优胜方案分享

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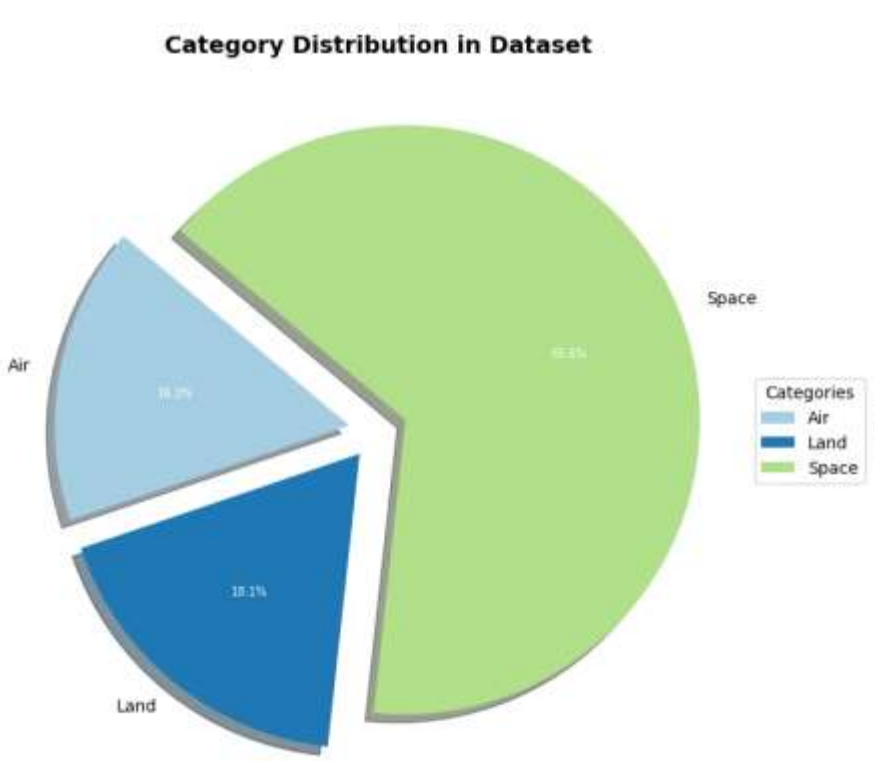
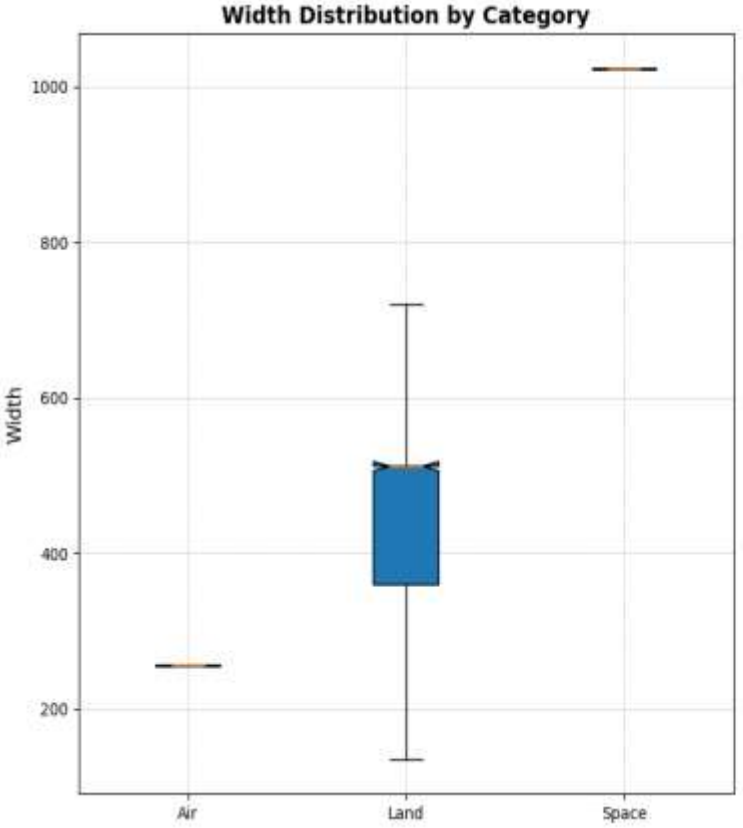
# 00 目录

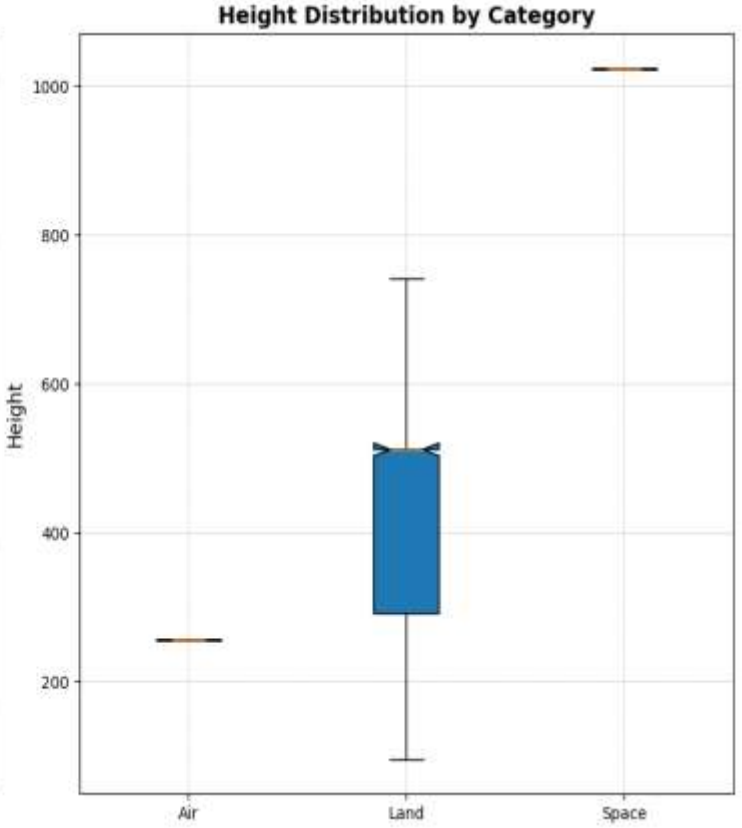
# 01 数据分析

## □ 类别不太均匀且不同类别间图像大小有差异

- 依据**类别均匀且像素总数均匀**的原则划分5折，构造合理的验证集是关键。



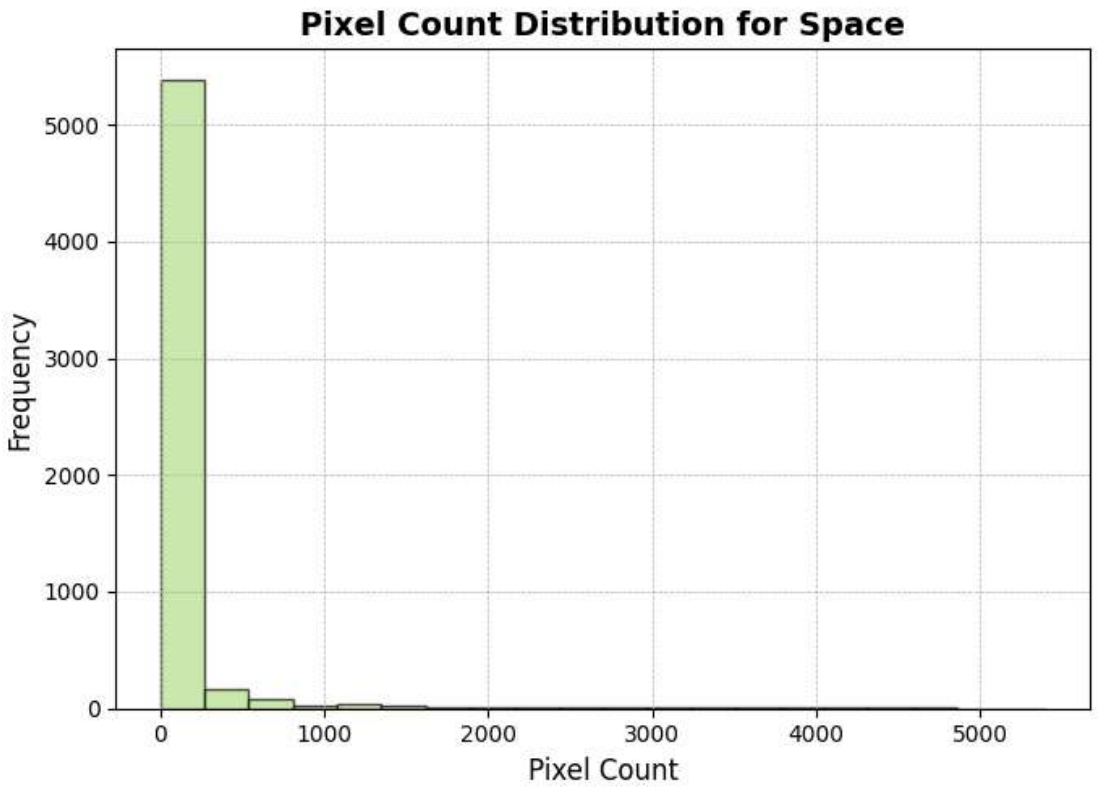



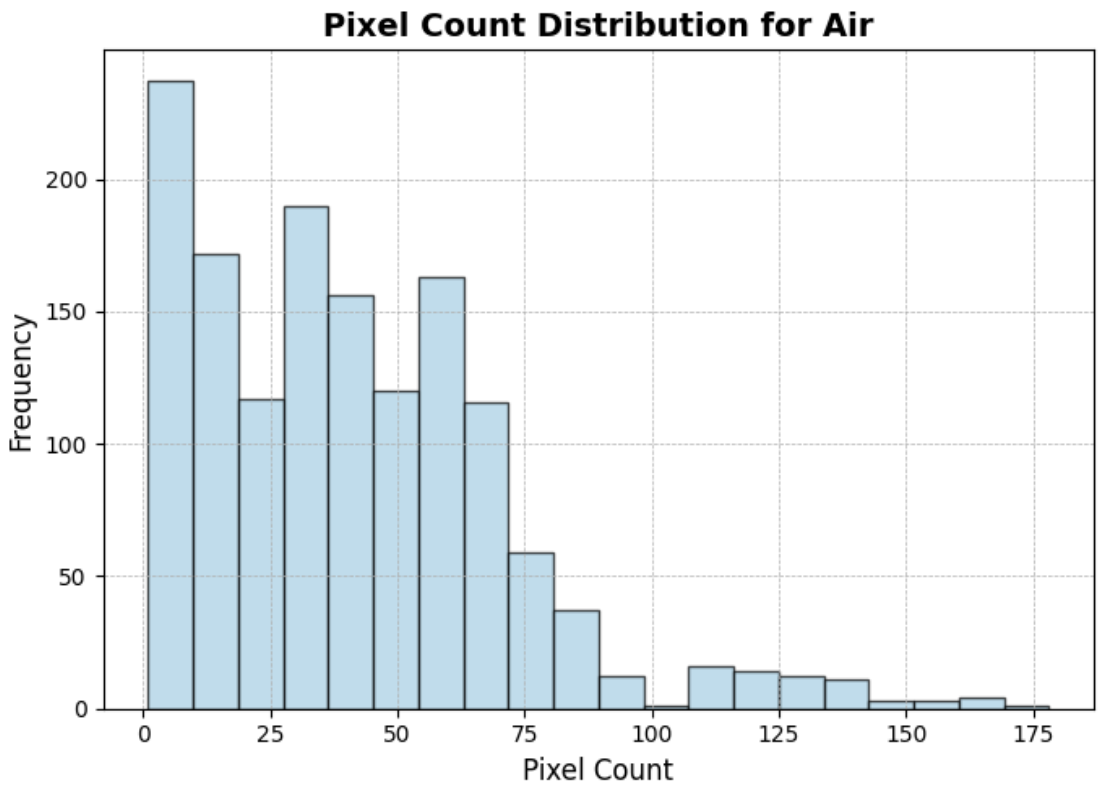



# 01 数据分析

## □ 不同类别图像的前景像素总数有差异

• 训练前期可以采取copy-paste对**较少**像素个数的类别图像做增强，可加速模型收敛，后期需要关闭copy-paste。



# 02 对我无效的方法尝试

## 口 模型方面

- HCFNet（2024.03）
- MSHNet（2022.03）
- MSDANet（2023.10）
- GGLNet（2023.08）
- SPIRNet（2024.02）
- UIUNet（2022.12）

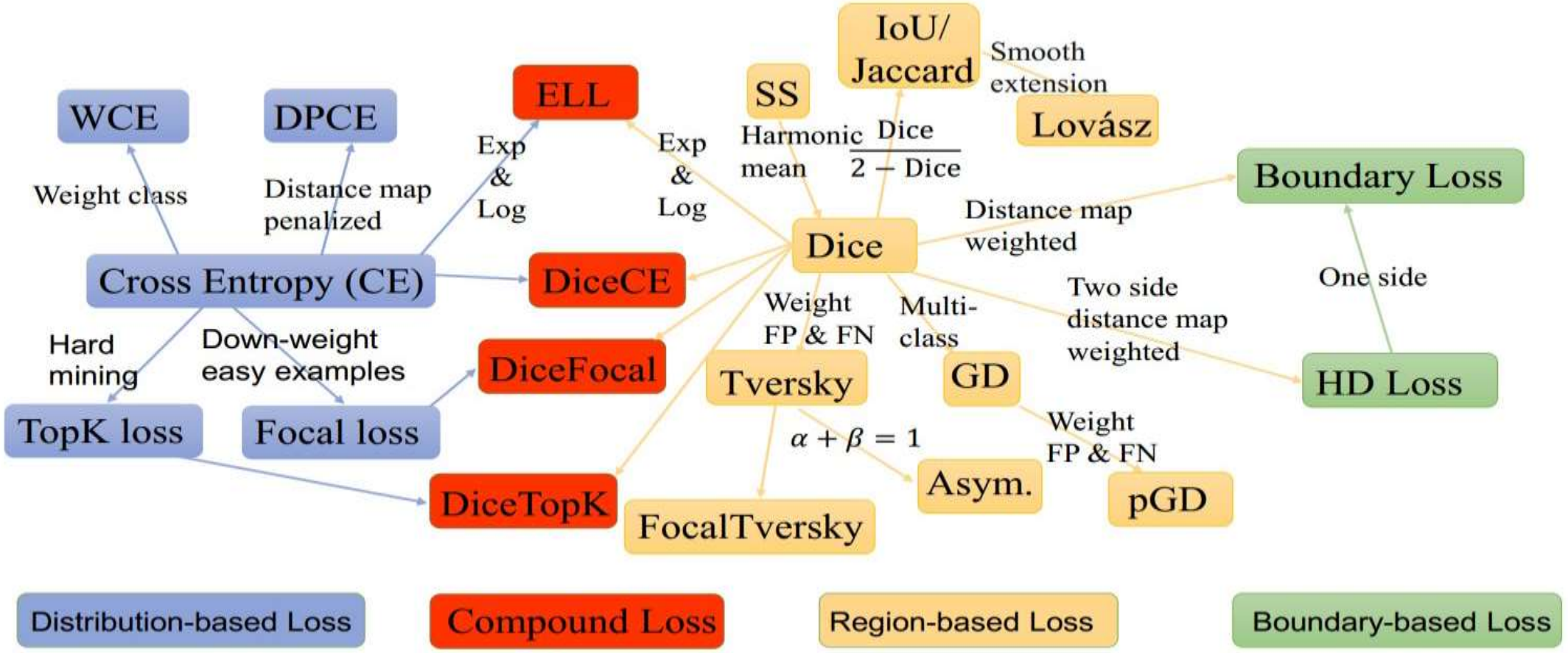
## 口 数据增强方面

- 亮度对比度
- 高斯噪声
- 随机擦除
- CutMix
- Mosaic
- AugMix
- Diffusion mosaic [1]

[1] Shi Y, Lin Y, Wei P, et al. Diff-Mosaic: Augmenting Realistic Representations in Infrared Small Target Detection via Diffusion Prior[J]. IEEE Transactions on Geoscience and Remote Sensing, 2024.

# 02 对我无效的方法尝试

## 口 损失函数方面 [1]




[1] https://www.kaggle.com/competitions/uw-madison-gi-tract-image-segmentation/discussion/329396

# 02 对我无效的方法尝试

## 口 策略方面

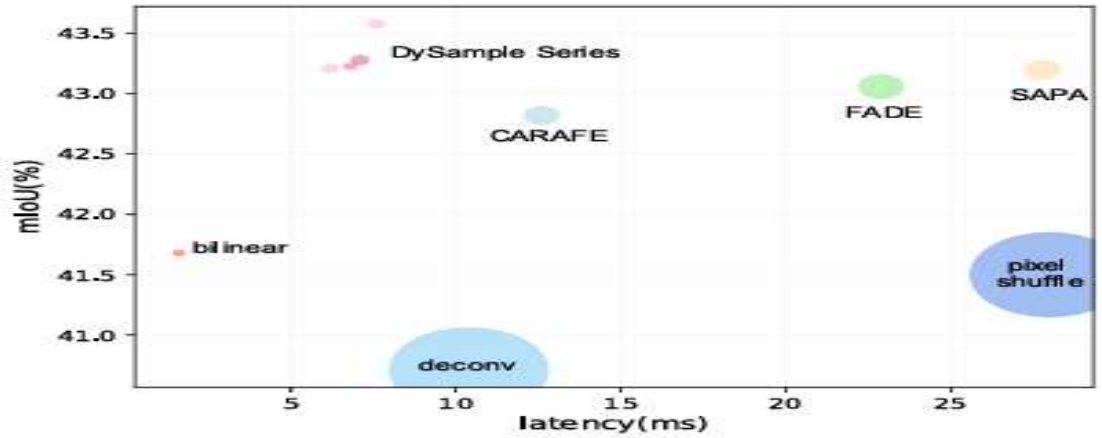
- 不同类别的图像用不同的网络分支
- 放大图像尺寸
- 类别过采样 [1]
- 将整体数据拼成大图统计均值方差用于归一化
- 降低batchsize后BatchNorm换成GroupNorm
- 将图像类别作为辅助损失

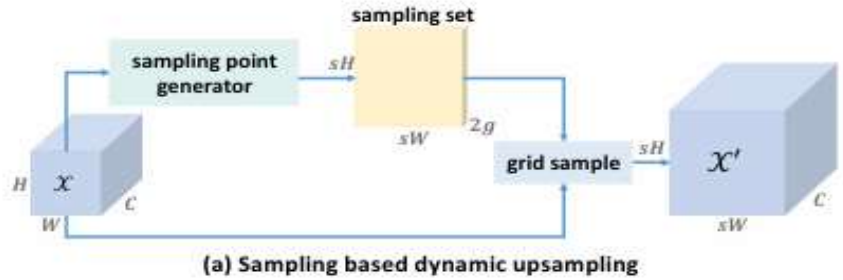
[1] https://github.com/ufoym/imbalanced-dataset-sampler

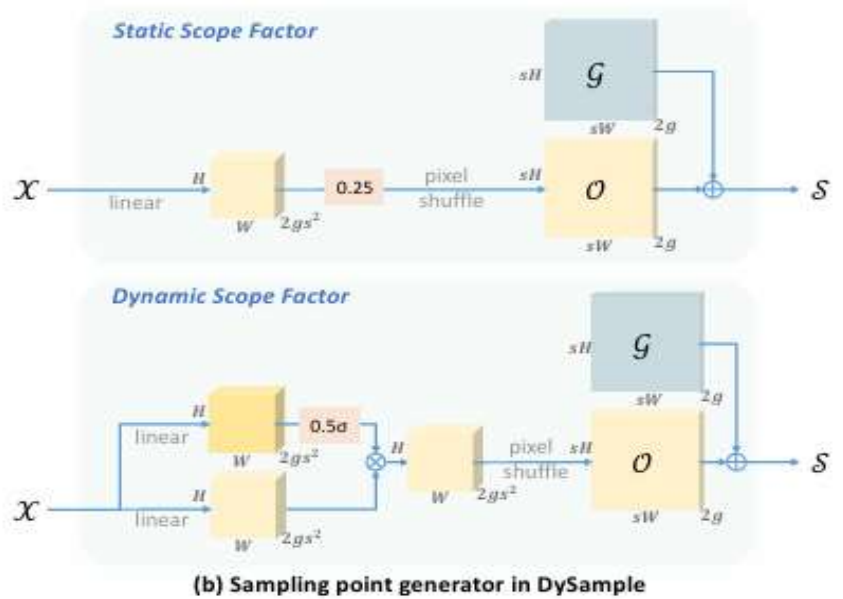
# 03 对我有效的方法尝试

## 口 模型方面

- SCTransNet [1]
- 上采样替换成Dysample [2]
- SCTB模块融合Mamba的SS2D




[1] Yuan S, Qin H, Yan X, et al. Sctransnet: Spatial-channel cross transformer network for infrared small target detection[J]. IEEE Transactions on Geoscience and Remote Sensing, 2024.
[2] Liu W, Lu H, Fu H, et al. Learning to upsample by learning to sample[C]//Proceedings of the IEEE/CVF International Conference on Computer Vision. 2023: 6027-6037.

# 03 对我有效的方法尝试

## 口 数据增强方面

- 翻转、旋转增强
- 训练前期采取copy-paste对相同类别相同batch的图像做在线增强，后期关闭copy-paste

## 口 损失函数方面

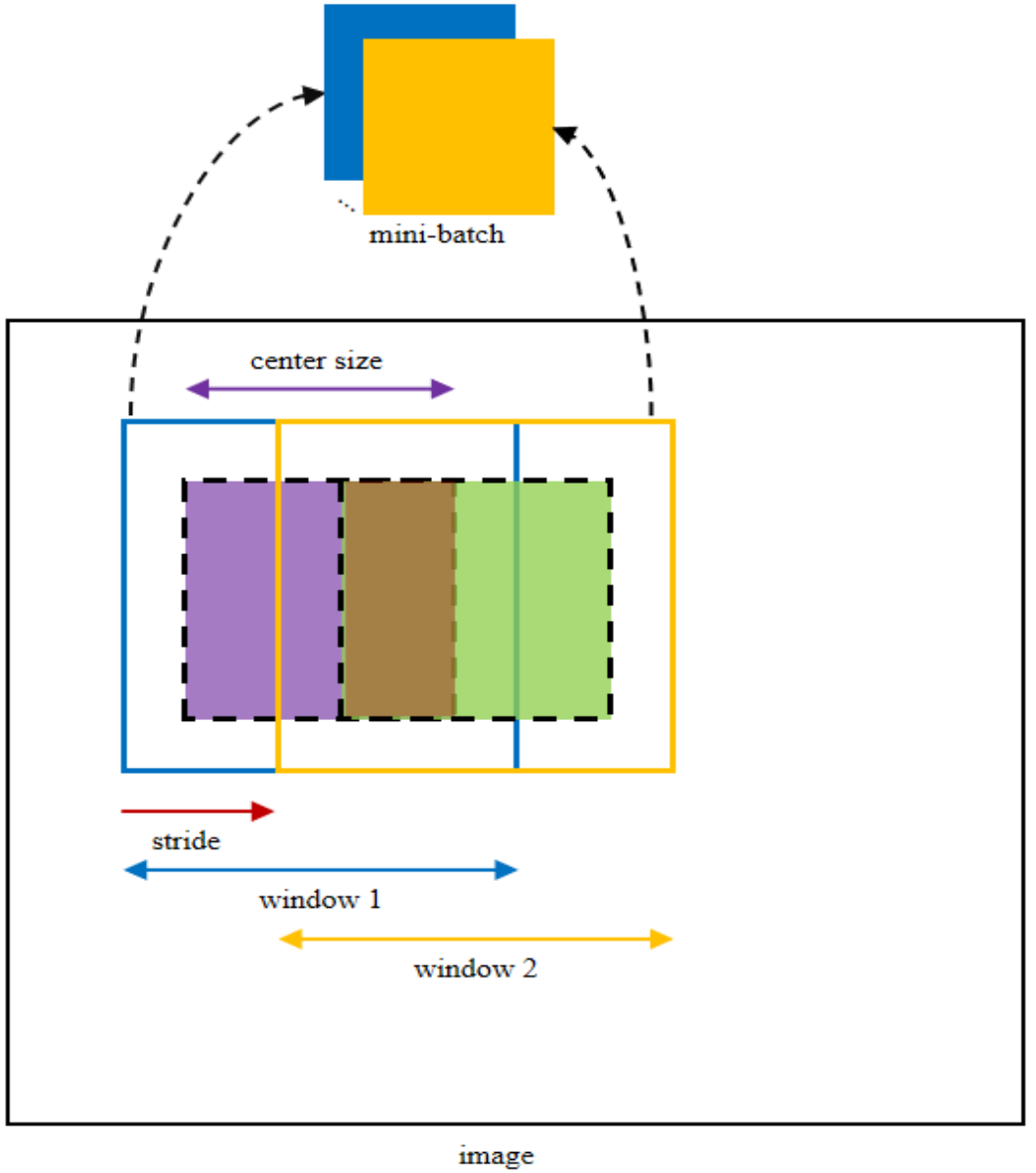
- 带有深监督的BCE Loss
- 最后使用Lovasz Loss [1]微调模型（一般都有效果）

[1] Berman M, Triki A R, Blaschko M B. The lovász-softmax loss: A tractable surrogate for the optimization of the intersection-over-union measure in neural networks[C]//Proceedings of the IEEE conference on computer vision and pattern recognition. 2018: 4413-4421.

# 03 对我有效的方法尝试

## 口 策略方面

- Warmup
- Transformer模型往往要训得久一些
- Test Time Augmentation
- Stochastic Weight Averaging
- 滑窗推理技巧（注意大图边缘的滑窗处理方法）
- 换不同的种子与划分策略找CV, LB, PB的相关性



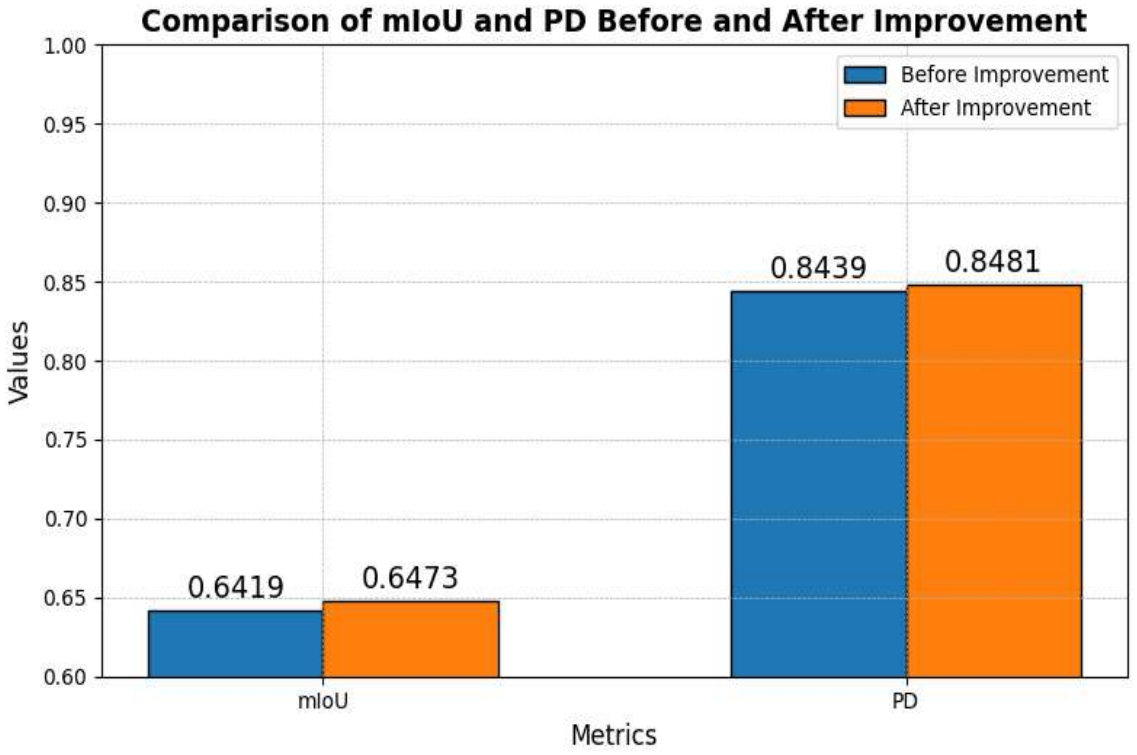
# 03 对我有效的方法尝试

## 口 不成文的技巧

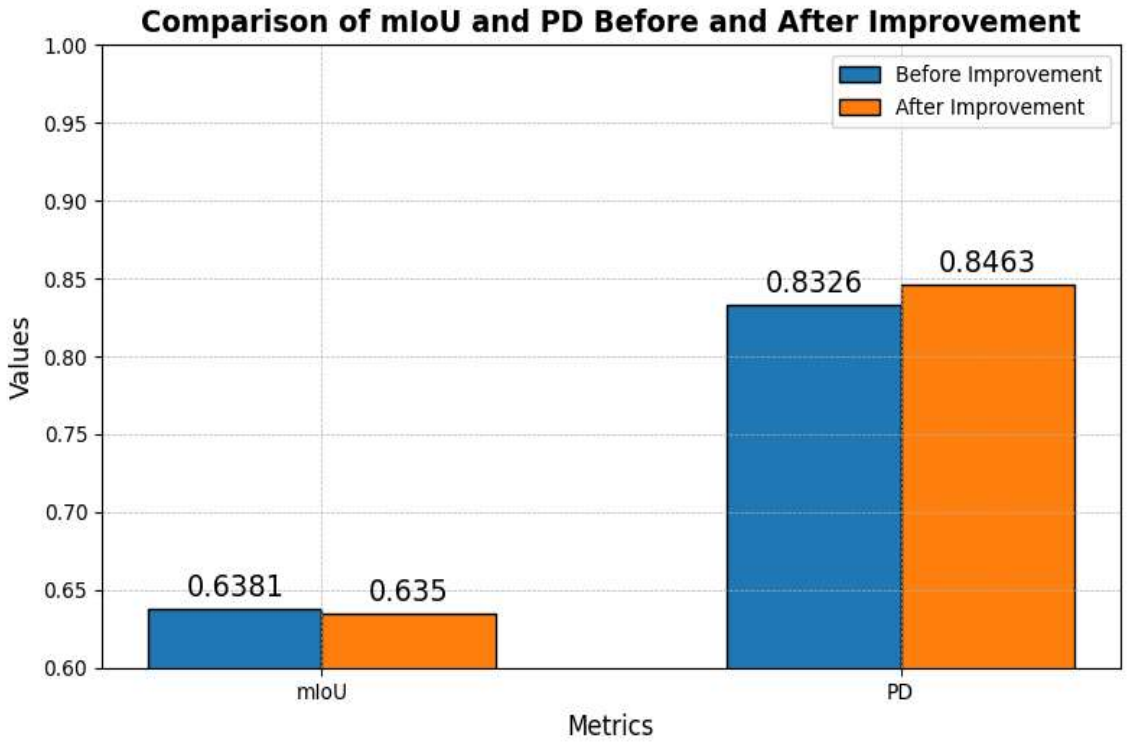
- 不同类别不同阈值，降低Space类别阈值
- 如果Space类别的图没有前景，阈值降低至0.001
- 双阈值法，对于低阈值区间的前景目标，将其闭环连通域质心赋值255

# 04 一些实验结果

## □ 上采样替换成Dysample

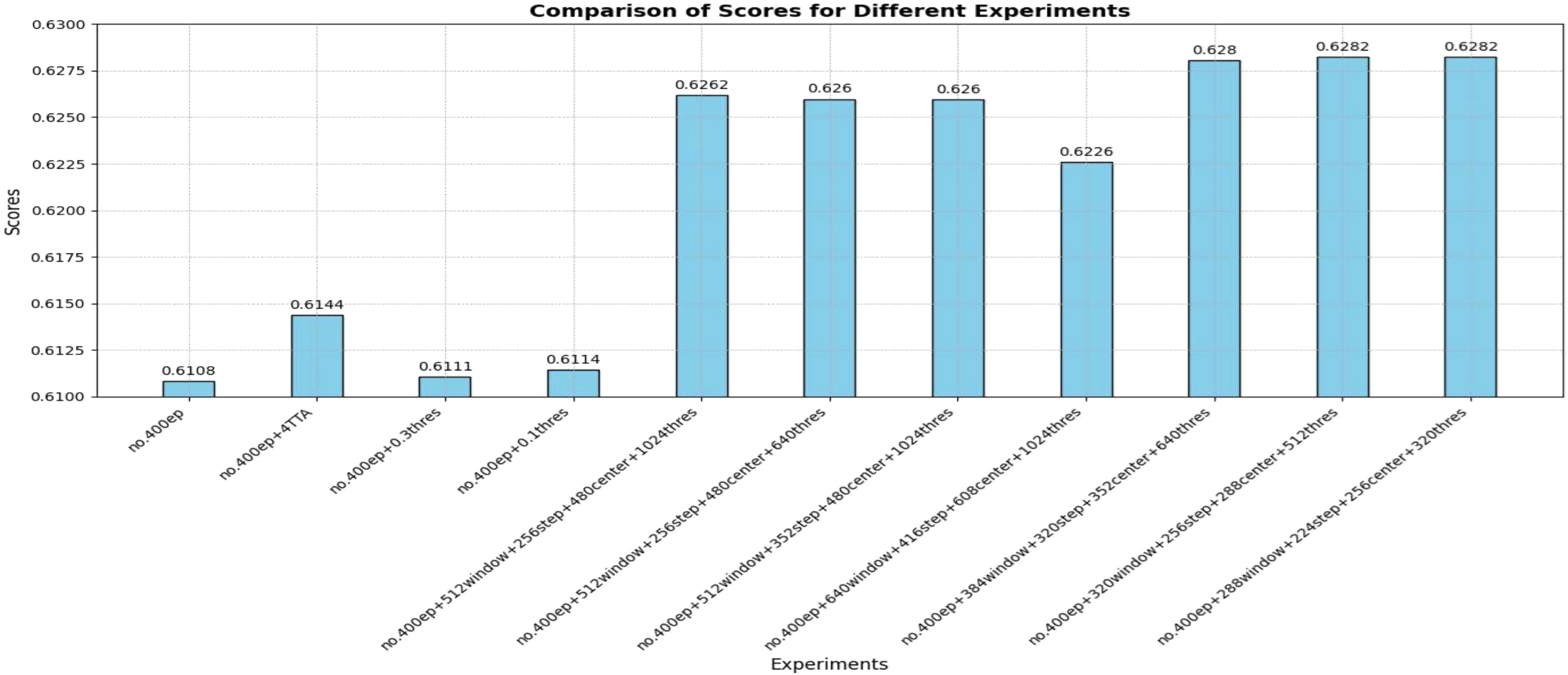



## □ copy-paste 增强



# 04 一些实验结果

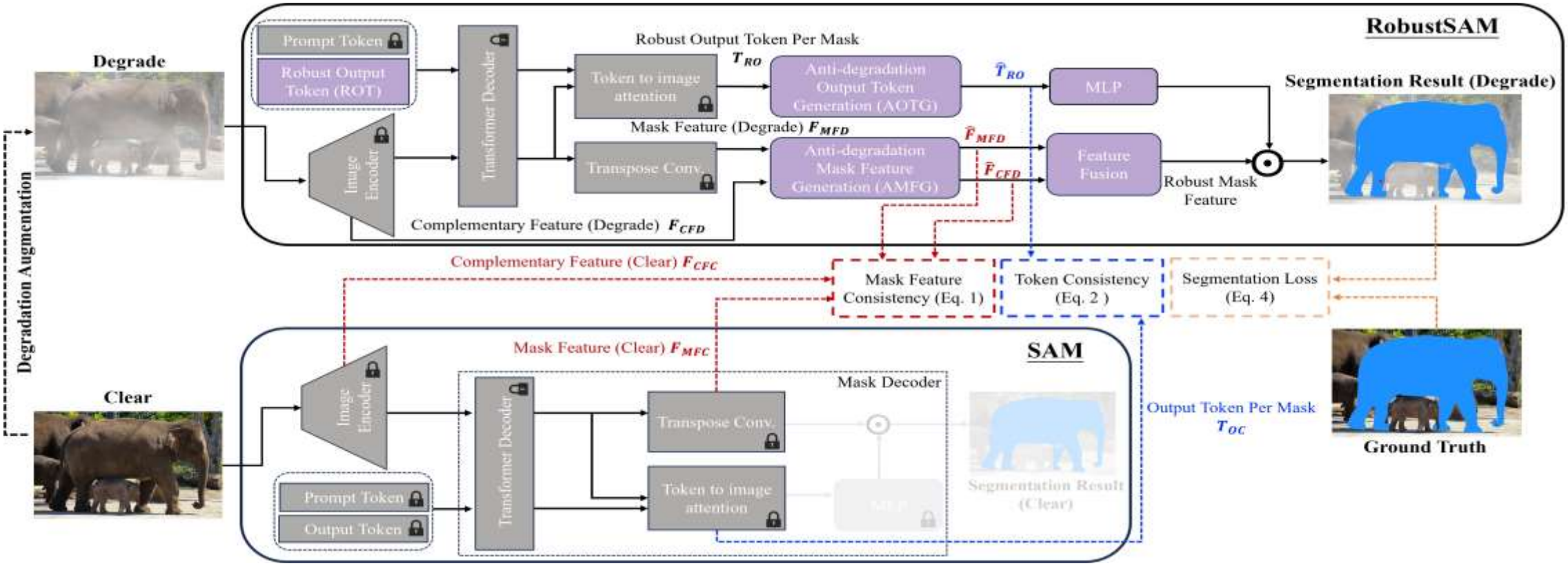
## □ 滑窗图像大小，中心裁剪大小，步长



# 05 展望

## □ ICPR Track1 RobustSAM [1]

## SAM, HQ-SAM, HR-SAM在小目标分割上效果不太行



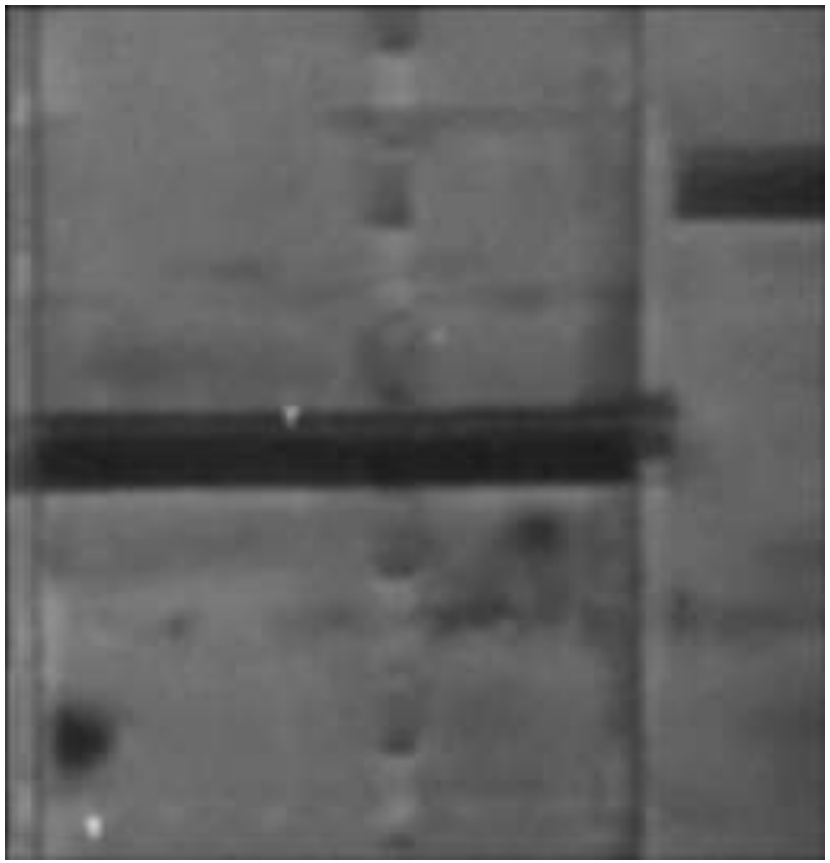

[1] Chen W T, Vong Y J, Kuo S Y, et al. RobustSAM: Segment Anything Robustly on Degraded Images[C]//Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2024: 4081-4091.

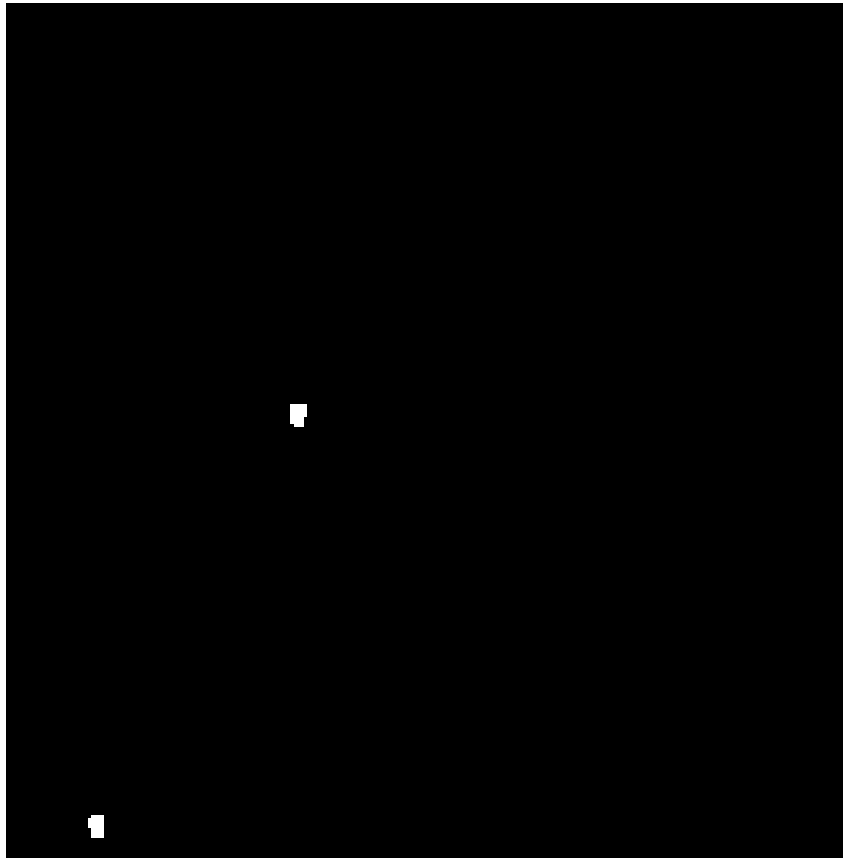
# 05 展望

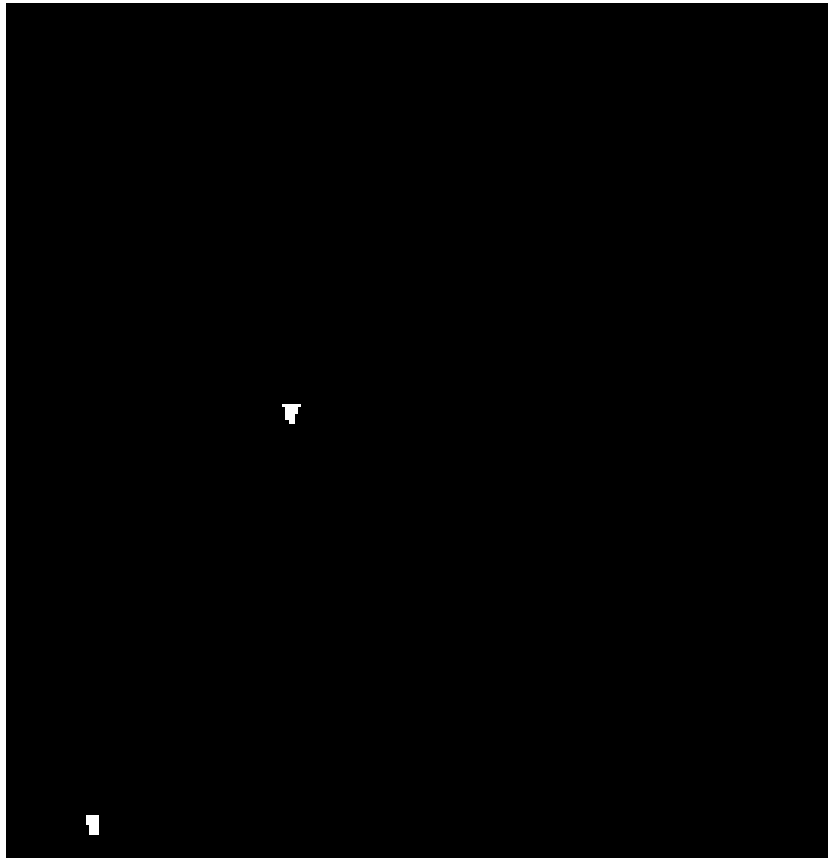
## □ RobustSAM标注效果

pseudo label

ground truth







# 05 展望

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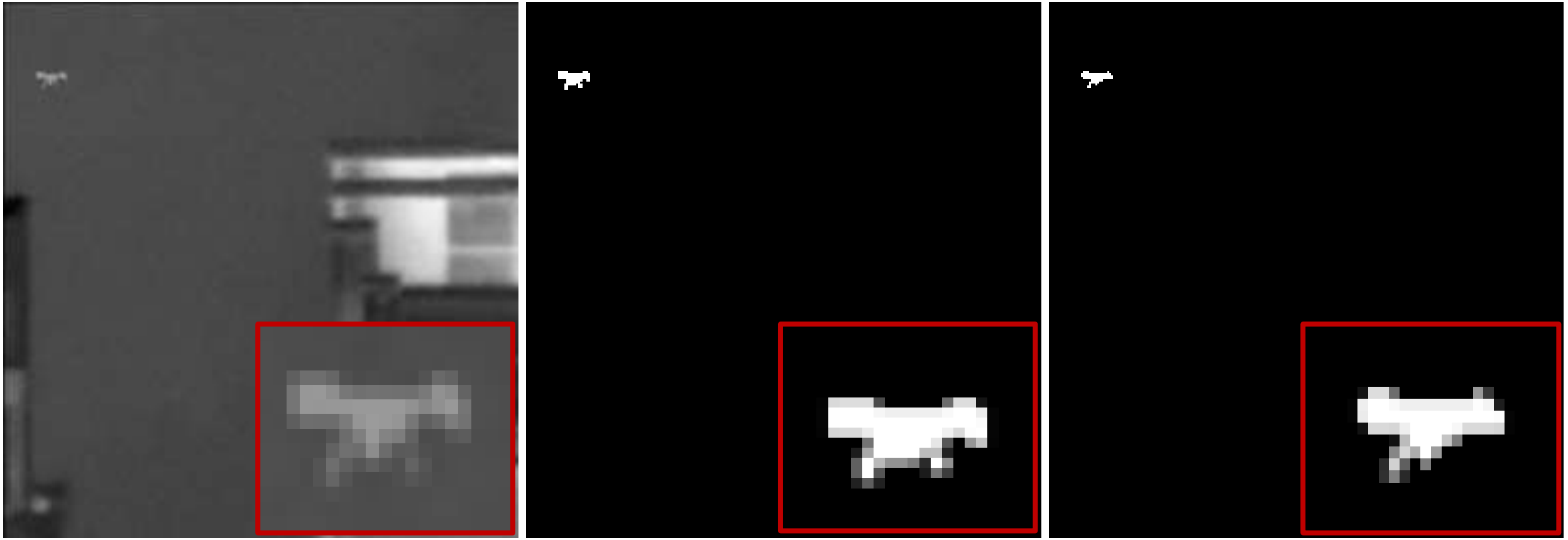
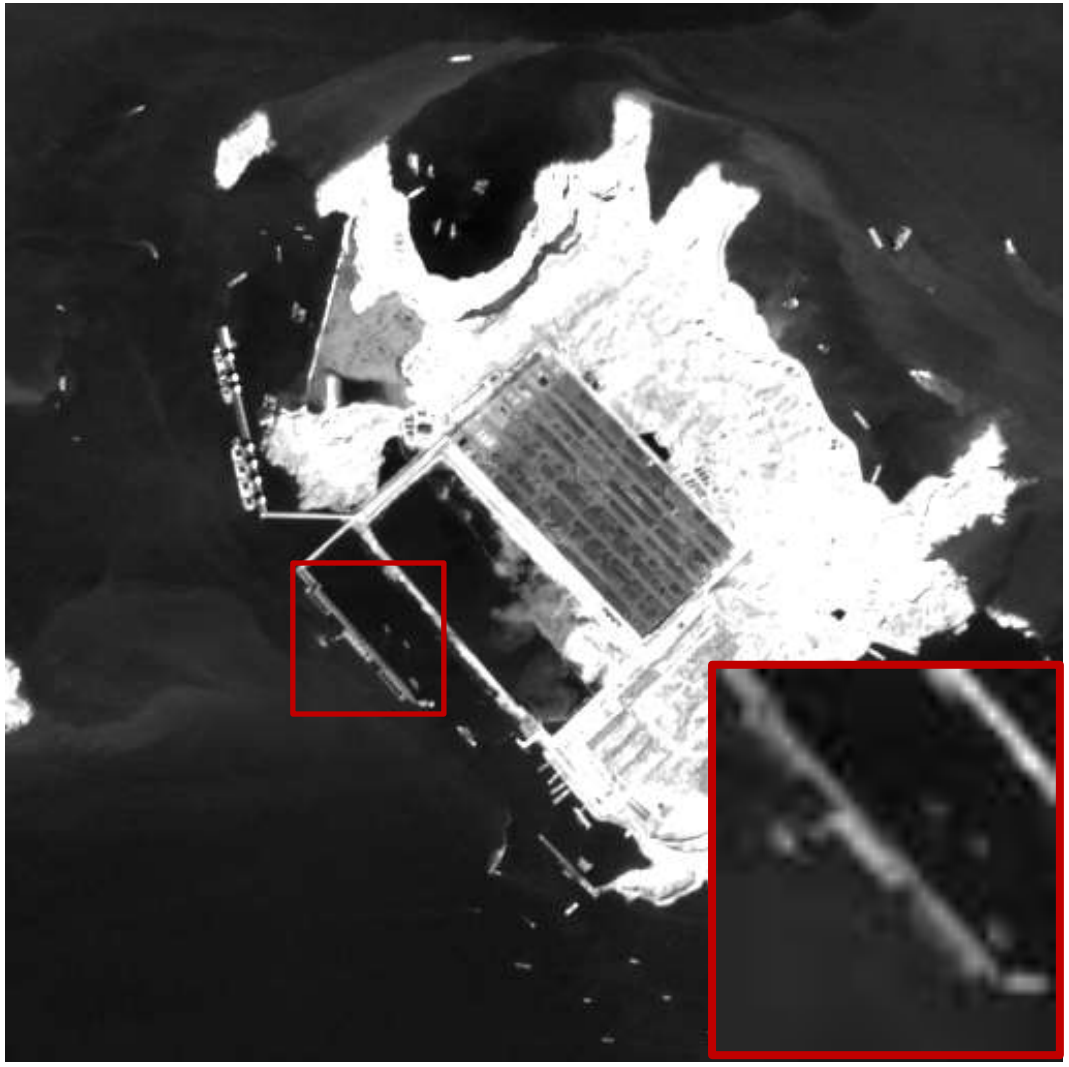
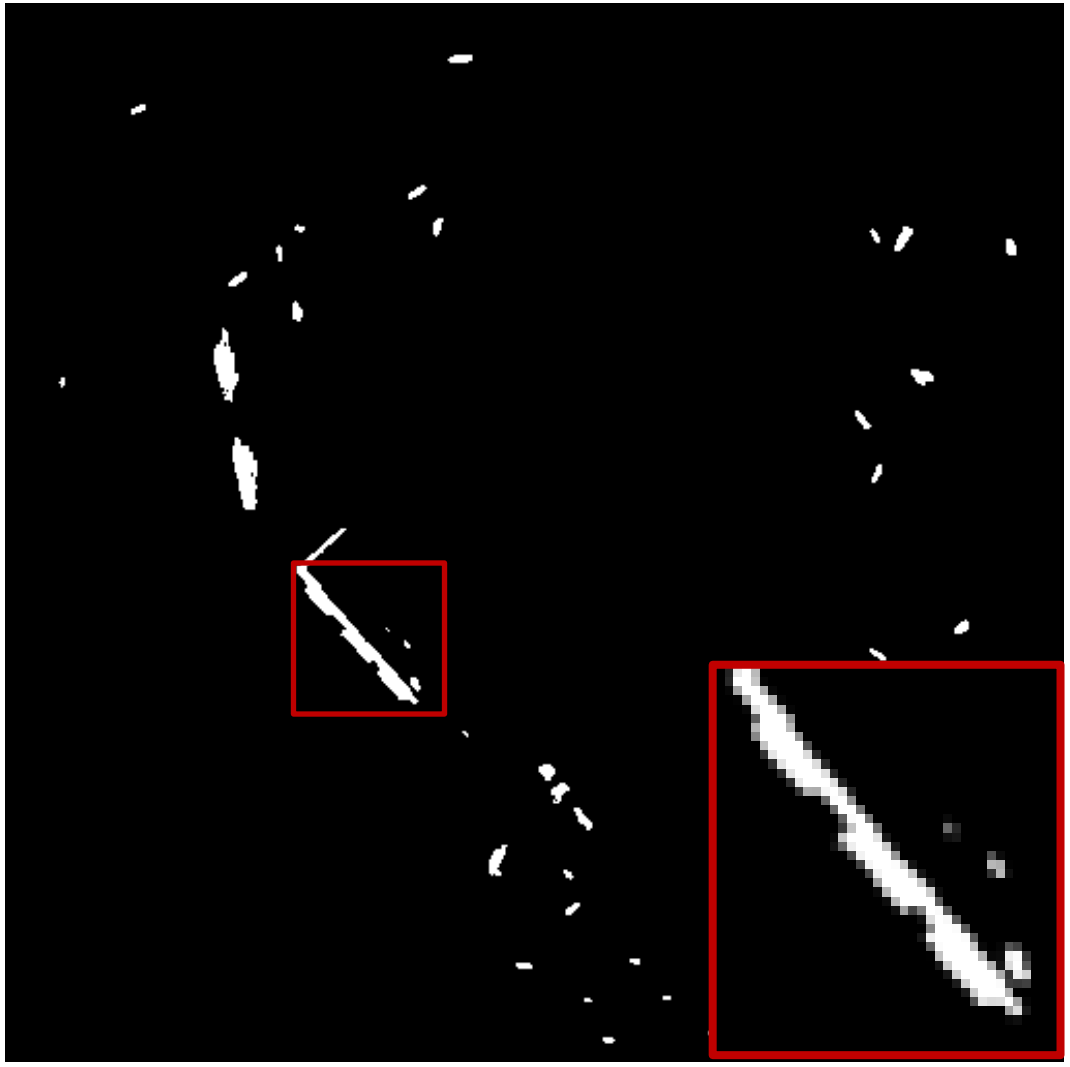
pseudo label　　ground truth



# 05 展望

## □ RobustSAM标注效果





# 自我介绍

现负责大规模交通场景图像生成，《中控AIGC》项目主要负责人

## 论文

[1] Zan Chen, **Chenxu Peng**, Yuanjing Feng*, et al. *Deep-based super-angular resolution for diffusion imaging (PRCV 2021).*

[2] Zan Chen, **Chenxu Peng**, Yuanjing Feng*, et al. *Super-resolved q-space learning of diffusion MRI (Med Phys 2023).*

[3] Zan Chen, **Chenxu Peng**, Yuanjing Feng*, et al. *Brain tumor segmentation via uncertainty guided transformer (MBEC 2023).*

[4] C Jiang, B Lin, X Ye, Y Yu, P Xu, **C Peng**, T Mou, et al. *Graph convolutional network with attention mechanism improve major depressive depression diagnosis based on plasma biomarkers and neuroimaging data (JAD 2023).*

[5] L Wang, Y Guo, Y Wang, et al. *NTIRE 2021 challenge on stereo image super-resolution: methods and results (CVPRW 2021).*

[6] Carmen Martín-Martín, Zan Chen, et al. *Validation of deep learning techniques for quality augmentation in diffusion MRI for clinical studies (NeuroImage 2023).*

# 自我介绍

## 竞赛

[01] 2019 全国大学生数学建模竞赛**全国二等奖**

[02] 2021 **华为云**阿尔茨海默症分类竞赛**季军**

[03] 2021 **CCF**婴儿血管瘤超声图像分割竞赛**冠军**

[04] 2021 **百度**飞桨花样滑冰选手骨骼点动作识别挑战赛**TOP1%**

[05] 2022 **百度**飞桨乒乓球运动员时序动作定位大赛**冠军** (PaddleVideo TCANet++作者)

[06] 2022 **CVPR** NTIRE challenge on stereo image super-resolution**第七名**

[07] 2022 **MICCAI**偏头痛患者dMRI超分辨率竞赛**第五名**

[08] 2022 **Kaggle** HuBMAP + HPA - Hacking the Human Body**金牌**

[09] 2023 **科大讯飞**脑PET图像分析和疾病预测挑战赛**冠军**

[10] 2023 **Kaggle** UBC Ovarian Cancer Subtype Classification and Outlier Detection**银牌**

[11] 2024 **Kaggle** SenNet + HOA - Hacking the Human Vasculature in 3D**银牌**

[12] 2024 **Kaggle** HMS - Harmful Brain Activity Classification**银牌**

[13] 2024 **Kaggle** CVPR Image Matching Challenge**银牌**

[14] 2024**中国航天**"智衡屋"AI挑战赛赛道二遥感目标识别赛**季军**

[15] 2024 **PRCV**广域红外小目标检测挑战赛**冠军**

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# 谢 谢!