Seegene M Detection with attention module

20210325 강현정

Additional Experiments

1. Which level attention module shows best result?
   - According to previous result, model showed it is good at catching low-level features
   - Considering that, attention module on low-level would be more accurate than on high-level

2. Still deep layers problematic in our model?
   - Attention module adopted to avoid missing information during convolution operation
   - It would be solved to some extent

3. Still ResNeXt effective in our model?
   - ResNeXt is good for learning various feature expressions
   - It still would be effective in our model

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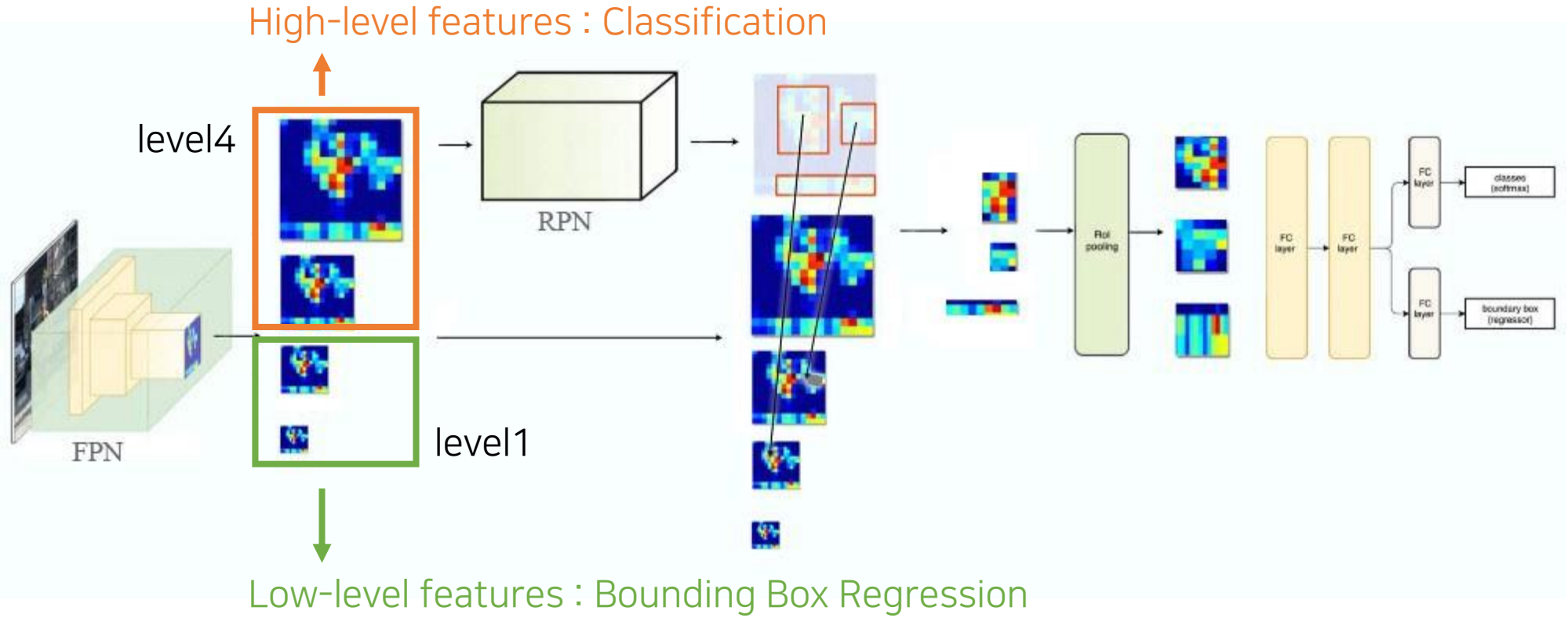
Attention level Experiment



Attention level Experiment

Base Model : Faster R-CNN + FPN + ResNet101

<Model Description>

frcnn_resnet_cbam : base model + cbam (level 1-4)

frcnn_resnet_cbam_low : base model + cbam (level 1-2)

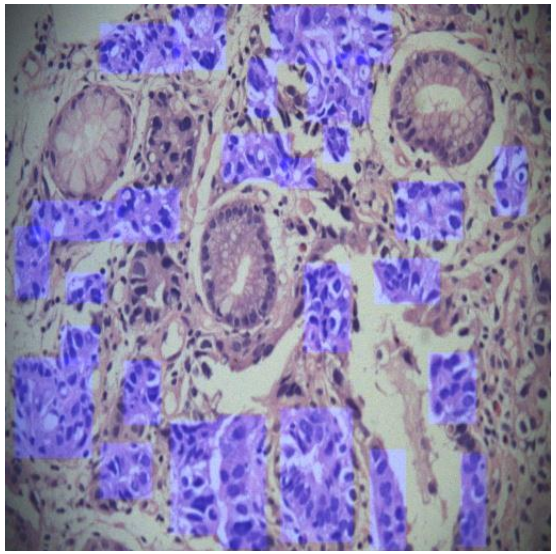
frcnn_resnet_cbam_high : base model + cbam (level 3-4)

If cbam module does not applied, original ResNet bottleneck block was used.

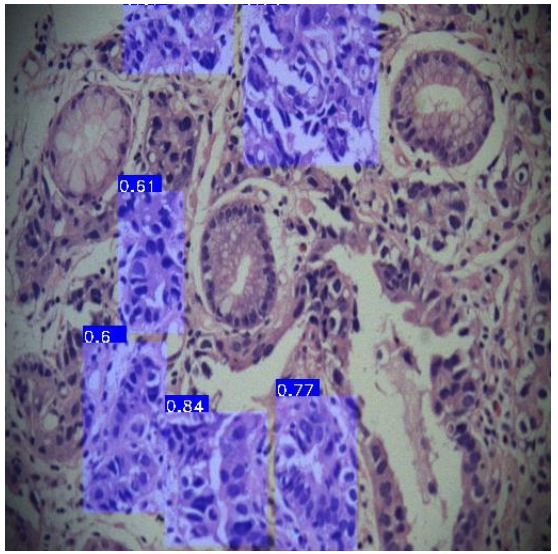
Model	Confidence Score	Accuracy	Precision
frcnn_resnet_cbam	0.5	80.37%	23.85%
frcnn_resnet_cbam_high	0.5	79.99%	23.19%
frcnn_resnet_cbam_low	0.5	80.18%	24.43%

Attention level Experiment

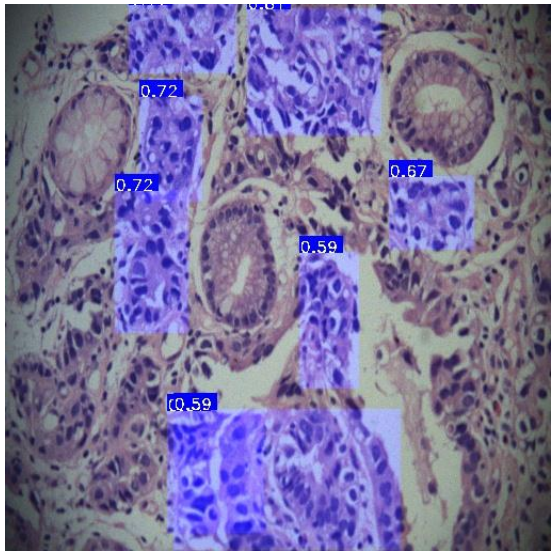
2020S 0163146010101-734



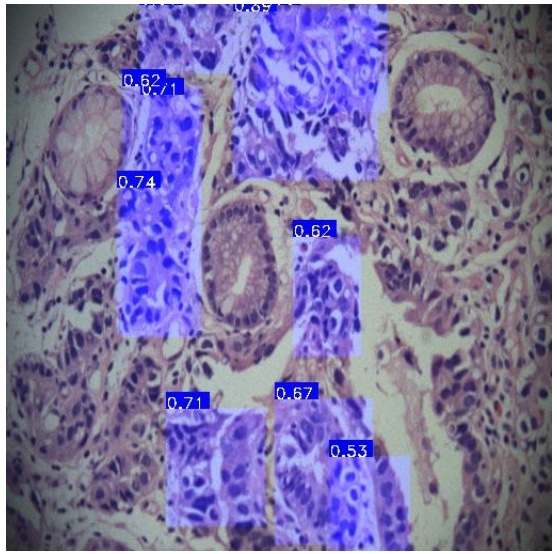
Ground Truth



cbam



cbam_low



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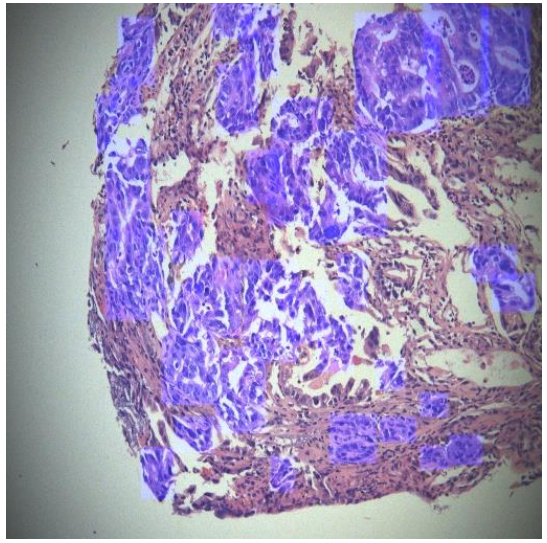
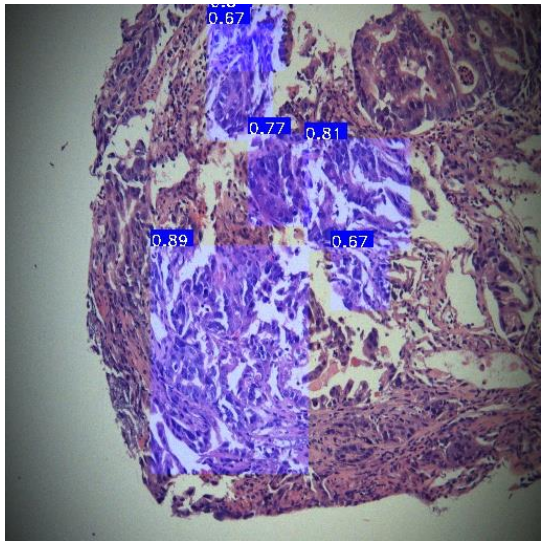
Attention level Experiment

2020S 0151714010101-249



Ground Truth



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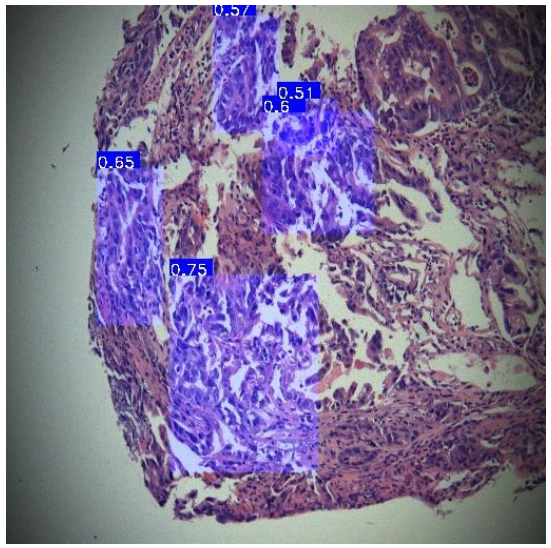

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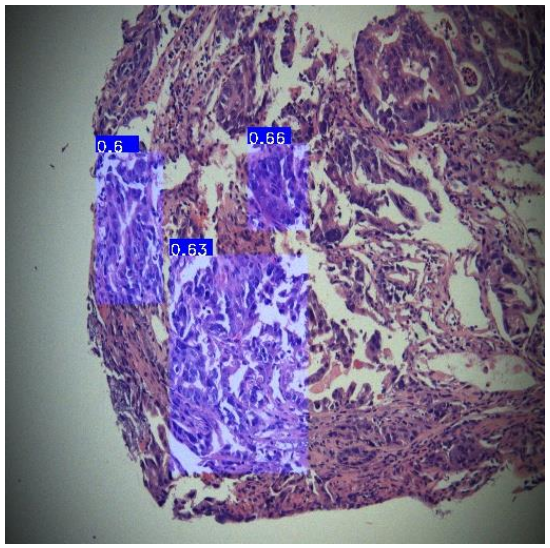
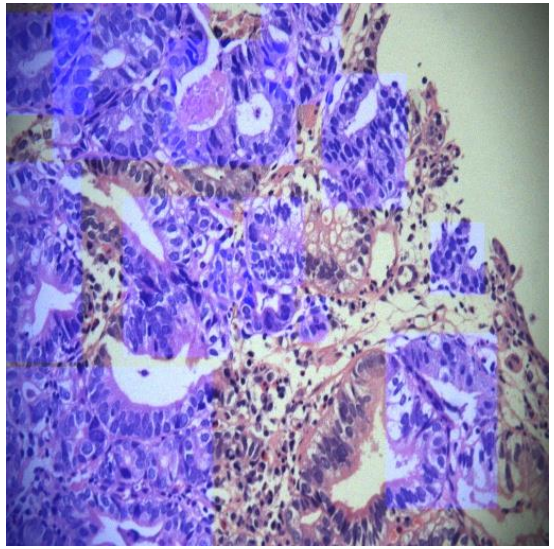


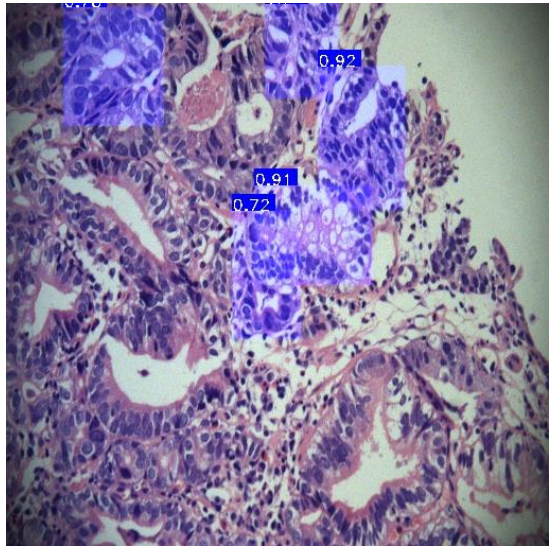
cbam_high

Attention level Experiment

2020S 0153900030101-287



Ground Truth



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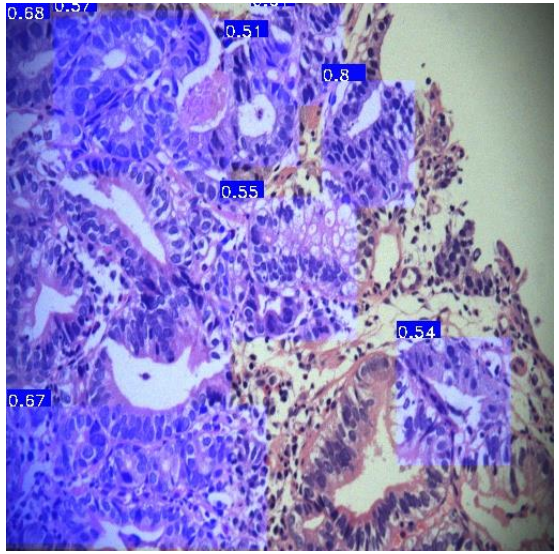

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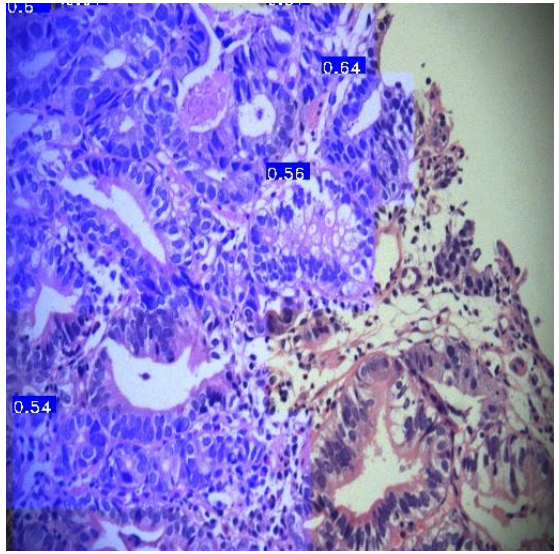
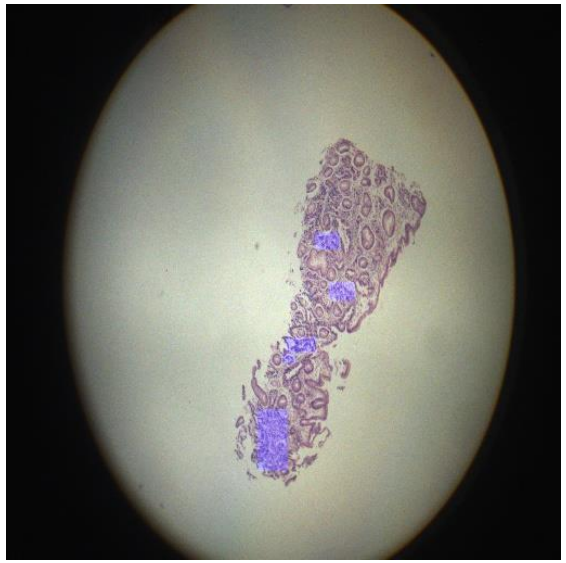


cbam_high

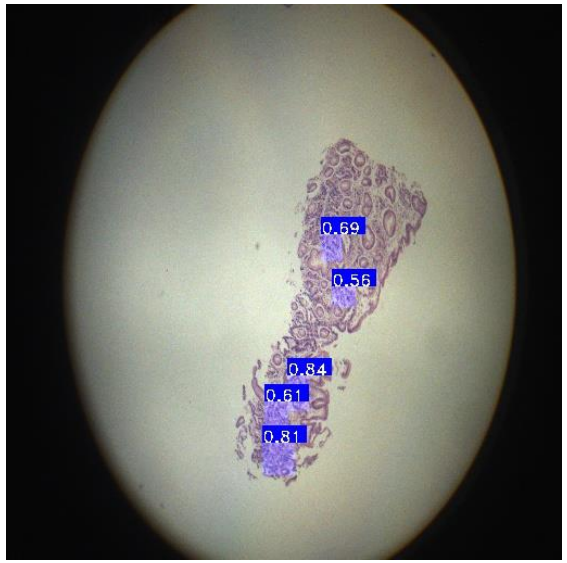
Attention level Experiment

2020S 0163146010101-664

배율에 따른 차이가 존재

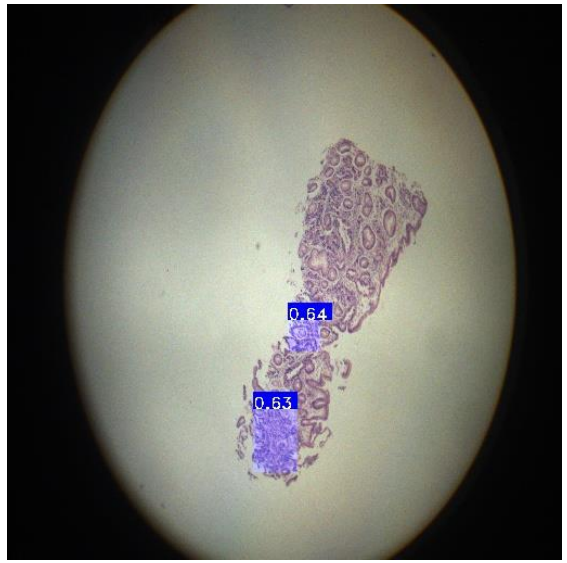


Ground Truth



cbam

cbam_low



cbam_high

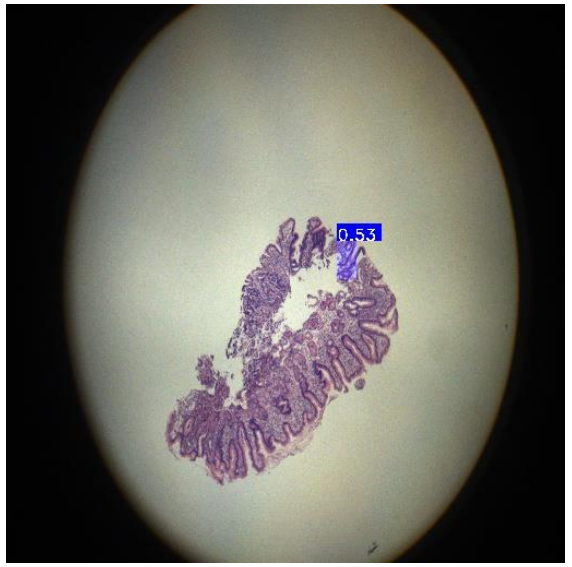
Attention level Experiment

2020S 0165169010101-133

배율에 따른 차이가 존재

Ground Truth

cbam



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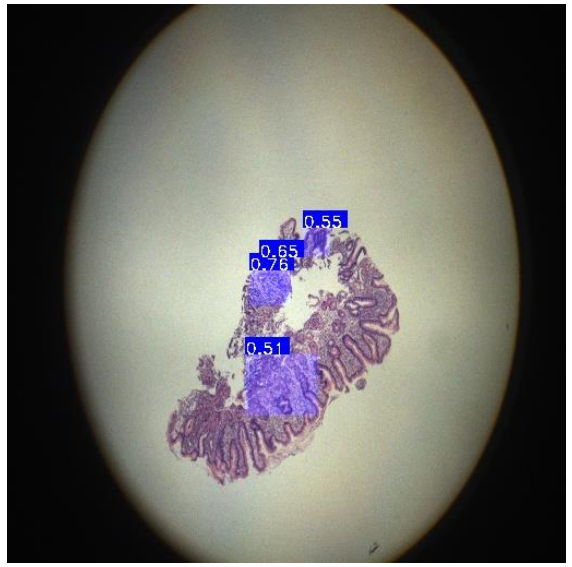

cbam_high

Attention level Experiment

1. General Object Detection

- Attention on low-level features is more effective than high-level features
- Contrary to assumption, all-level attention model showed lowest accuracy but not on TPR
- Still could avoid over-prediction which is a main problem in frcnn_anchor model (model w/o attention)

2. Small Object Detection

- Contrary to assumption, cbam_low showed poor accuracy than all-level attention model
- According to comparison, attention on high-level features is more helpful for SOD (Small object detection)
- Considering zoom-level RoI generation

Additional Experiments

1. Which level attention module shows best result?
   - According to previous result, model showed it is good at catching low-level features
   - Considering that, attention module on low-level would be more accurate than on high-level

2. Still deep layers problematic in our model?
   - Attention module adopted to avoid missing information during convolution operation
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3. Still ResNeXt effective in our model?
   - ResNeXt is good for learning various feature expressions
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Deep Layer with Attention Module Experiment

Base Model : Faster R-CNN + FPN

<Model Description>

frcnn_resnet_cbam : base model + resnet101 +cbam (level 1-4)

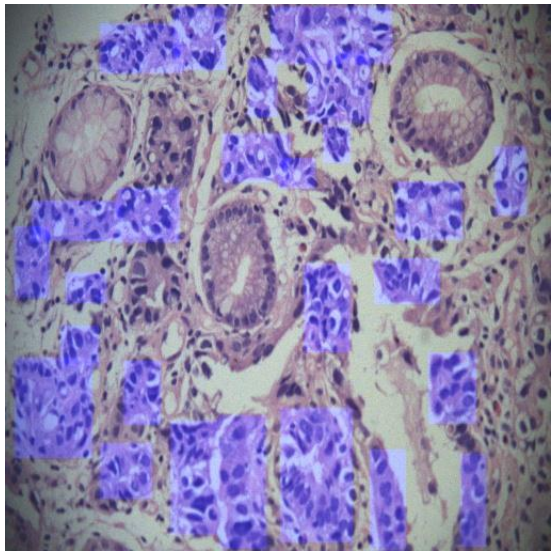
frcnn_resnet_cbam_low : base model + resnet101 +cbam (level 1-2)

frcnn_resnet152_cbam : base model + resnet152 + cbam (level 1-4)

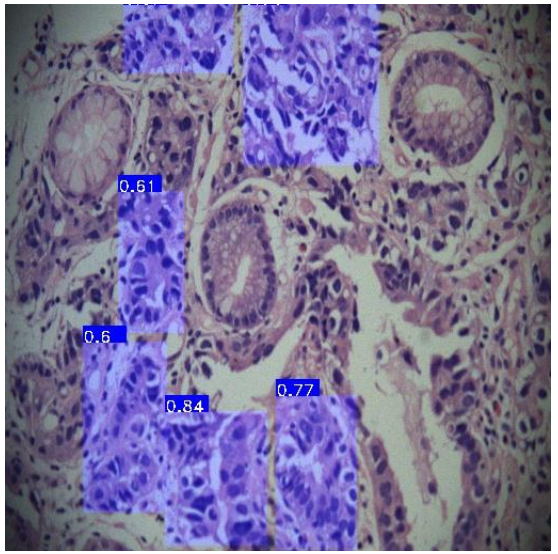
Model	Confidence Score	Accuracy	TPR
frcnn_resnet_cbam	0.5	80.37%	23.85%
frcnn_resnet_cbam_low	0.5	80.18%	24.43%
frcnn_resnet152_cbam	0.5	81.12%	23.58%

Deep Layer with Attention Module Experiment

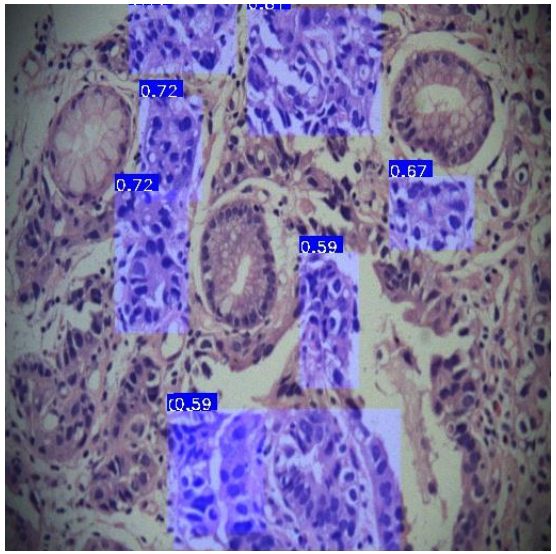
2020S 0163146010101-734



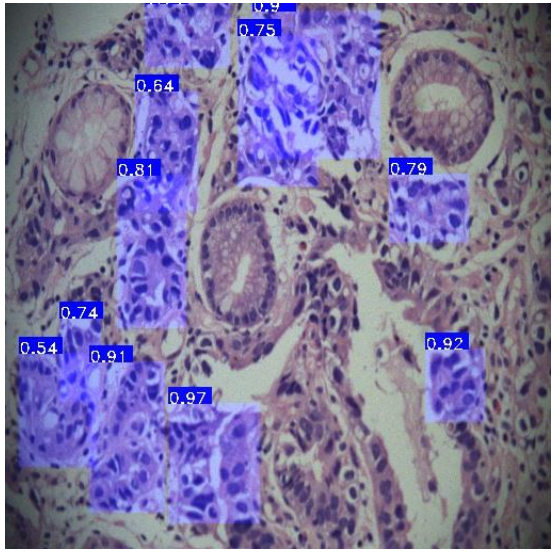
Ground Truth



cbam



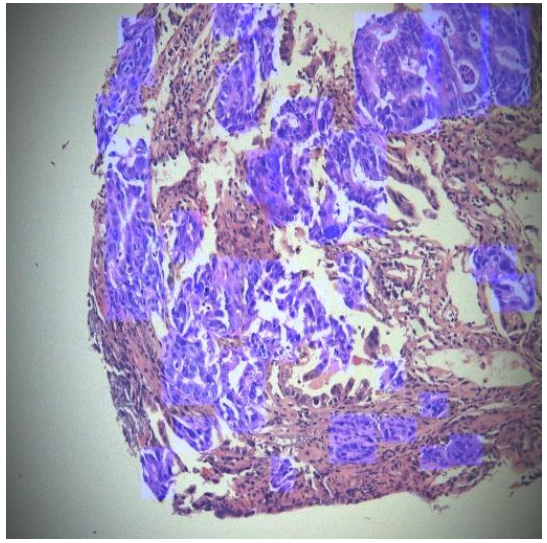
cbam_low



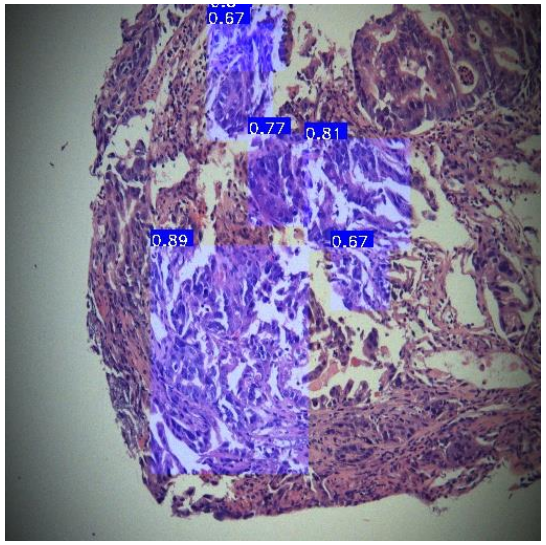
cbam_resnet152

Deep Layer with Attention Module Experiment

2020S 0151714010101-249



Ground Truth



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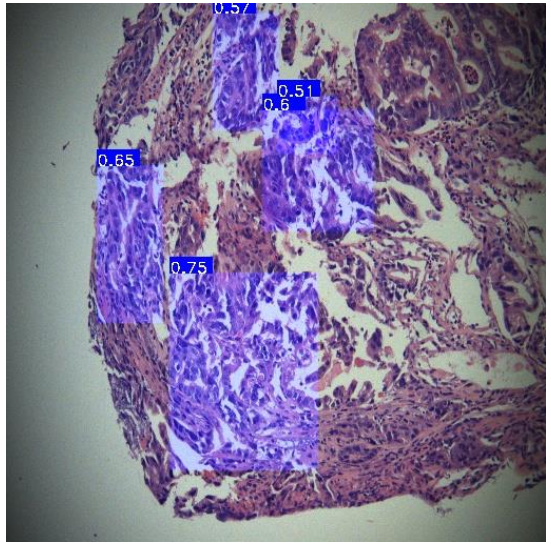

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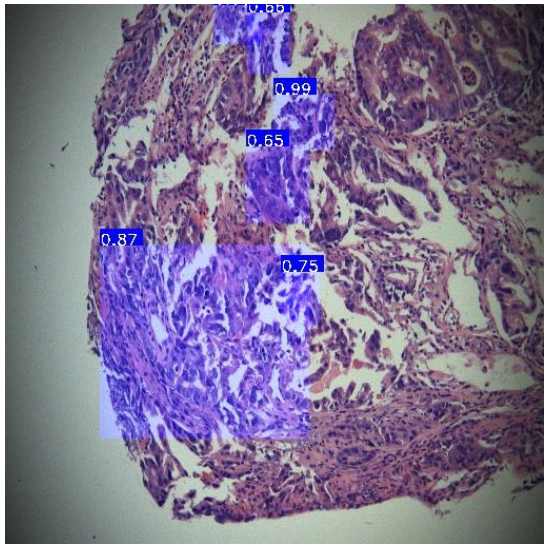
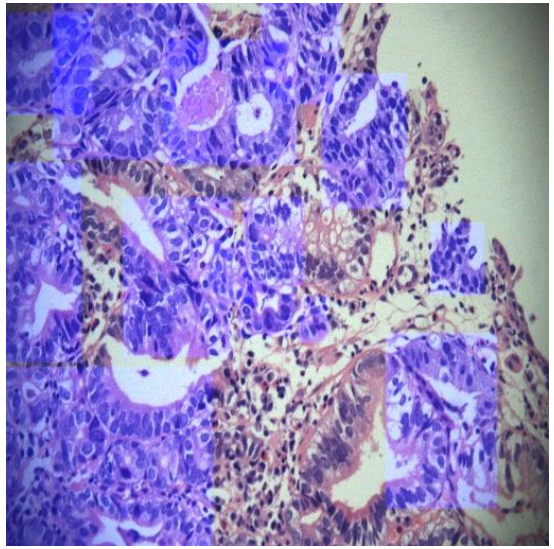


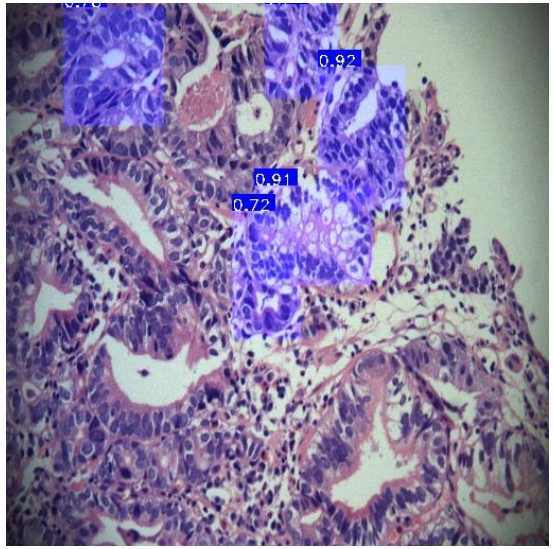
cbam_resnet152

Deep Layer with Attention Module Experiment

2020S 0153900030101-287



Ground Truth



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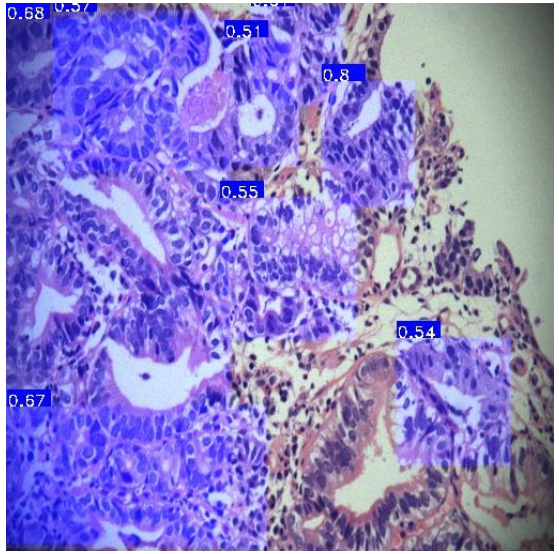
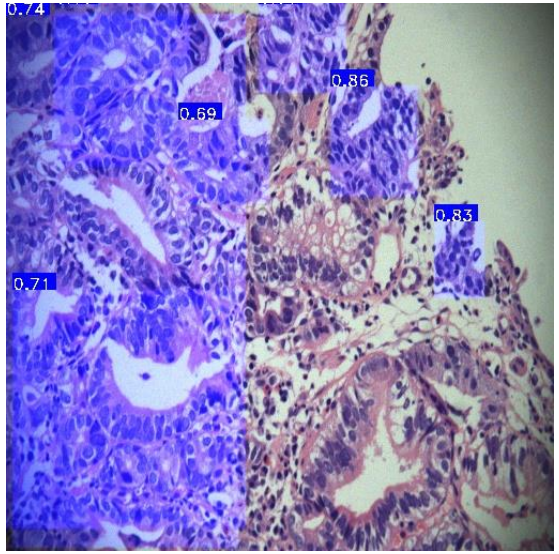


cbam_low

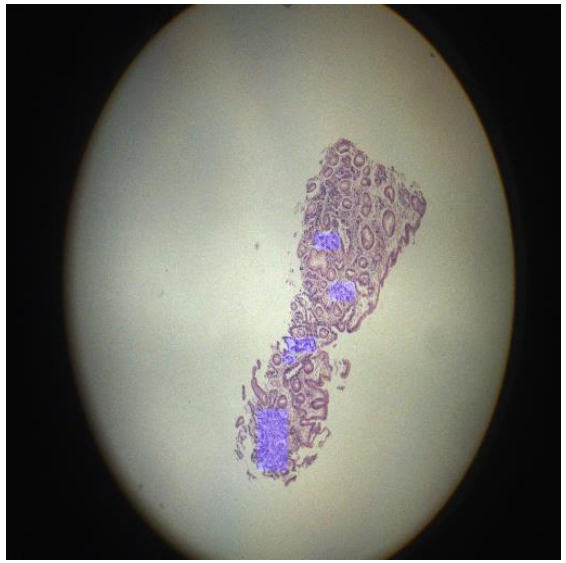


cbam_resnet152

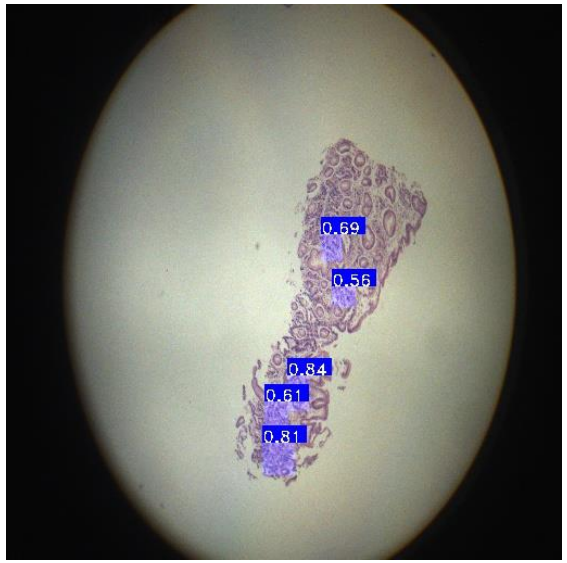
Deep Layer with Attention Module Experiment

2020S 0163146010101-664

배율에 따른 차이가 존재

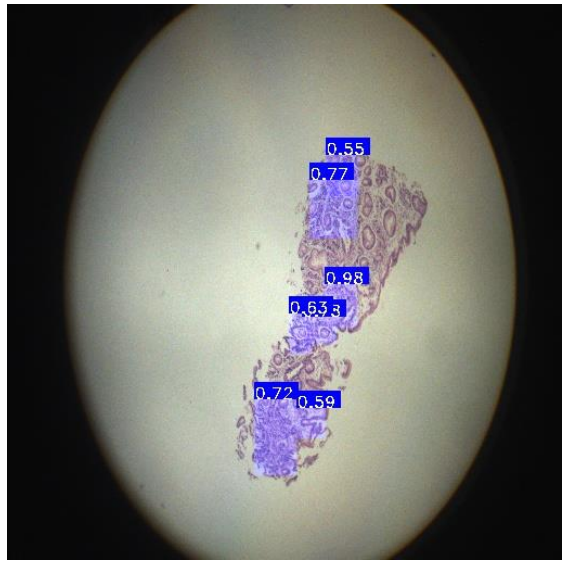


Ground Truth



cbam

cbam_low



cbam_resnet152

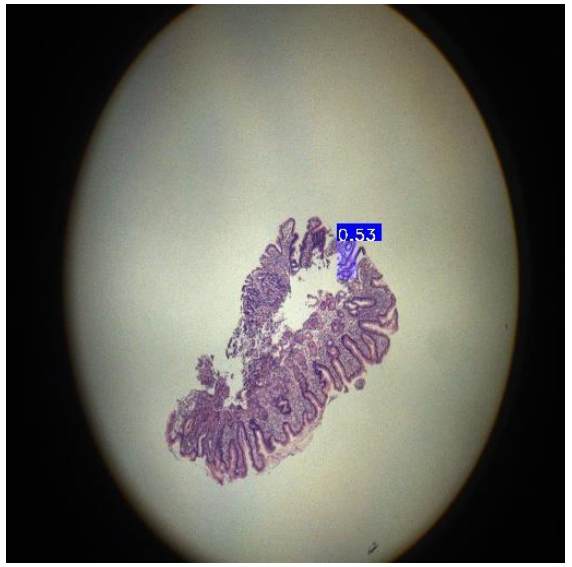
Deep Layer with Attention Module Experiment

2020S 0165169010101-133

배율에 따른 차이가 존재

Ground Truth

cbam



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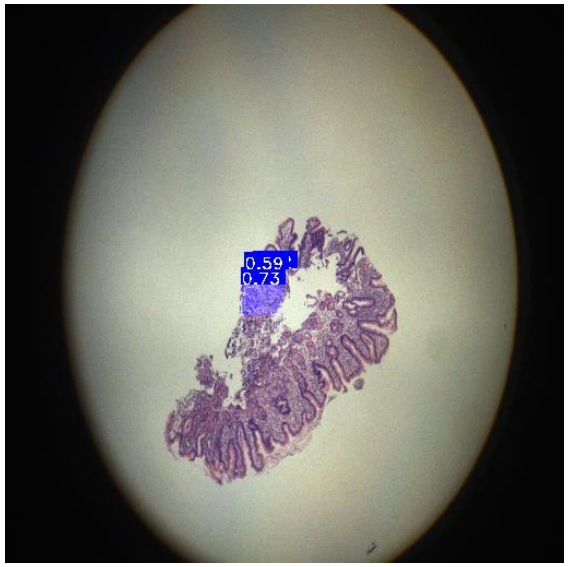

cbam_resnet152

Deep Layer with Attention Module Experiment

1. General Object Detection

- As with assumption, deep layer problem showed in non-attention model is solved
- Attention module could extract advantages of deep backbone model

2. Small Object Detection

- In the same manner, deep layer can boost the accuracy of small objects

Additional Experiments

1. Which level attention module shows best result?
   - According to previous result, model showed it is good at catching low-level features
   - Considering that, attention module on low-level would be more accurate than on high-level

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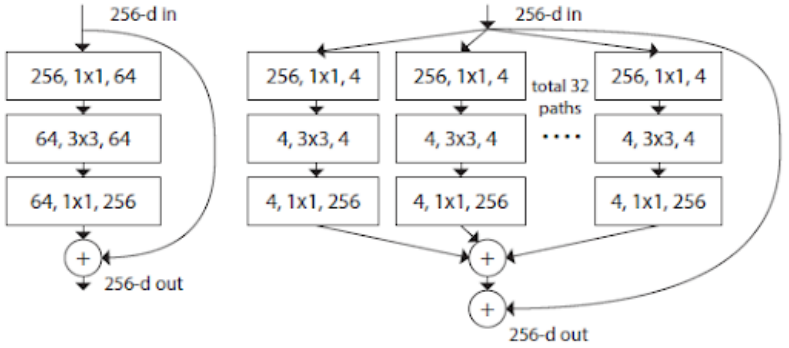
ResNeXt with Attention Module Experiment



Base Model : Faster R-CNN + FPN

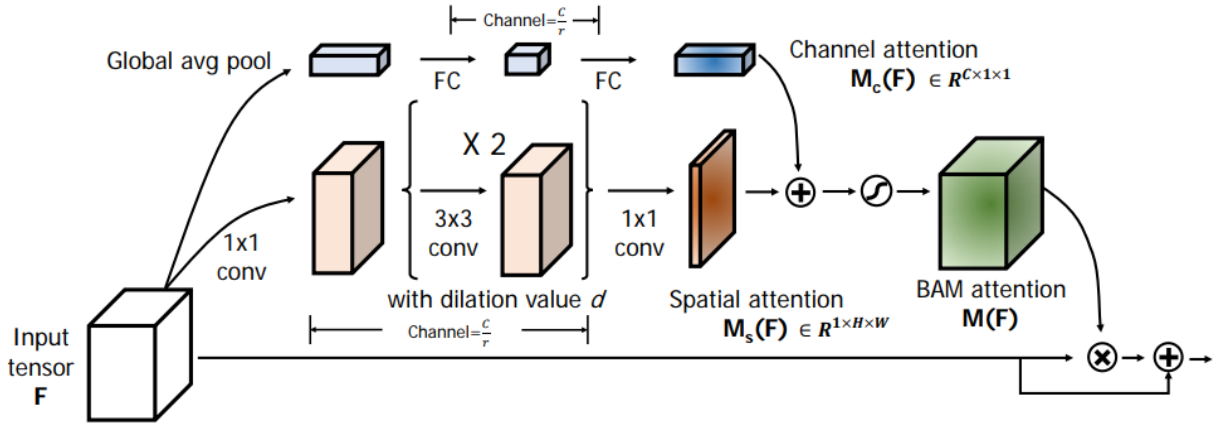
<Model Description>

frcnn_resnet_cbam : base model + resnet101 +cbam (level 1-4)

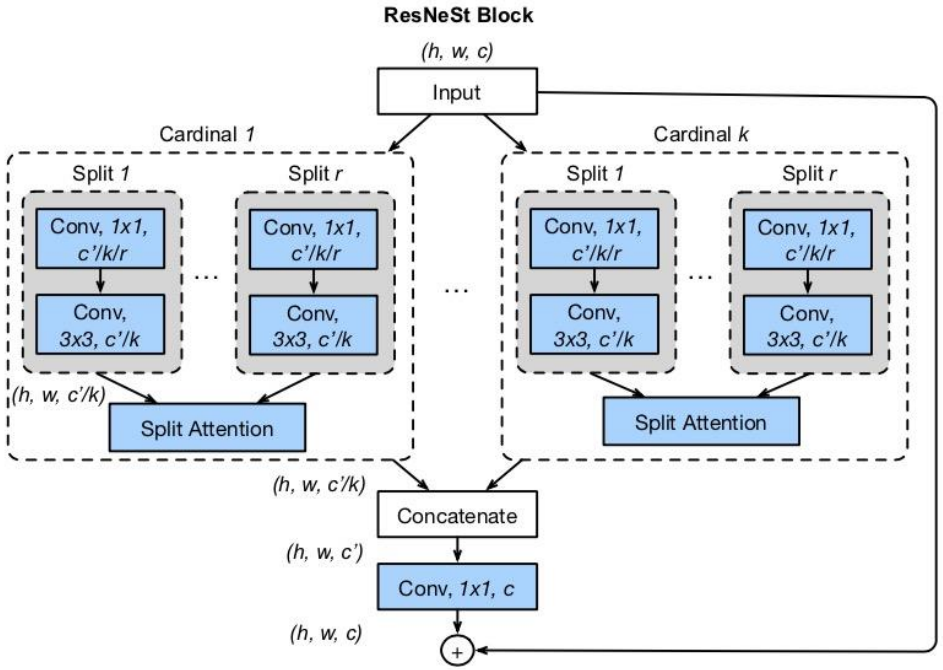
frcnn_resnet_cbam_low : base model + resnext50 + cbam (level 1-4)

Model	Confidence Score	Accuracy	TPR
frcnn_resnet_cbam	0.5	80.37%	23.85%
frcnn_resnet_cbam_low	0.5	80.18%	24.43%
frcnn_resnet152_cbam	0.5	81.12%	23.58%
frcnn_resnext_cbam	0.5	80.48%	22.03%

ResNeXt with Attention Module Experiment



CBAM_resnet

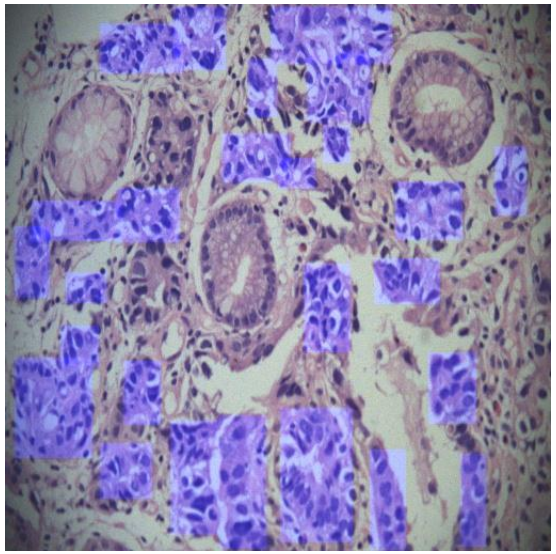


ResNeSt

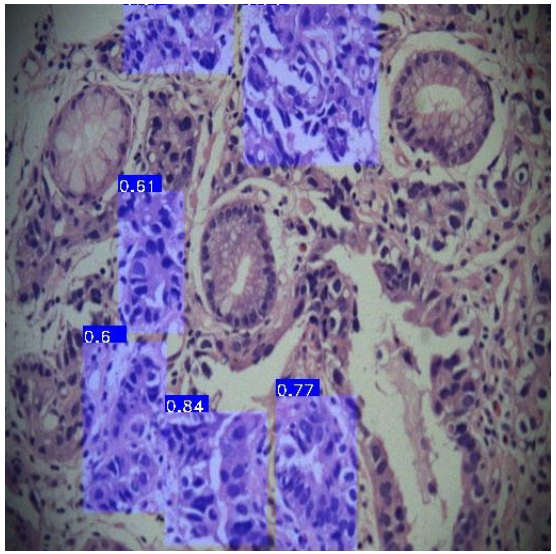
Zhang, H., Wu, C., Zhang, Z., Zhu, Y., Zhang, Z., Lin, H., ... & Smola, A. (2020). Resnest: Split-attention networks. *arXiv preprint arXiv:2004.08955*.

ResNeXt with Attention Module Experiment

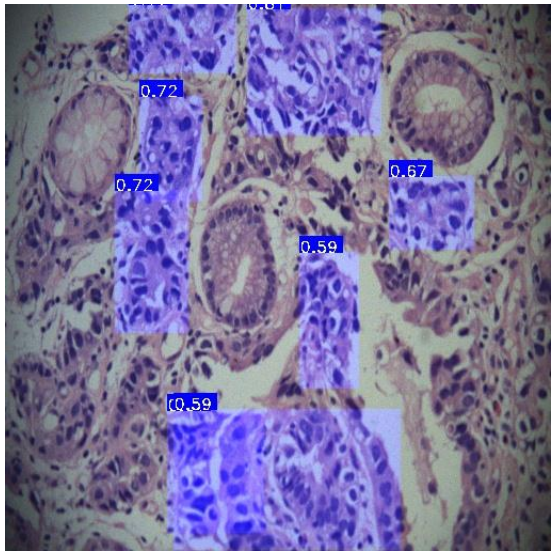
2020S 0163146010101-734



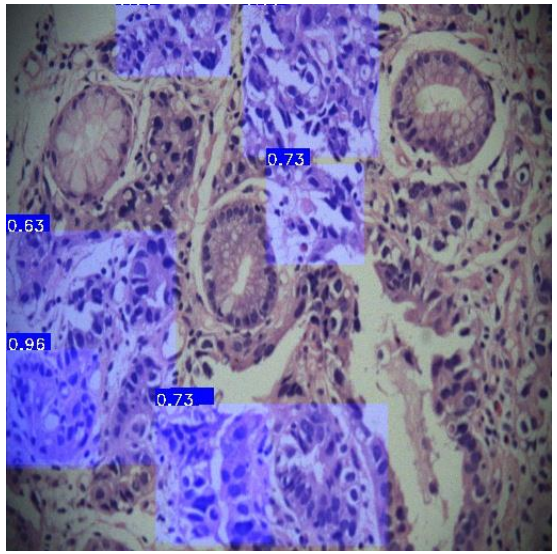
Ground Truth



cbam



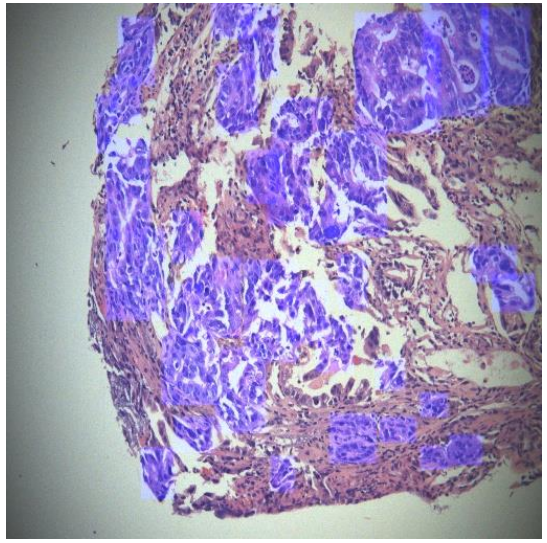
cbam_low



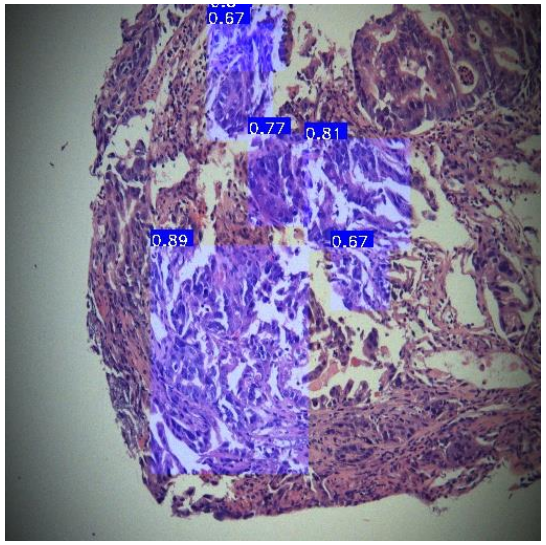
cbam_resnext101

ResNeXt with Attention Module Experiment

2020S 0151714010101-249



Ground Truth



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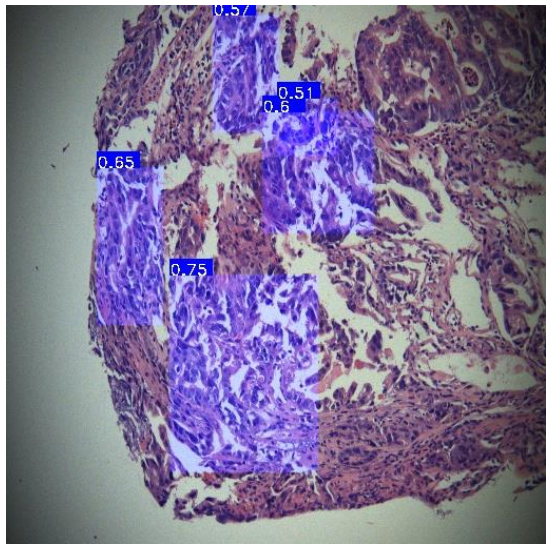
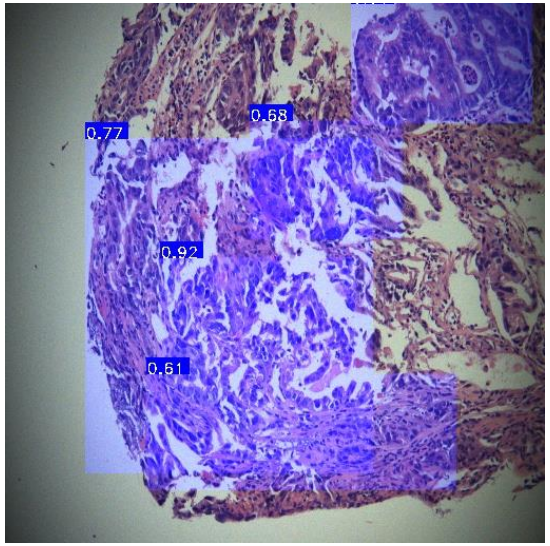


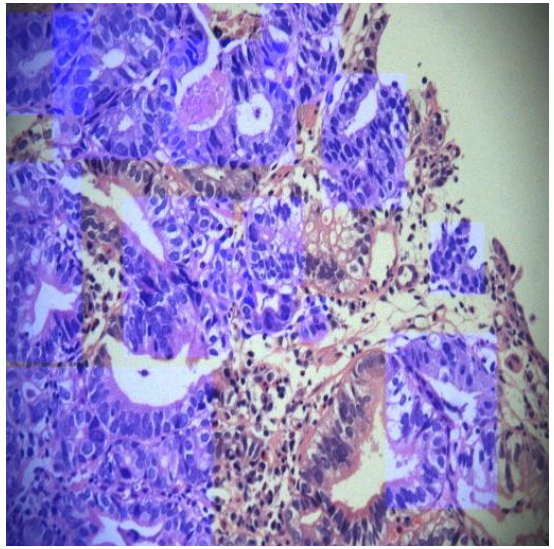
cbam_low



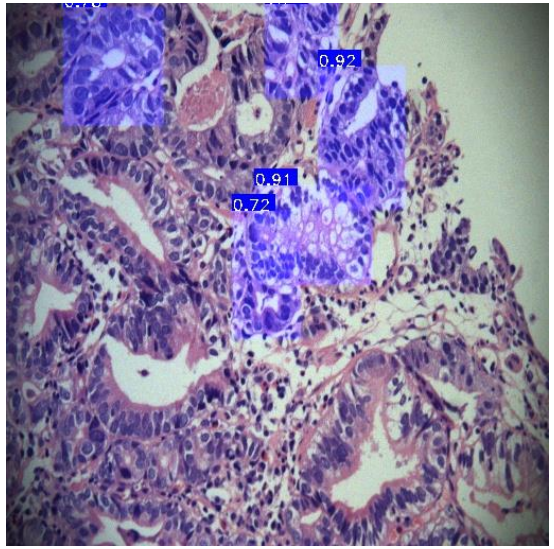
cbam_resnext101

ResNeXt with Attention Module Experiment

2020S 0153900030101-287



Ground Truth



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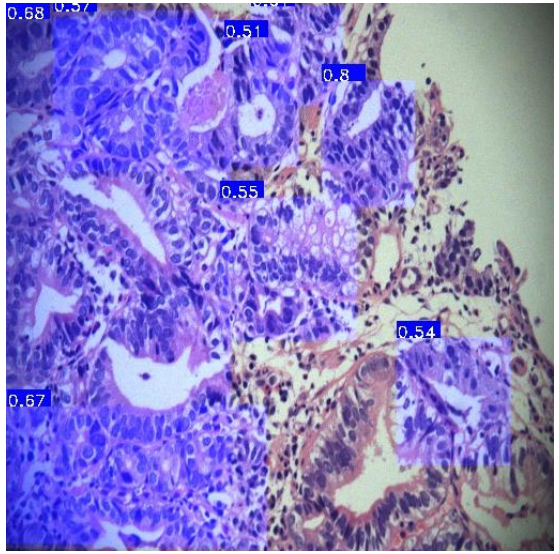

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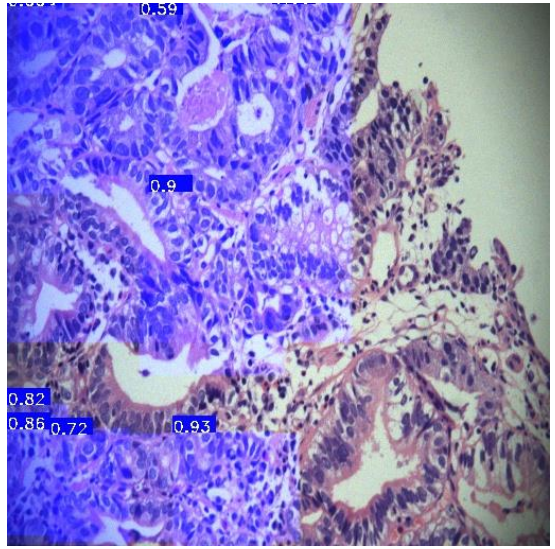
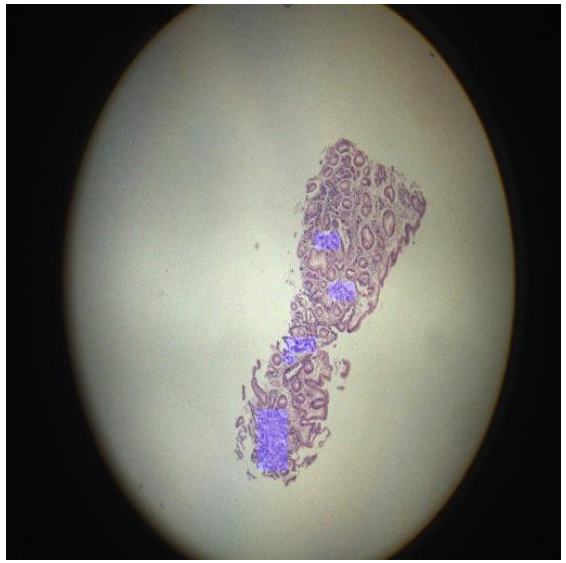


cbam_resnext101

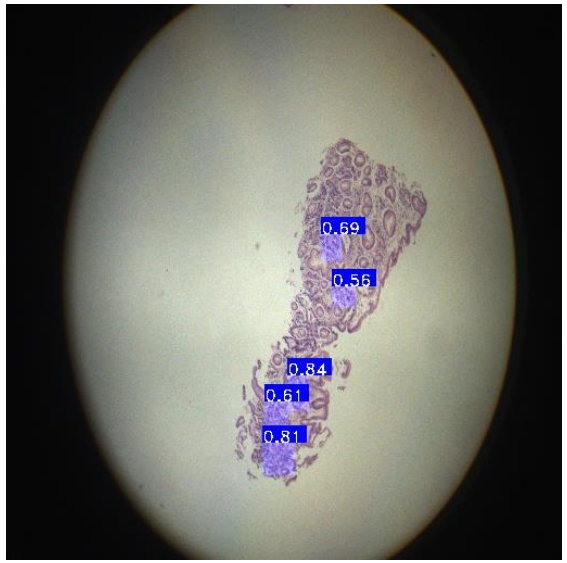
ResNeXt with Attention Module Experiment

2020S 0163146010101-664

배율에 따른 차이가 존재

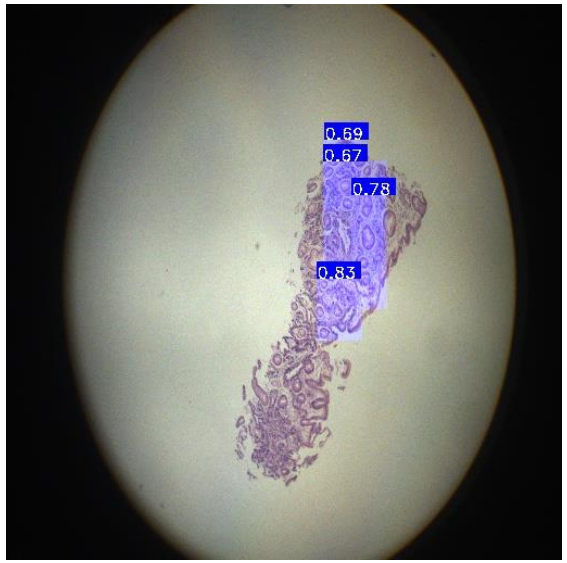


Ground Truth



cbam

cbam_low



cbam_resnext101

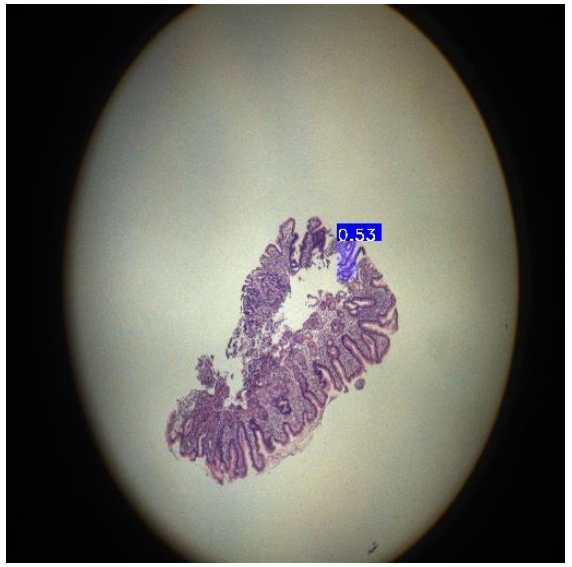
ResNeXt with Attention Module Experiment

2020S 0165169010101-133

배율에 따른 차이가 존재

Ground Truth

cbam



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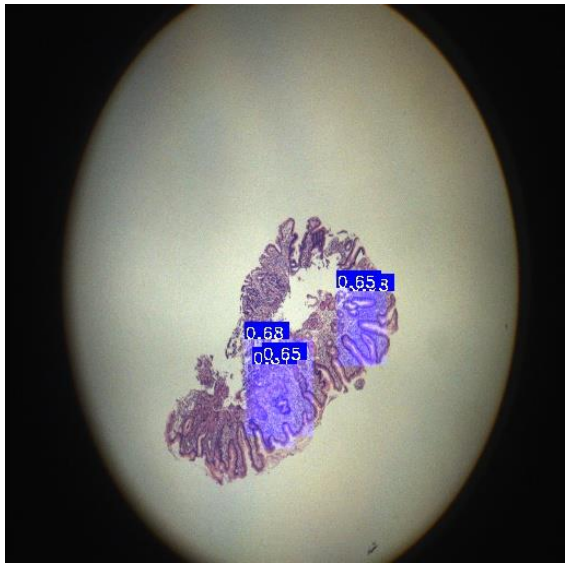


cbam_resnext101

ResNeXt with Attention Module Experiment

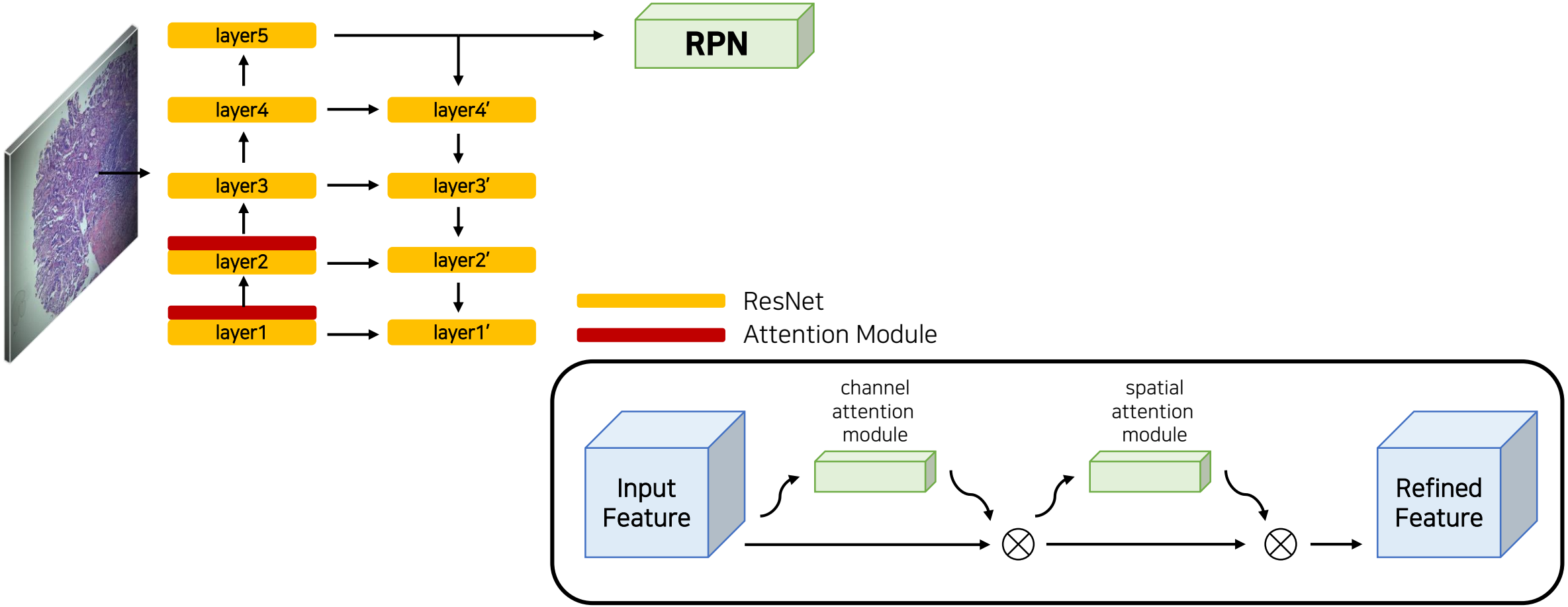
1. General Object Detection

- ResNeXt have advantage on learning multiple expressions
- Attention model could use advantage of ResNeXt model but not that much contrary to non-attention model
- Bounding box regression loss greater than ResNet model

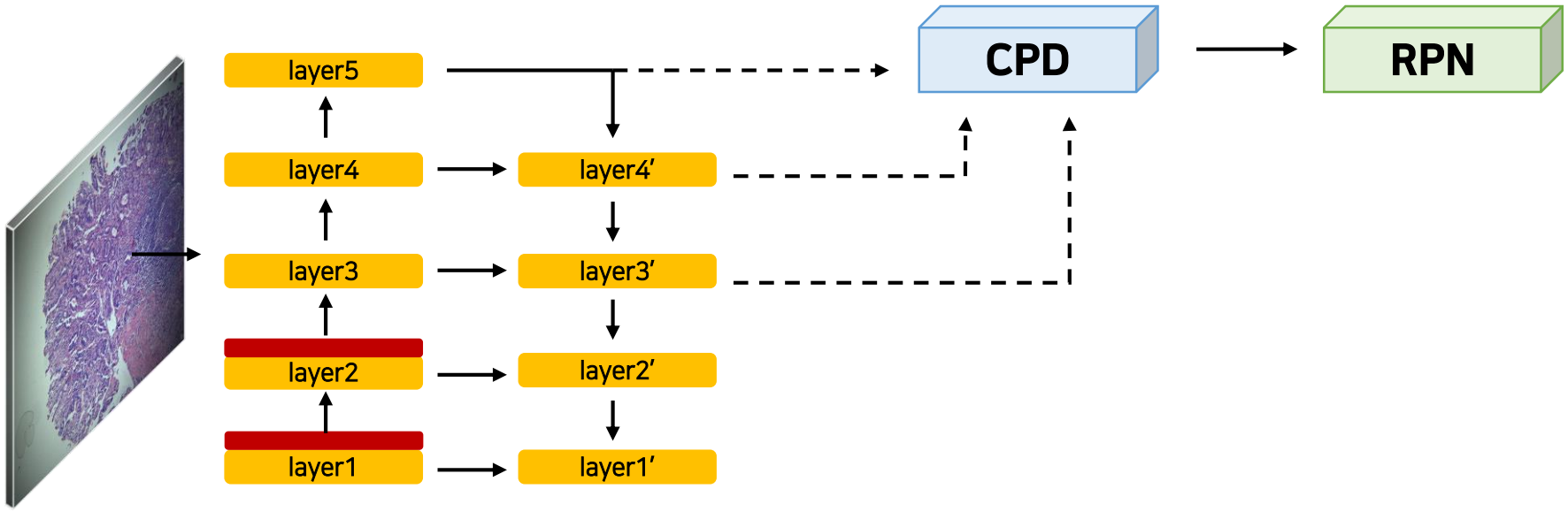
2. Small Object Detection

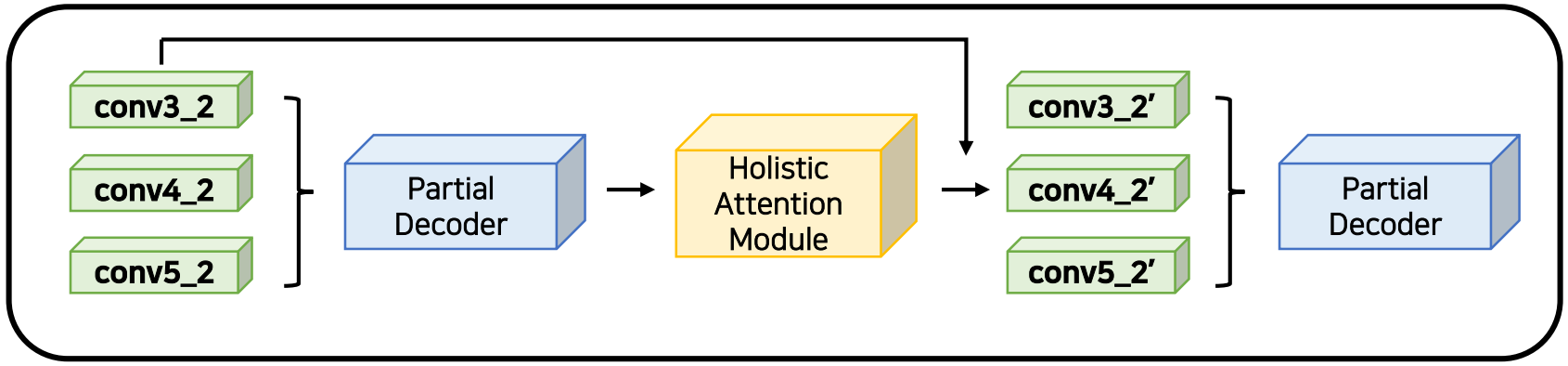
- Too bad. It is worse than all-attention ResNet model
- Accuracy is similar to low-attention ResNet model
- Have to find out that problem comes from using ResNeXt model or using low-layer model

Current Best Model

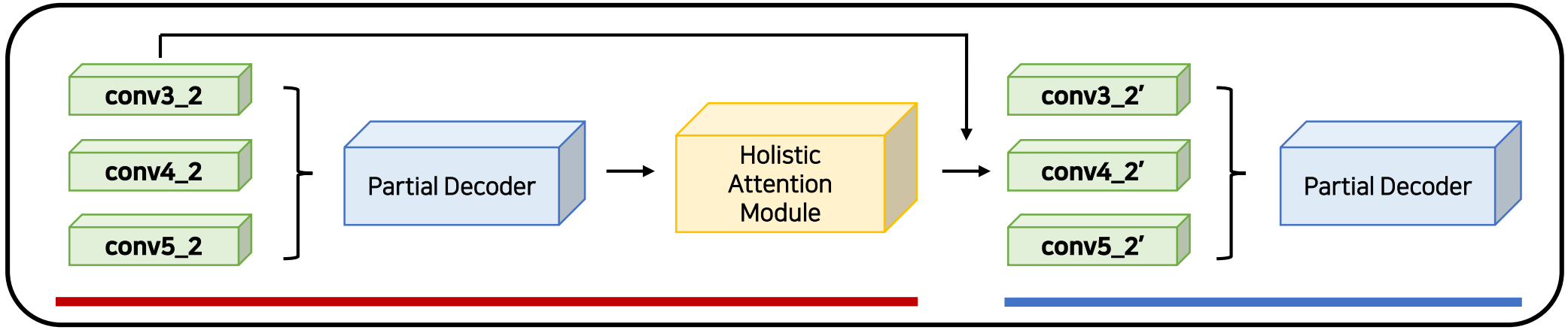


What to do?


layer5
layer4
layer3
layer2
layer1
layer4′
layer3′
layer2′
layer1′
CPD
RPN


conv3_2
conv4_2
conv5_2
Partial Decoder
Holistic Attention Module
conv3_2′
conv4_2′
conv5_2′
Partial Decoder

Cascade Partial Decoder



Segment the objects that the most salient!

Find the most salient objects (hamster!!) and segment those objects

Thank you :-)