

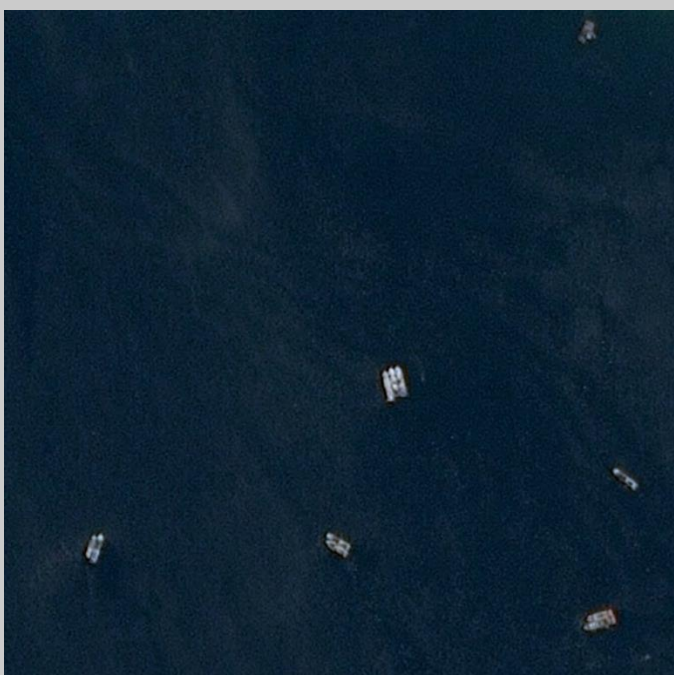
Ships Segmentation in Aerial Imagery

Using Deep Neural Networks

Naama Alon & Avshalom Dayan Supervised by Ran Ben Izhak

Project Goals

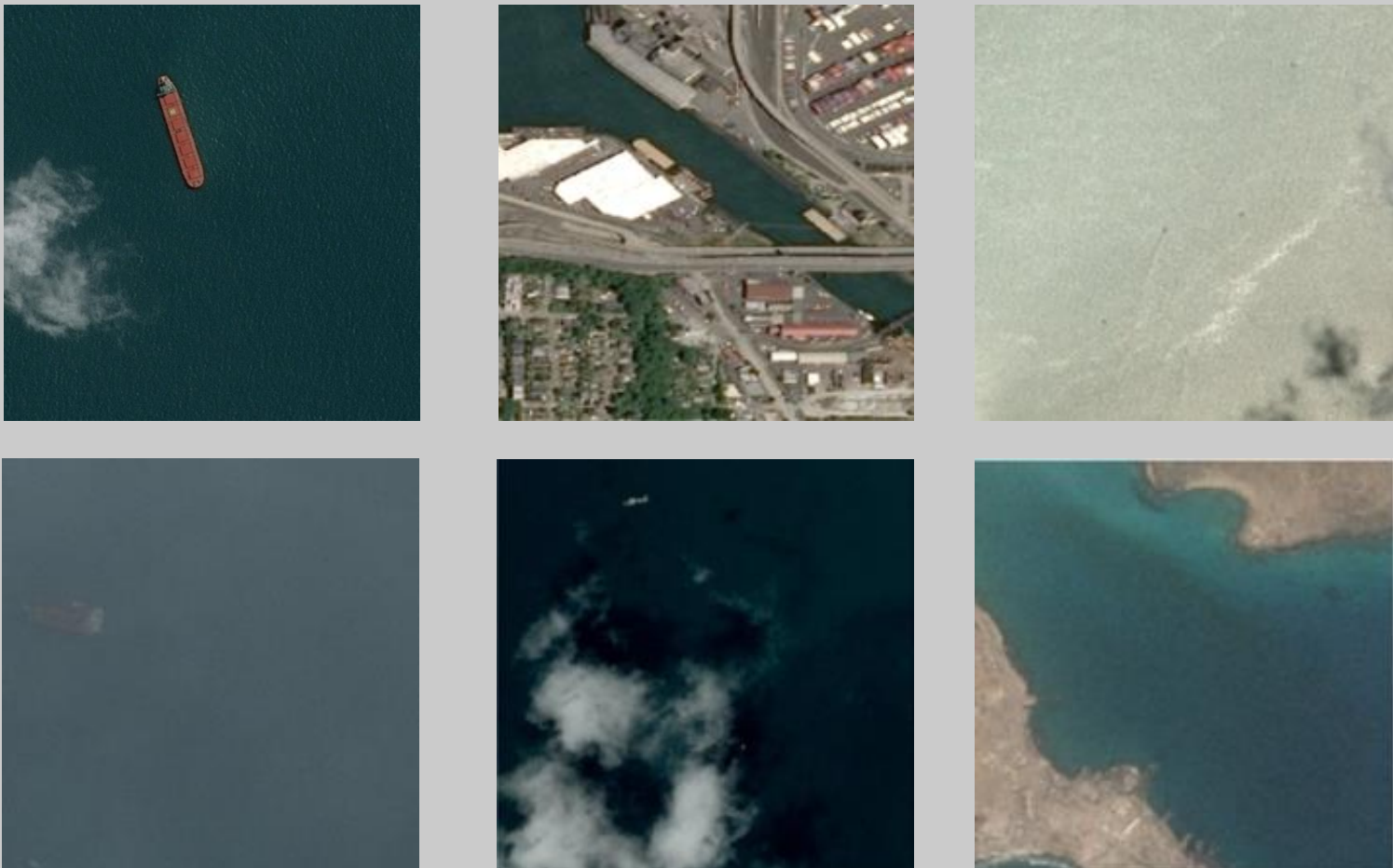
- Detect and segment ships in aerial imagery.



Kaggle Contest

- Contest presented by Airbus.
- Detect and segment ships in aerial images under different conditions: clouds, haze, clusters and at ports.
- Data given by Airbus, 205K images.
- Evaluation metrics:

$$F_{\beta} = (1 + \beta^2) \cdot \frac{\text{precision} \cdot \text{recall}}{(\beta^2 \cdot \text{precision}) + \text{recall}} \quad \text{IoU}(A, B) = \frac{A \cap B}{A \cup B}$$



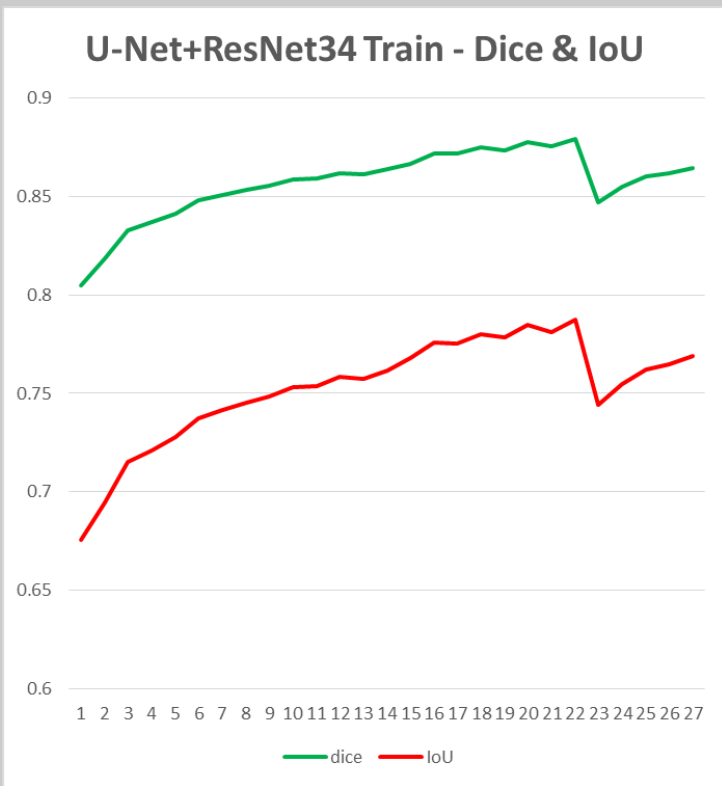
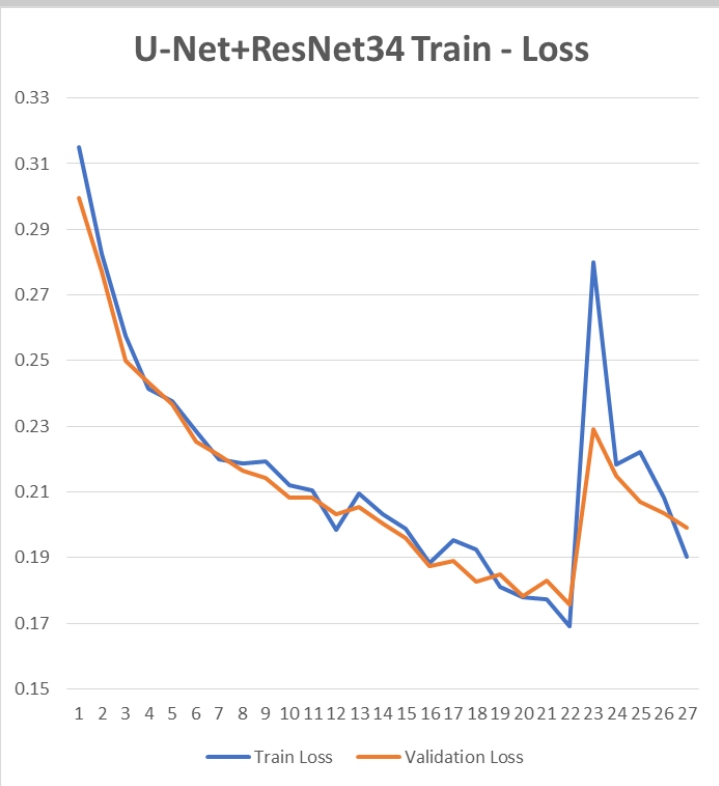
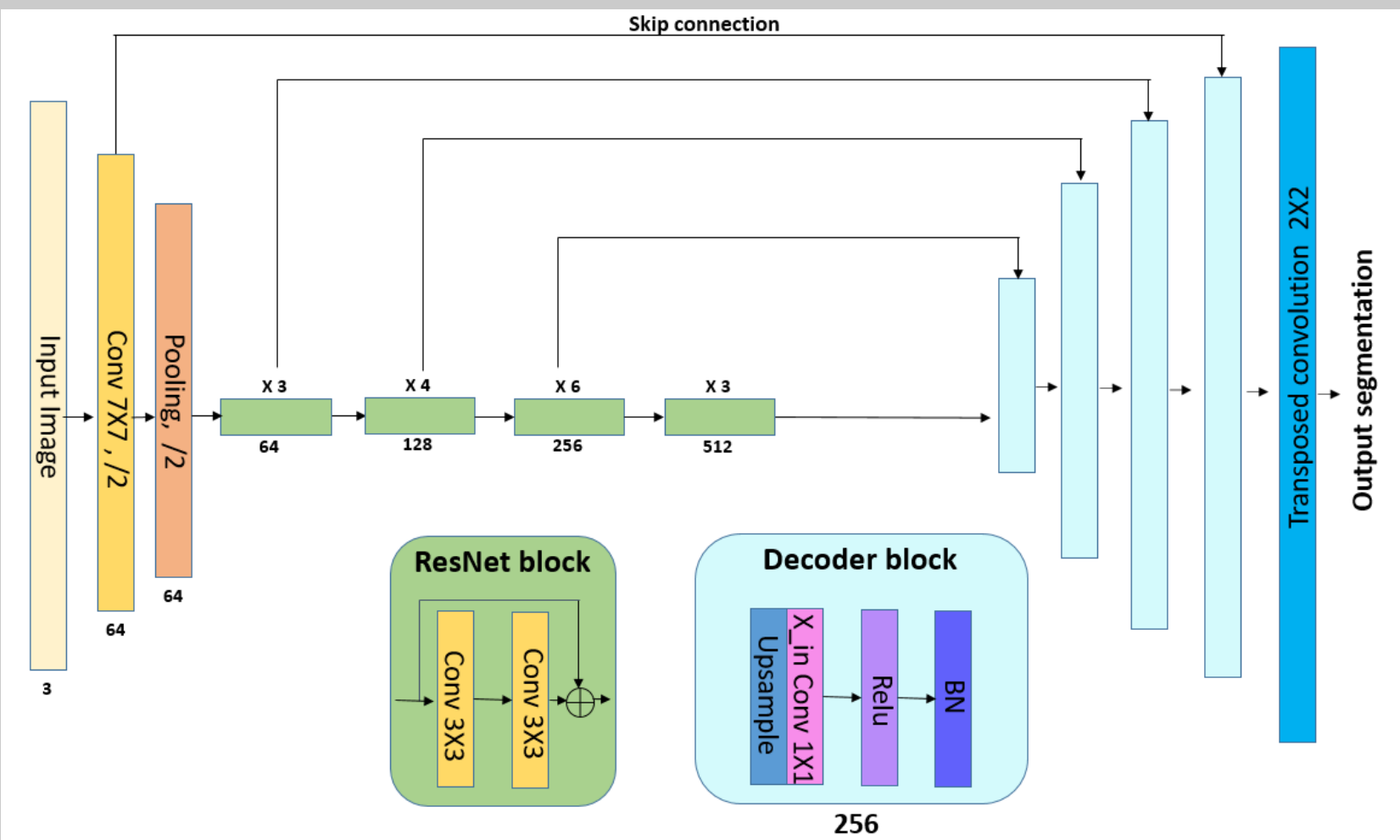
Solutions Exploration

- Faster R-CNN + Grabcut
- U-Net (standard)
- U-Net with ResNet34 encoder

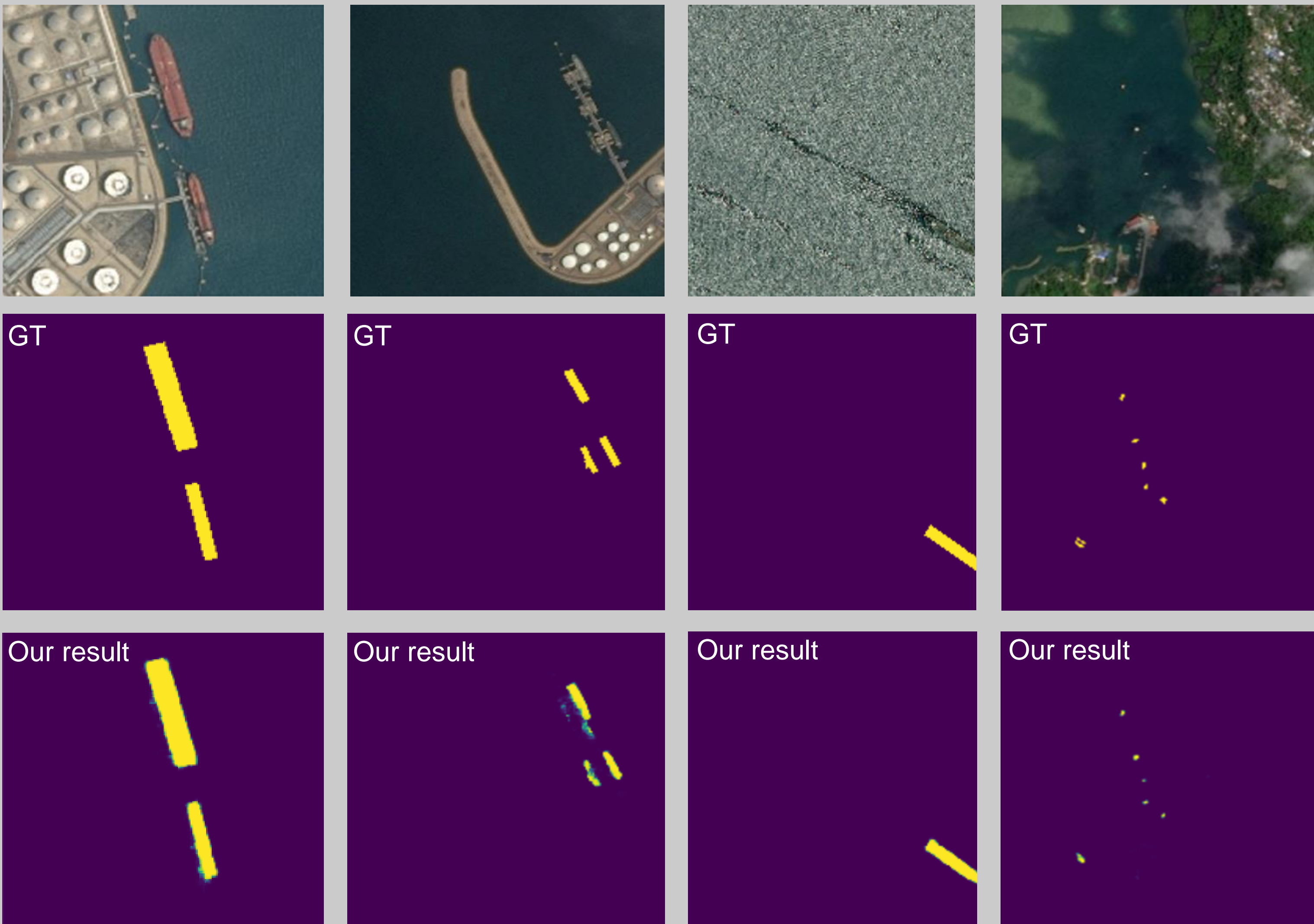
(Our final architecture)

Model Architecture - U-Net with ResNet Encoder

- The encoder is a pre-trained classification network (ResNet).
- The decoder consists of up sampling (deconvolution) and concatenation features from encoder followed by regular convolution operations.



Results Examples



Results

Solution	IoU	Rank
U-Net (standard)	0.694	820/880
U-Net+ ResNet34	0.836	181/880
U-Net+ ResNet34 (Optimized)	0.840	127/880

* Winners achieved IoU of 0.85448

Conclusion

- Achieved excellent detection and good segmentation results.
- Some limitation due to the quality of the labeling.