



Indiana University Bloomington

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and Engineering

Sematic Segmentation on the Underwater Images

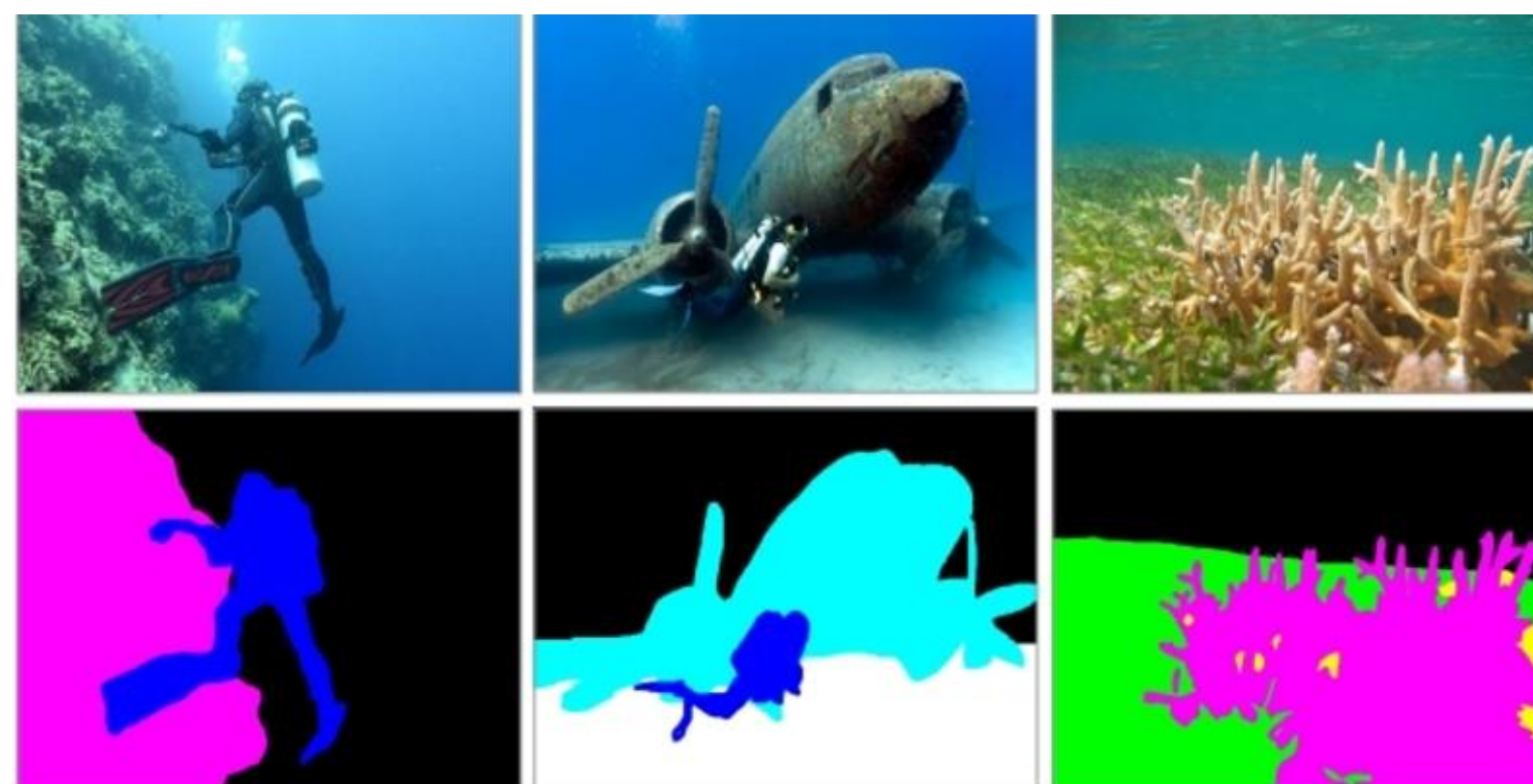
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Abstract

Modeling Semantic Segmentation

Results

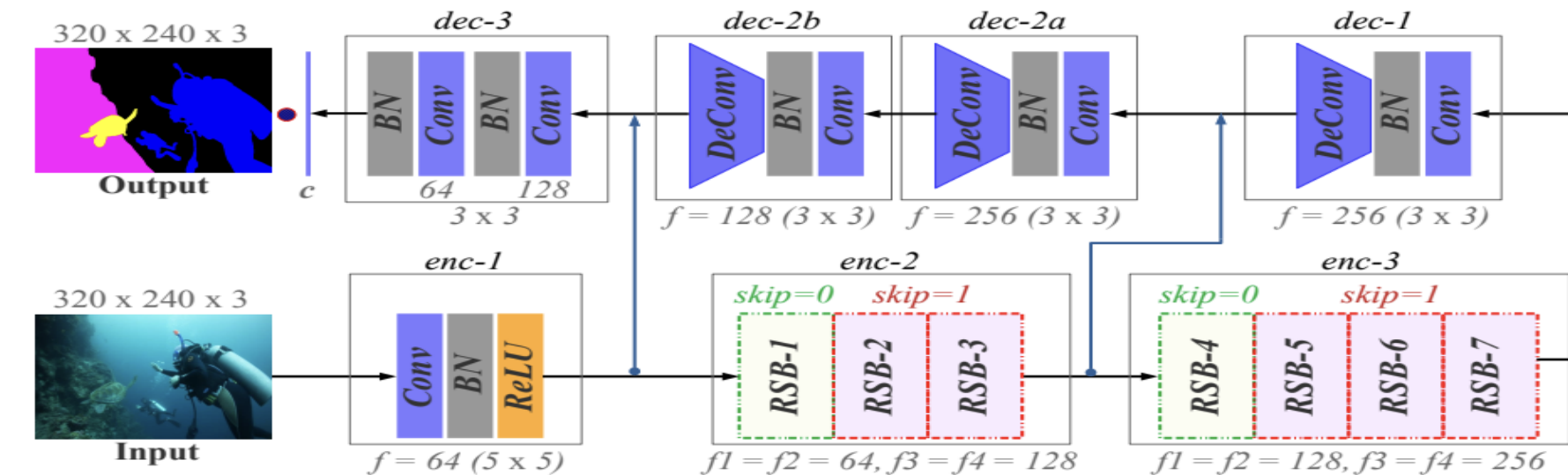
- **Semantic Segmentation** is a popular problem in the computer vision domain.
- **Underwater segmentation** is not explored as deep as segmentation on ground objects.
- In this project, we are interested in **applying segmentation techniques** to underwater images.
- As one of the important features of the human visual system, **the visual attention mechanism** is essential in image generation, scene classification, **target detection** and tracking when applied in the field of computer vision.
- We first implemented **SUIM-Net_{RSB}** and later experimented by introducing **the Efficient Channel Attention and Triplet Attention module** in SUIM-Net_{RSB}.



Challenges

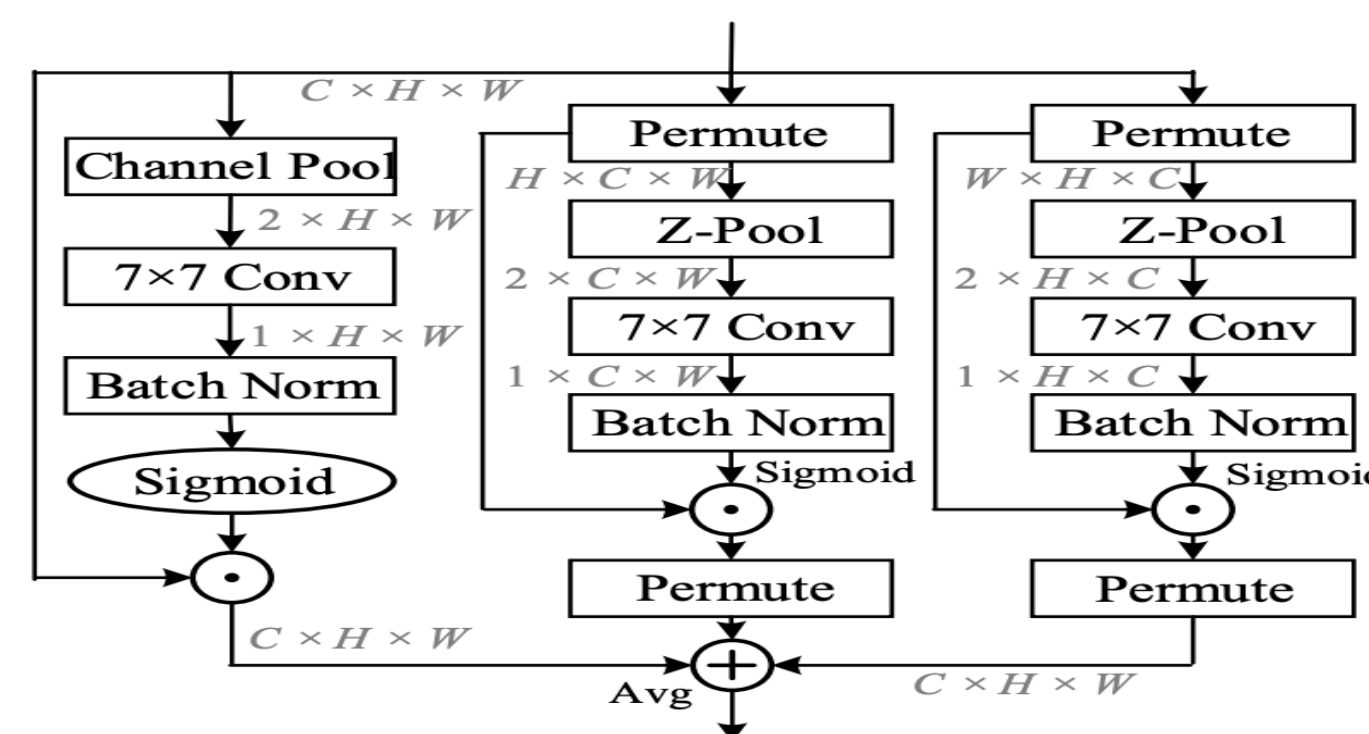
- Initially we wanted to experiment with Visual Transformer for Image segmentation to evaluate its performance. But due to computational challenge as well as time constraint we had to change our idea. Even after shifting ideas, computation still proved to be a challenge.

SUIM-Net with Residual Skip Block

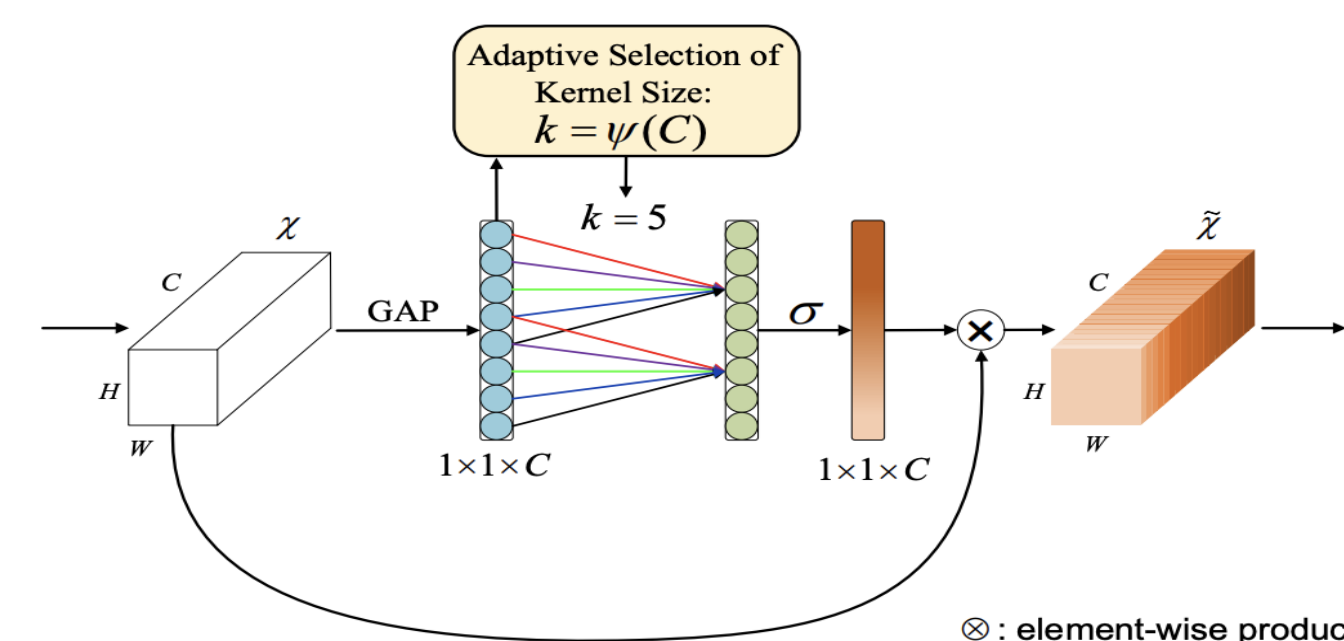


(b) The end-to-end architecture of SUIM-Net_{RSB}: three composite layers of encoding is performed by a total of seven RSBs, followed by three decoder blocks with mirrored skip-connections.

Triplet Attention Module



Efficient Channel Attention(ECA)



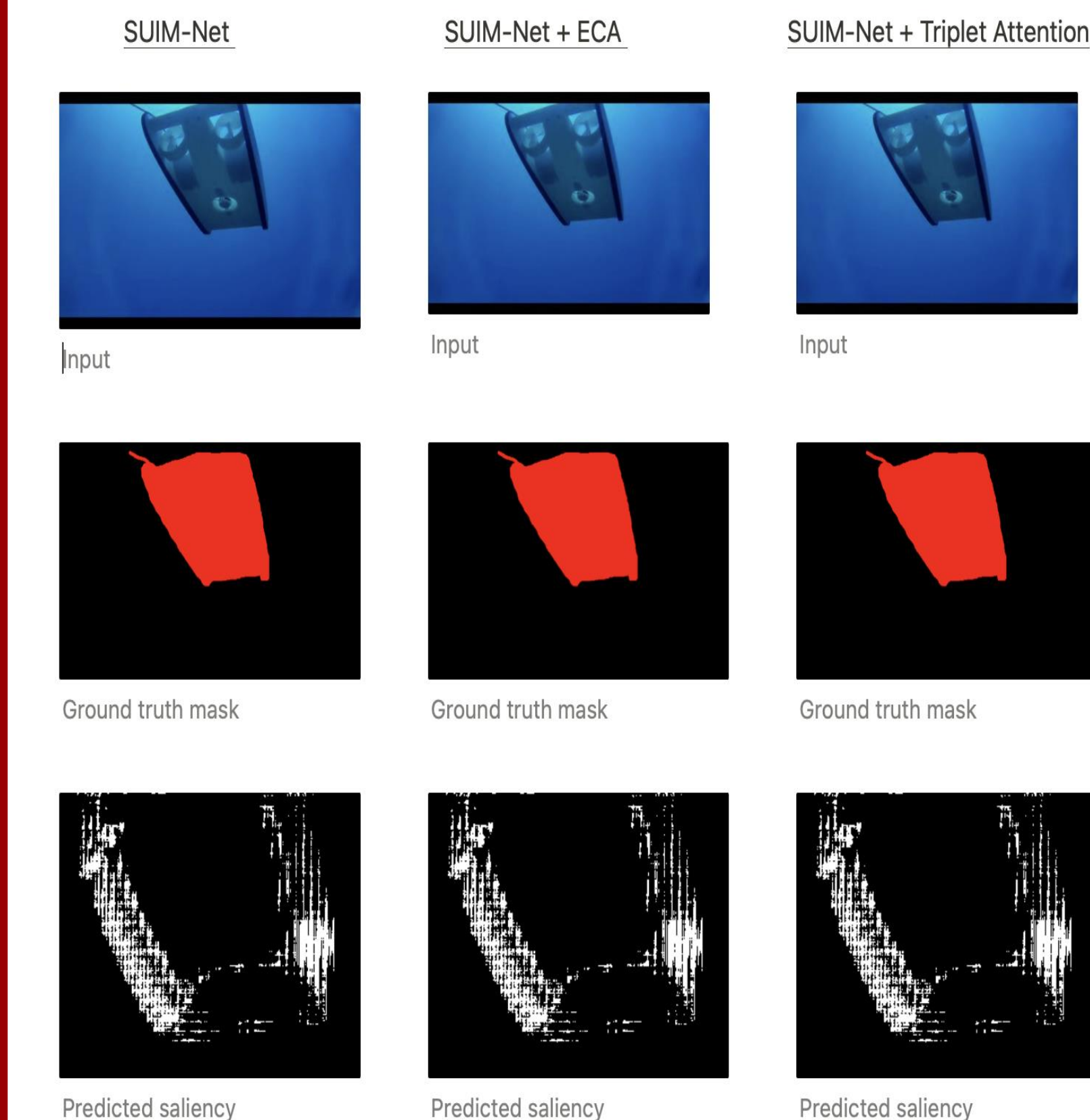
Experiments

- For better comparison, we ran the experiments on same setup.
- Firstly, we executed the SUIM-Net with smaller parameters compared to original authors.
- Experiment 1: Introduced ECA module after 1st encoder block.
- Experiment 2: Initiated Triplet Attention module between encoder 1 and skip connection to decoder 3.

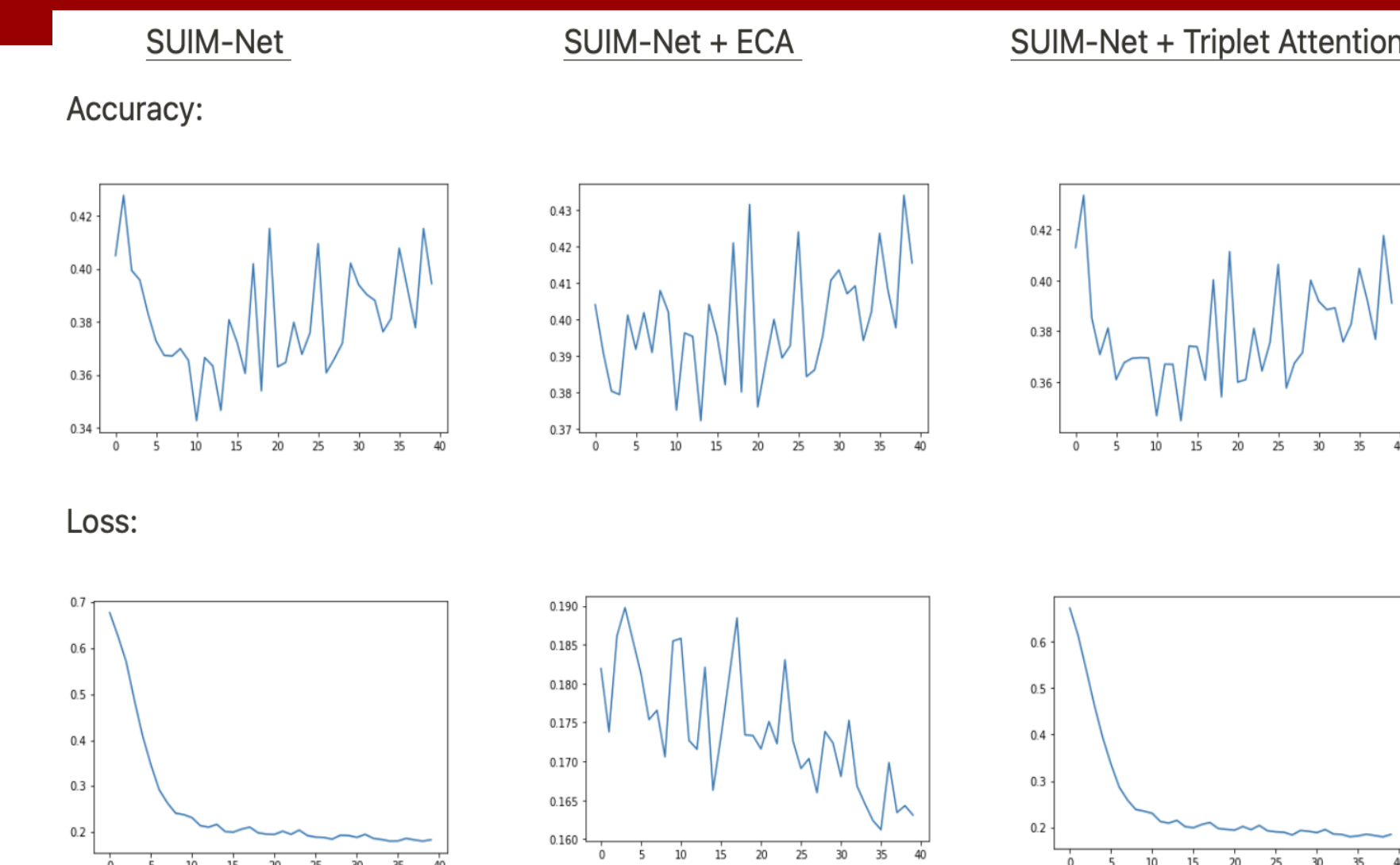
Setup

- Batch size: 4
- Epochs: 40
- steps per epoch: 100
- learning rate: 1e-4
- optimizer: Adam
- loss = 'binary_crossentropy'
- GPU: Tesla T4 (Colab pro)

*SUIM-Net + ECA - 18 + 22 + 40 epochs



Observations



Future Work

- We would want to use DeiT(Data Efficient Image Transformer) for a future experiment for underwater image segmentation.
- We would also want to try current model with different dataset(currently we have only 1500 images(SUIM) available)