SURF SHORT REVIEW

GROUP B

CONTEXT

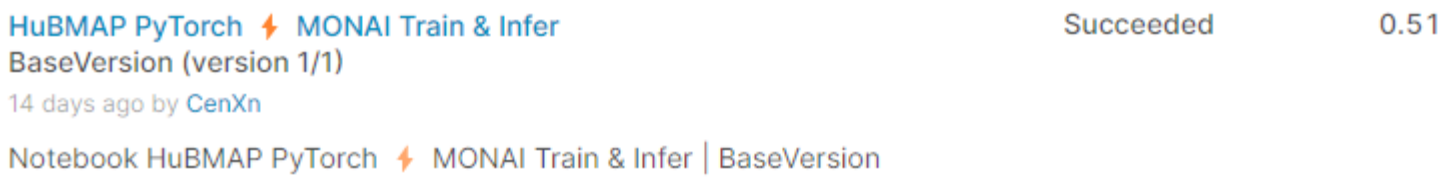
- UW-Madison Gi Tract Image Segmentation
- HubMap+HPA – Hacking the Human Body Task

UW-MADISON GI TRACT IMAGE SEGMENTATION

- Apply same baseline on HubMap Competition

HuBMAP: UNet Semantic Approach [Infer] unet-eff1-diceloss/best_epoch-04 (1).bin (version 2/2) 15 days ago by 15 Notebook HuBMAP: UNet Semantic Approach [Infer] | unet-eff1-diceloss/best_epoch-04 (1).bin	Succeeded	0.38
HuBMAP: UNet Semantic Approach [Infer] unet-eff1-diceloss/best_epoch-04.bin (version 1/2) 15 days ago by 15 Notebook HuBMAP: UNet Semantic Approach [Infer] | unet-eff1-diceloss/best_epoch-04.bin	Succeeded	0.39
HuBMAP: UNet Semantic Approach [Infer] (version 2/4) 16 days ago by CenXn Unet++ Effb0 Epoch120	Succeeded	0.19

SAME RESIZE STRATEGY WITH MONAI



- Better, but hard to improve.

SHORT RESULT

Network Architecture	Loss Function	Epoch Number	No. of Model	Public Score
UnetPlusPlus + Efficient-b0	Dice	120	Last Epoch	0.19
UnetPlusPlus + Efficient-b0	Dice	120	Best Epoch	0.39
Unet + Efficient-b1	Dice	20	Best Epoch	0.39
Unet	Dice	10	Best Epoch	0.51

RESIZE STRATEGY SUMMARY

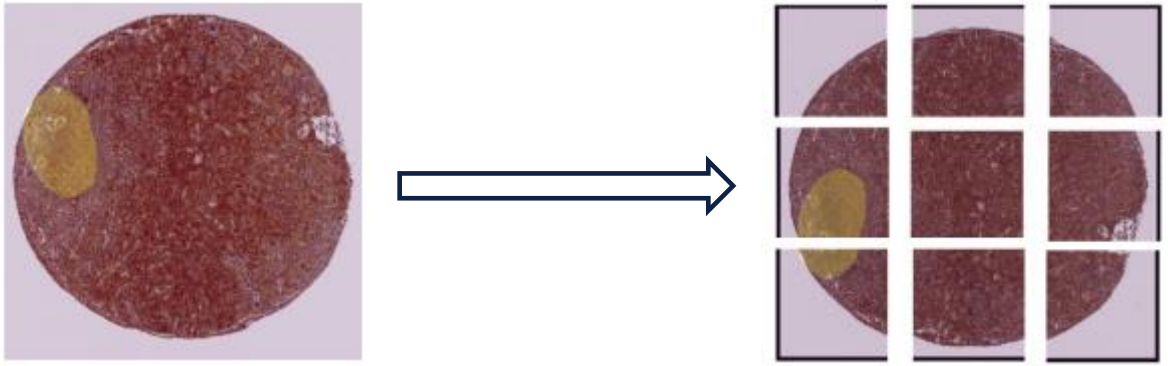
```
if scale:
    new_size = (image.shape[1] // scale, image.shape[0] // scale)
    image = cv2.resize(image, new_size)
    mask = cv2.resize(mask, new_size)
```

```
post_pred_transform = monai.transforms.Compose(
    [
        monai.transforms.Resize(spatial_size=(height, width), mode="nearest"),
        monai.transforms.Activations(sigmoid=True),
        monai.transforms.AsDiscrete(threshold=threshold),
    ]
)
```

- Summary:
  - Directly Resize the image, performance bad.
- Try to use tilling method.

TILE METHOD

- Divide the original image into 9 parts, and resize into 256x256.



- And apply with UneXt50, which similar with previous competition: Hacking the Kidney.
  - Unet + Res50Net +ASPP + FPN

SHORT RESULT (THRESHOLD = 0.225)

Network Architecture	Augmentation Strategy	Epoch Number	No. of Model	Public Score
UneXt50	Original	15	All the Four Models	0.57
UneXt50	1st	15	All the Four Models	0.56
UneXt50	3rd	15	All the Four Models	0.64
UneXt50	512x512 Dataset+3rd	25	All the Four Models	0.37
UnetXt50	512x512 Dataset+3rd + Changed Mean, Std, Pre-train Model	25	All the Four Models	0.40

Gradient explosion with zero accuracy during training.

Note:
512x512: Divide Original Image into 9 parts and resize into 512x512.
All the model used the Symmetric Lovász loss.
Symmetric Lovász loss: Symmetric binary Lovasz hinge loss.

SHORT RESULT (THRESHOLD = 0.225)

Network Architecture	Augmentation Strategy	Epoch Number	No. of Model	Public Score
EfficientUnet(b5)	Original	32	All the Four Models	0.66
EfficientUnet(b5)	3rd	32	All the Four Models	0.65
EffificentUnet(b5)	Original + ①	32	All the Four Models	0.55
EfficentUnet (b5)	Original + Expansion	32	All the Four Models	0.68
EfficentUnet (b7)	Original	32	All the Four Models	0.68
EfficentUnet (b7)	Original + Expansion	32	All the Four Models	★ 0.70

①: Divide Original Image into 4 parts and resize into 256x256.

ANOTHER IMPROVE ASSUMPTION

- Make different organs cases the same number.

Organ	Time	Final Number
Kidney	1	186
Prostate	1	212
Spleen	3	192
Large intestine	3	198
Lung	3	232

- Possible reason that fail
  - The essence of this competition is a binary classification problem, which does not have much to do with the different number of different organ cases.

SHORT RESULT

Network Architecture	Augmentation Strategy	Threshold	No. of Model	Public Score
EfficientUnet(b5)	Original + Expansion	0.225	All the Four Model	0.68
EfficientUnet(b5)	Original + Expansion + Balanced Dataset	0.225	All the Four Model	0.58
EfficientUnet(b5)	Original + Expansion + Balanced Dataset	0.10	All the Four Model	0.67

Thank you!