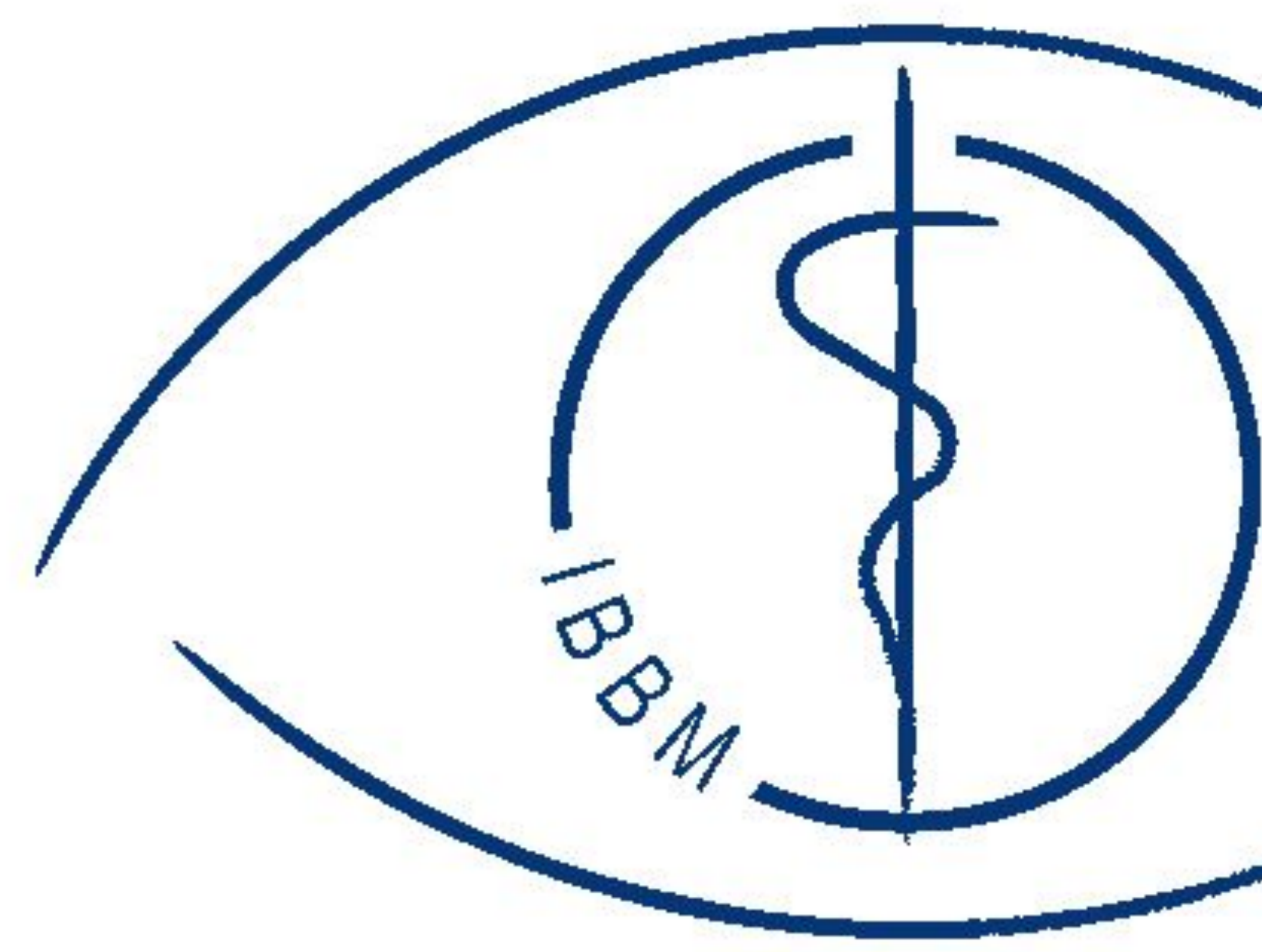


# 2D TriWingedNet for 3D Intracranial Aneurysm Segmentation



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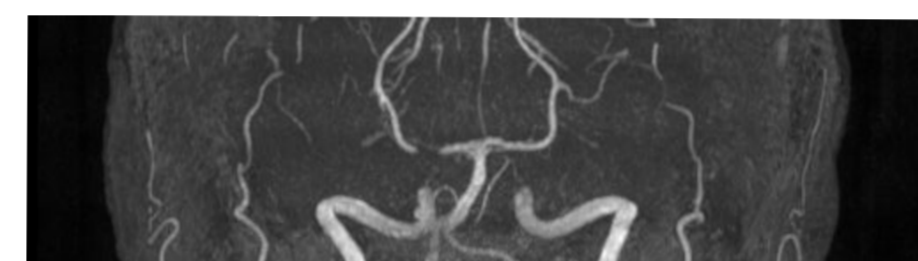
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## Overview

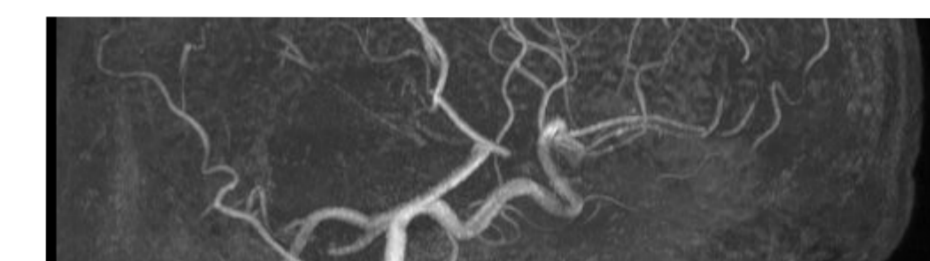
- Purpose of network is to automatically segment unruptured intracranial aneurysms from TOF-MRAs.
- Opt to project the MRA using Maximum Intensity Projection into 3 views and use a 2D TriWingedNet architecture.
- On inference, 2D outputs are combined to reconstruct 3D segmentation map.
- Initial testing in 2D shows promising results.
- With further changes to the architecture, the 3D segmentation of the TOF-MRAs could become more accurate



Axial MIP



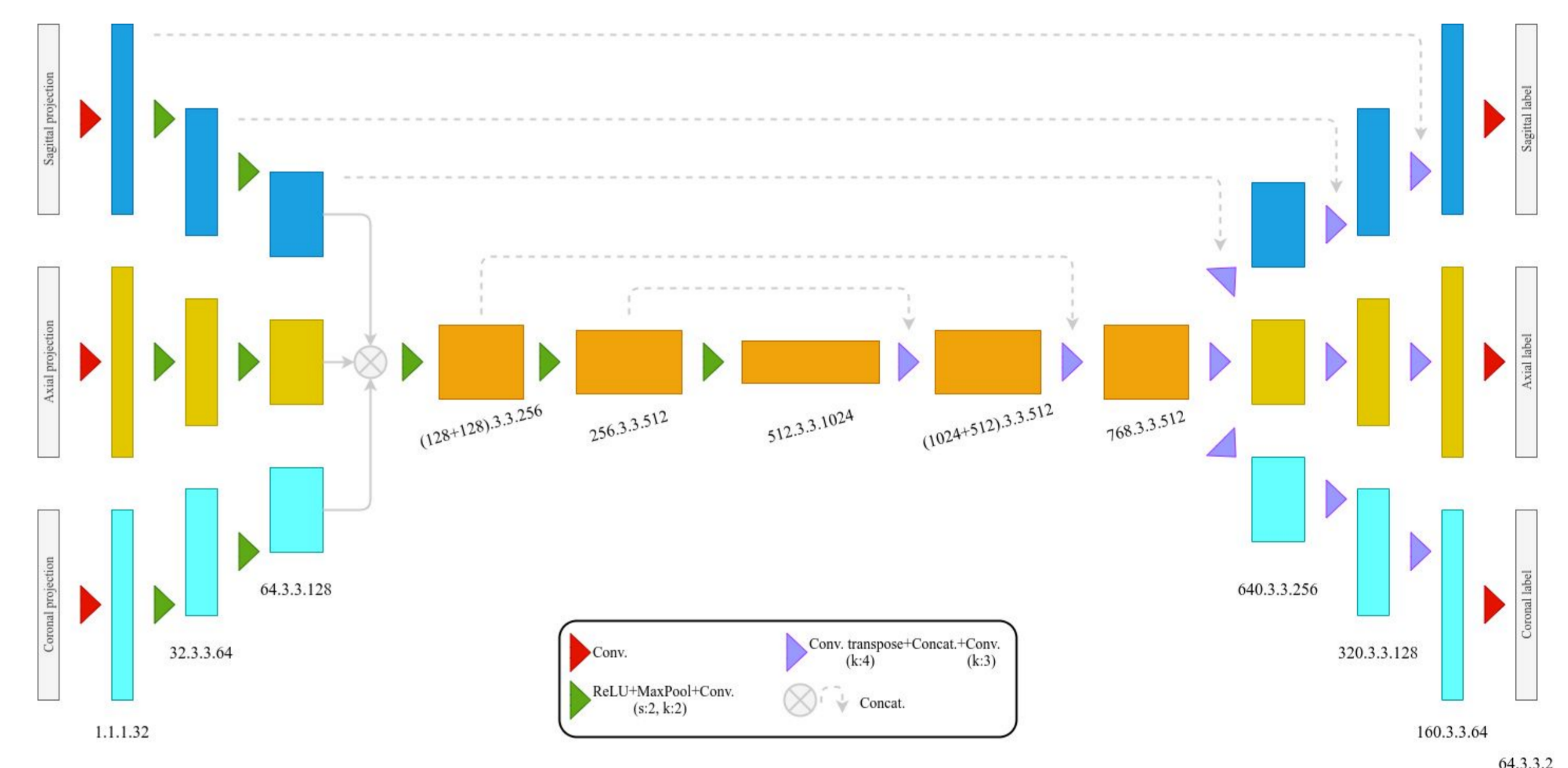
Coronal MIP



Sagittal MIP

## Method

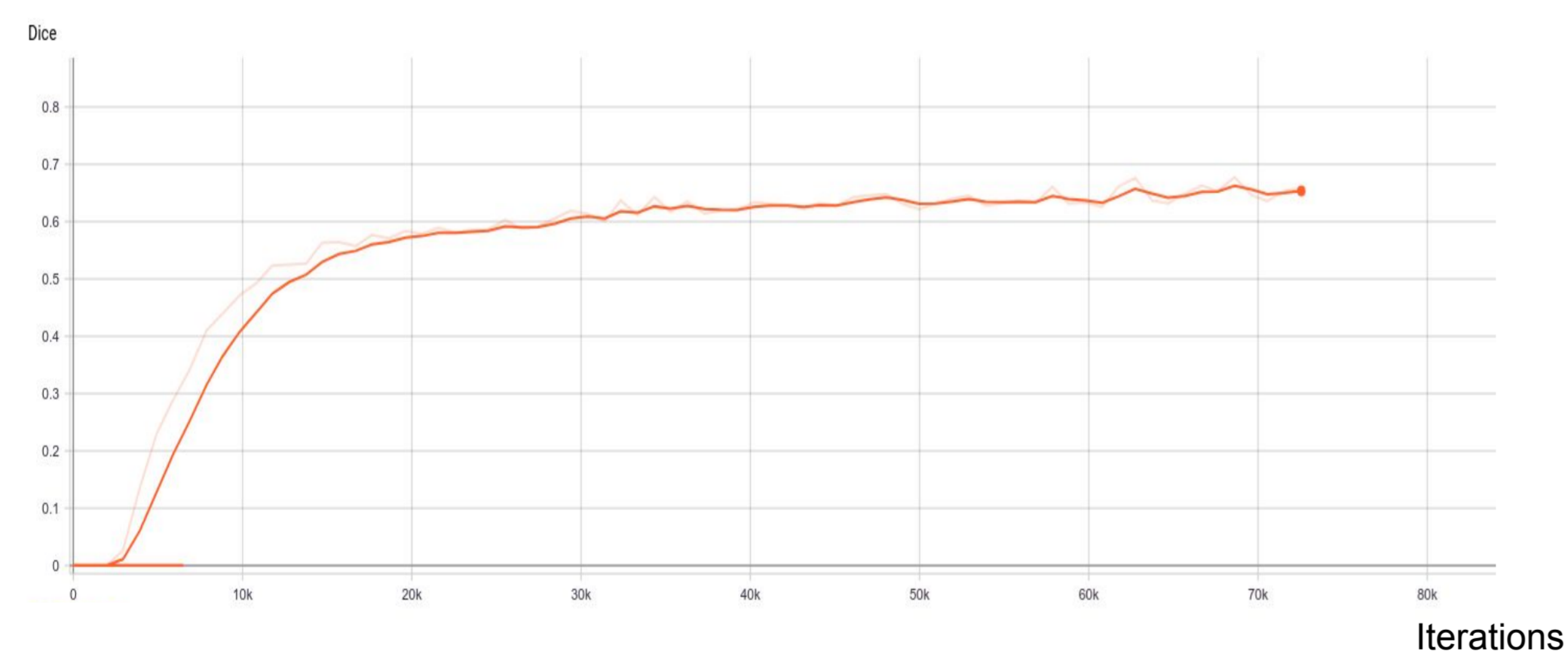
- MIPs taken of each MRA in an offline manner after voxel size resampling ( $0.25 \times 0.25 \times 0.25 \text{ mm}^3$ ).
- TriWingedNet trained on MIP images of all 3 views of all TOF-MRAs.
- Architecture as shown in figure heavily influenced by Btrfly Net [1].
- Dice loss [2] used for training with Adam optimizer and 0.001 learning rate in PyTorch.



## Results

### Training

- 2D – Dice score : 0.65 ( $\pm 0.2$ )
- 3D – Dice score : 0.31 ( $\pm 0.1$ )

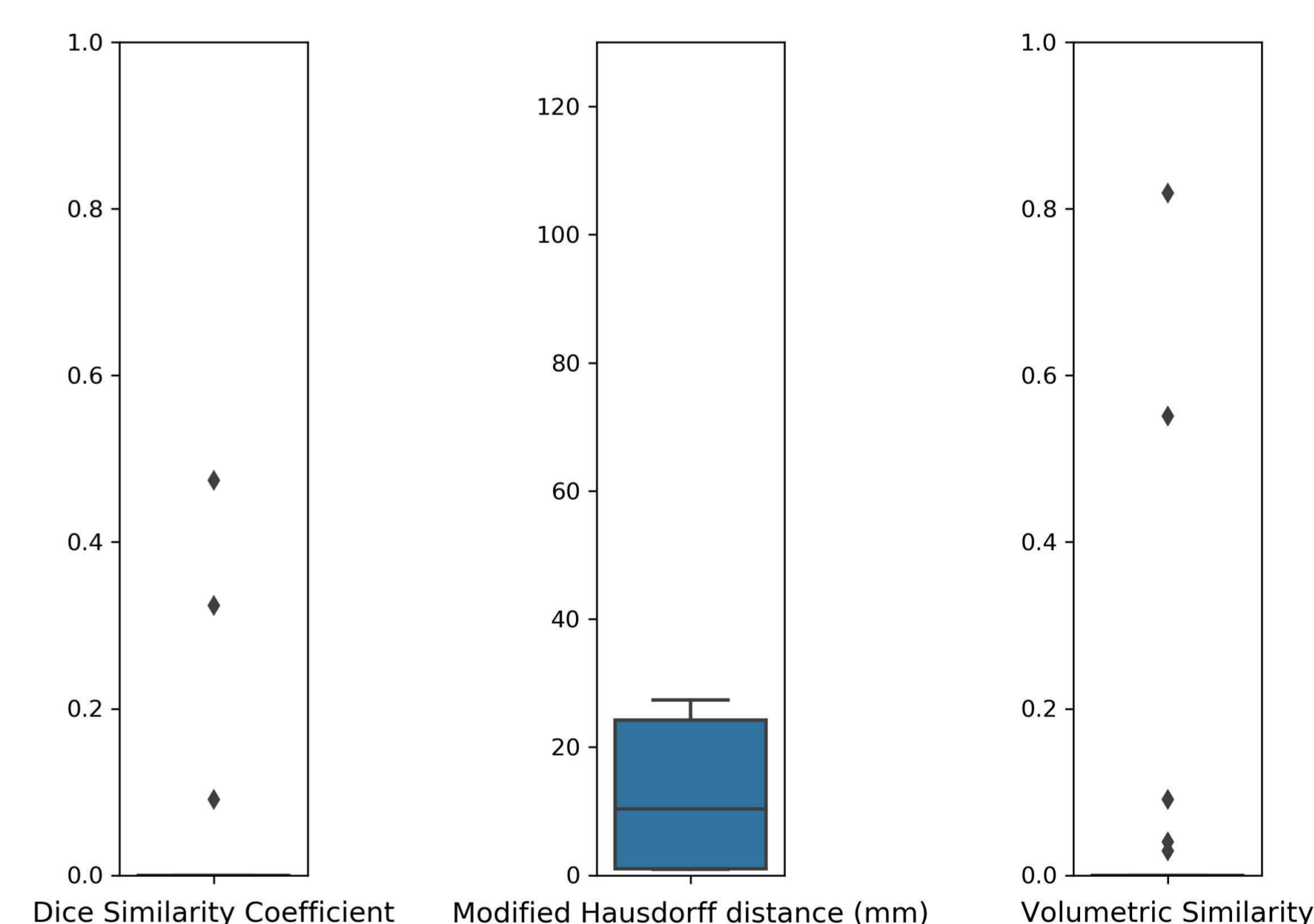


### Testing

Team: **ibbm** Task 1 Rank: **0.5** Task 1 Place: **10 th**  
Task 2 Rank: **0.69** Task 2 Place: **8 th**

Task 1	False Positives	Sensitivity
Average	0.01	0.02
Rank	0	1

Task 2	Dice Coefficient	Modified Hausdorff Distance (mm)	Volumetric Similarity
Average	0.01	12.77	0.01
Rank	1	0.07	1



## Conclusion

- During training network seems to obtain good scores in 2D.
- Over-fitting to the training data makes TriWingedNet unable to generalize on new data.
- Network structure can be changed in future iterations.
- Over-fitting could be reduced by adding augmentations to TOF-MRA data.

## References

[1] Sekuboyina, Anjany, et al. "Btrfly net: Vertebrae labelling with energy-based adversarial learning of local spine prior." International Conference on Medical Image Computing and Computer-Assisted Intervention. Springer, Cham, 2018.

[2] Milletari, Fausto, Nassir Navab, and Seyed-Ahmad Ahmadi. "V-net: Fully convolutional neural networks for volumetric medical image segmentation." 2016 fourth international conference on 3D vision (3DV). IEEE, 2016.