DL hw3 part1

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1 Task 1

I was expecting that train curve for UNet without augmentation will be lower than training curve for UNet with augmentation and inverse effect for validation curves(or may be even increasing loss after some time). Reasons for such expectations are follows: non augmented version see only limited number of samples so it should fit them easier then unlimited number of samples which obtained with augmentation, while added augmented samples should force model to generalize well. But results I gained are contradictory with expectations. Augmented UNet show similar or even worse performance on train set with bigger oscillations than non-augmented version. On first half of learning stage augmented version show better performance on validation set, while on a second half non-augmented version is better. I have no explanation for such behaviour, first my idea was that some applied transforms are too destructive and corrupt images or labels, but I check it and this is not hold. Below training and validation curves plots are provided.

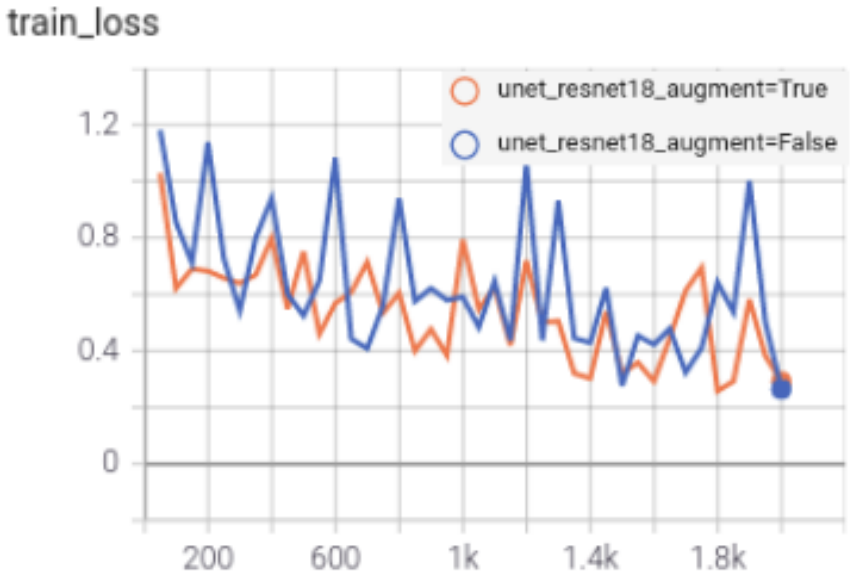

Figure 1: Mean class-accuracy

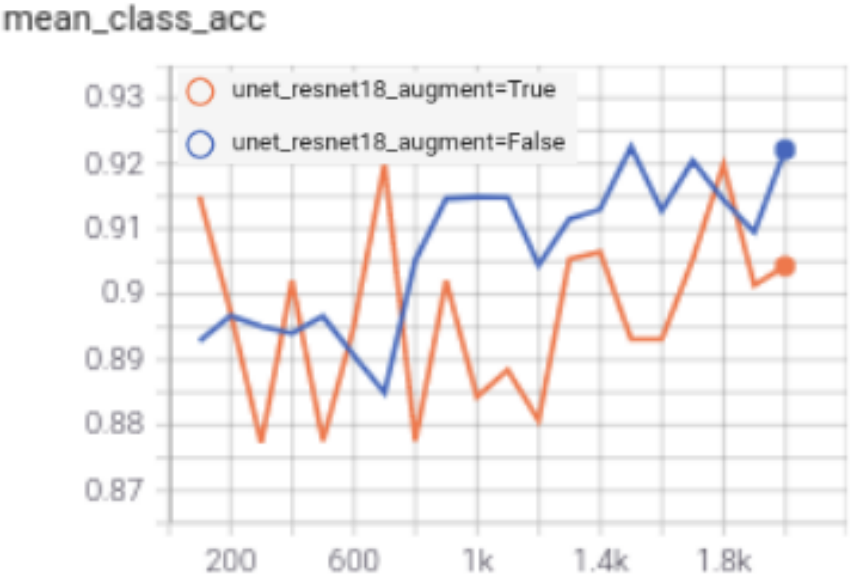

Figure 2: Mean class-accuracy

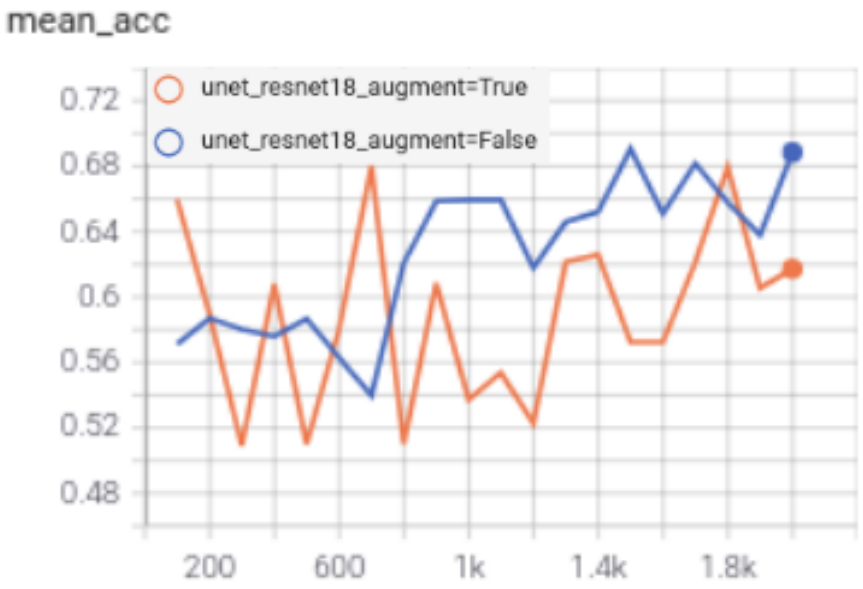

Figure 3: Mean accuracy

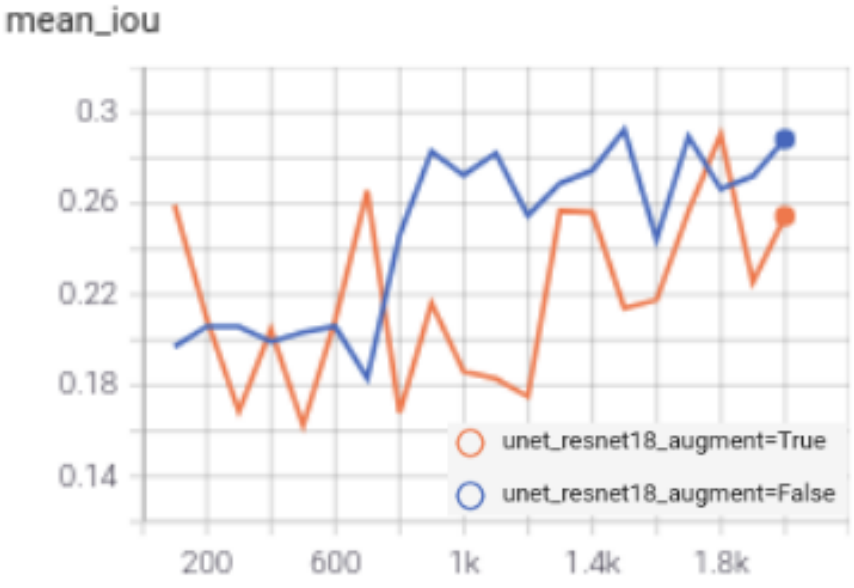

Figure 4: Mean IoU

2 Task 2

Validation curves for both ResNet18 trained with and without ASPP fluctuate significantly, and I can't definitely say that one performs better than another. On train set version without ASPP performs slightly worse and fluctuate more. It is not surprisingly because version with ASPP have bigger capacity and can fit train set more easily.

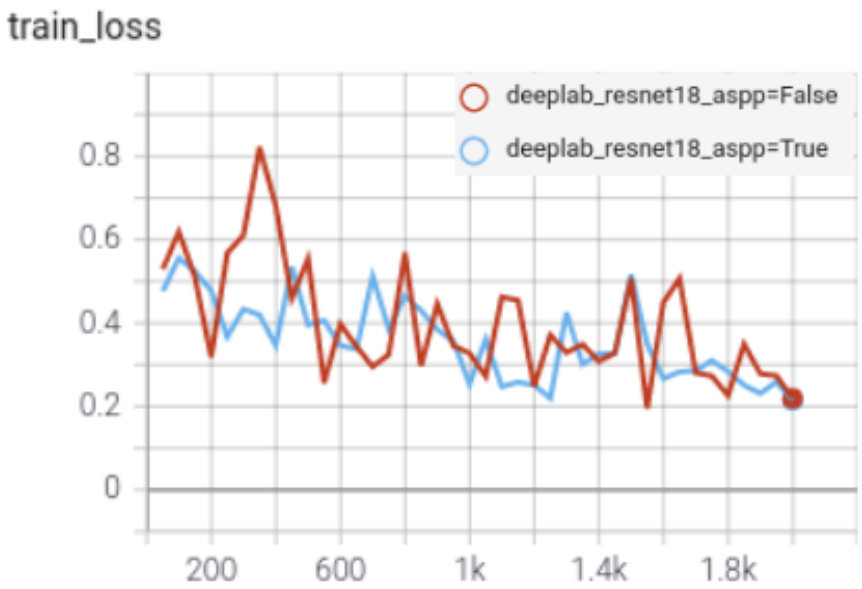

Figure 5: Mean class-accuracy

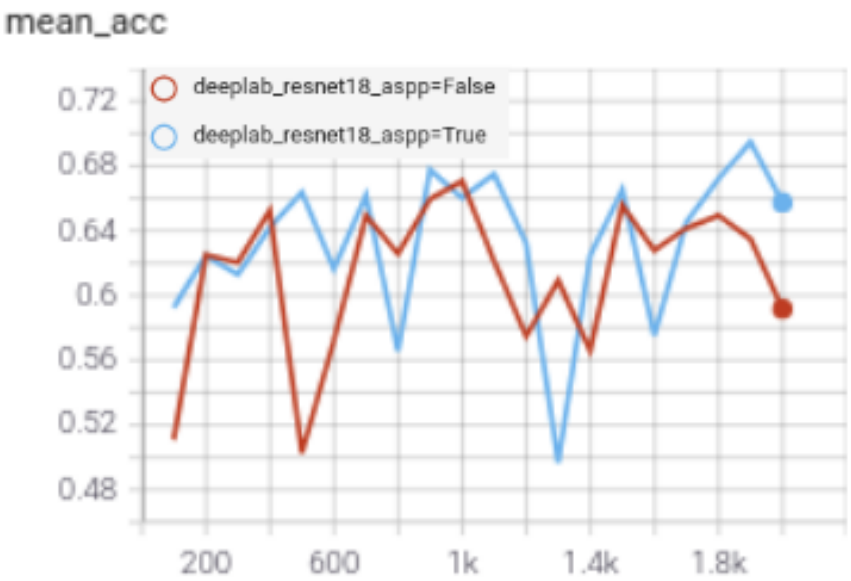

Figure 6: Mean class-accuracy

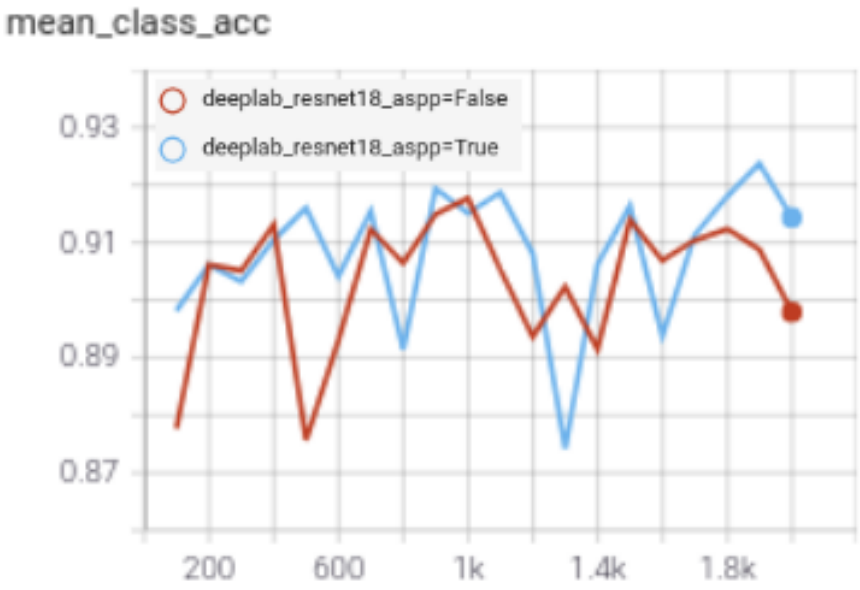

Figure 7: Mean accuracy

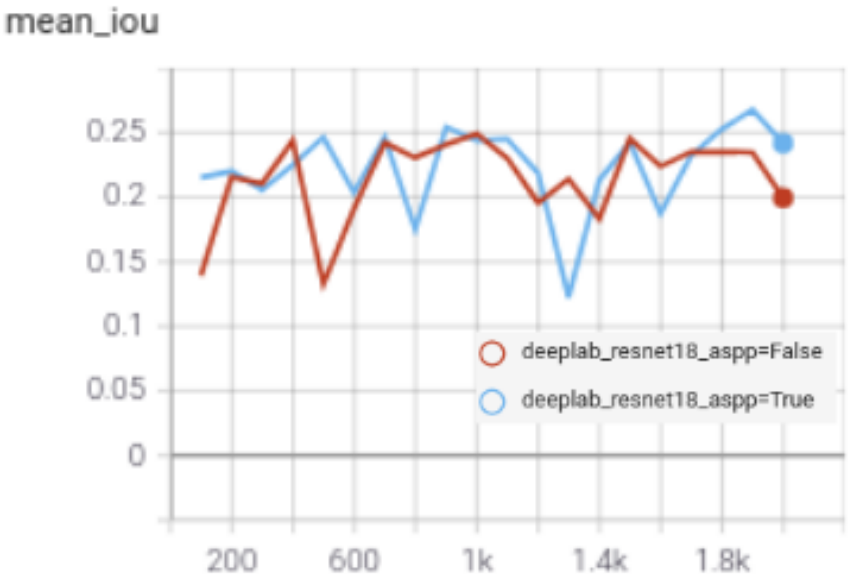

Figure 8: Mean IoU

3 Task 3

UNet model has bigger mIoU than other models but slower on inference and training 2 times more than others. Second result on mIoU show MobileNetv3 and it's best model in terms of train time, inference time and model size. VGG model has bigger mIoU than Resnet18, but it 2 times slower on inference than Resnet18 and 5 times bigger than other models. Resnet18 quite small and fast model, however it has worse mIoU. VGG model can be accelerated and compressed by changing default convolutions to separable convolutions; for better gradient propagation and in result better quality skip-connections can be added. For UNet model same tenchique with separable convolutions can be applied, also building blocks can be changed to inverted bottlenecks for performance boost. Same can be applied for Resnet18.

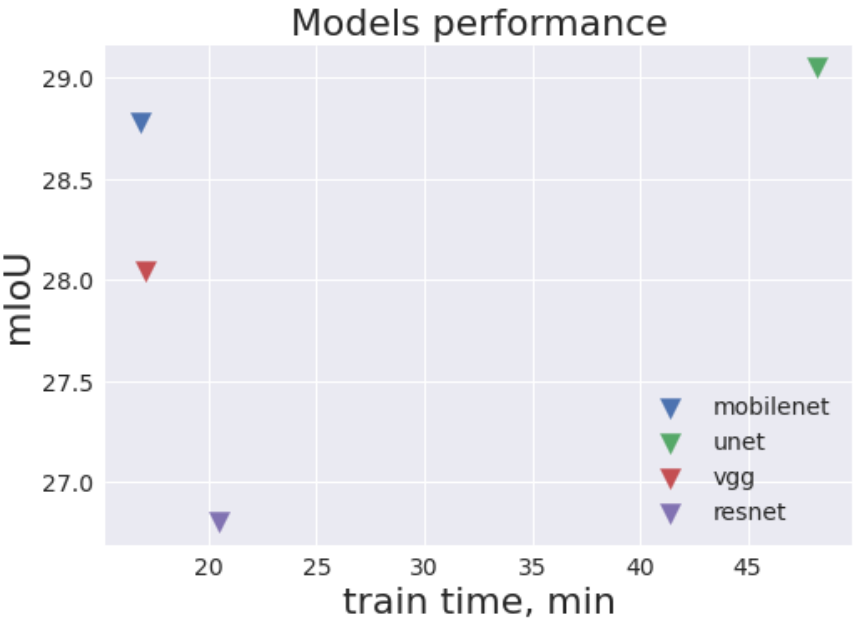

Figure 9: Models performance

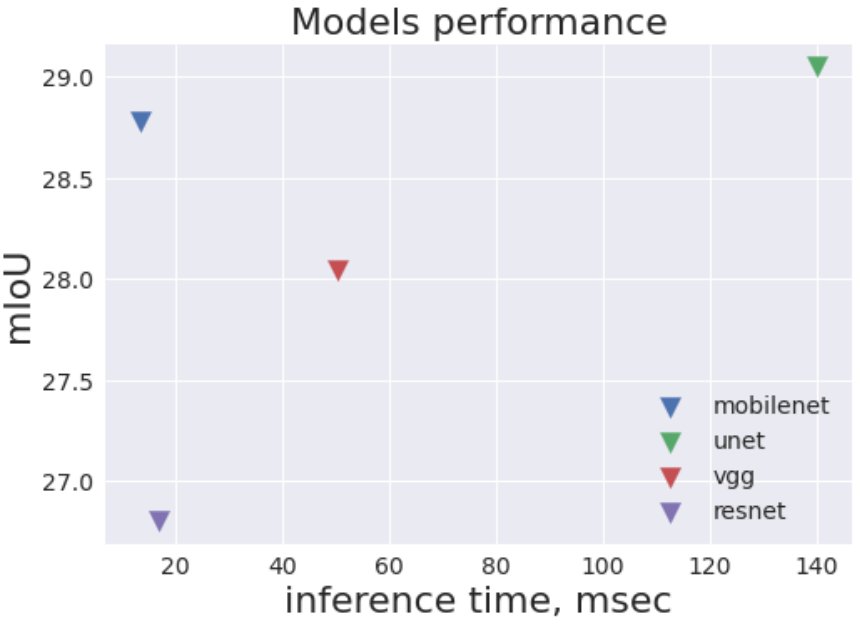

Figure 10: Models performance

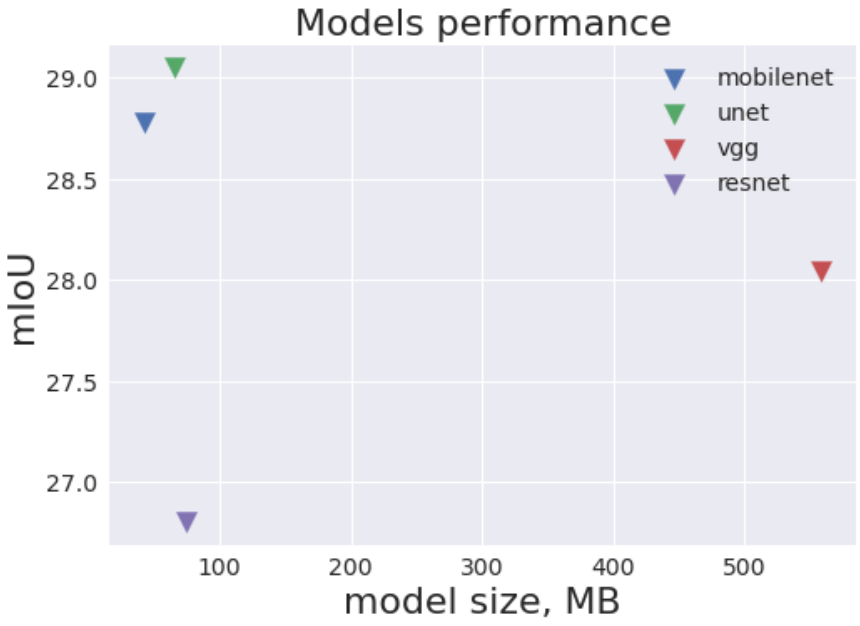

Figure 11: Models performance

4 Task 4

UNet model predict better background class than others (probable reason for that - background class most popular). Model can confuse water and road (Figures 12,13,14,15). Model can't segment pool borders, but it segment water in pool good(Figure 12). There are water and road classes segment instead of buildings(Figures 12,15). Model can miss a lot of forest(Figures 16, 17)

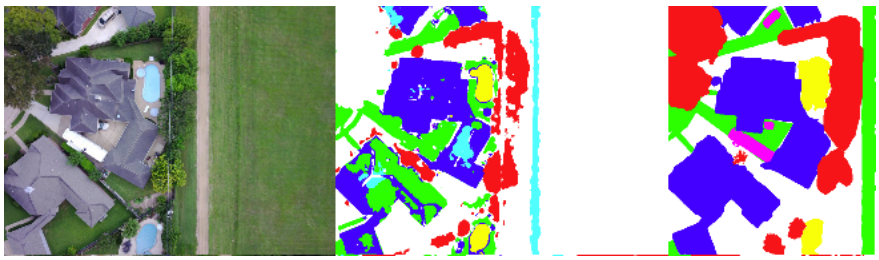

Figure 12: UNet prediction

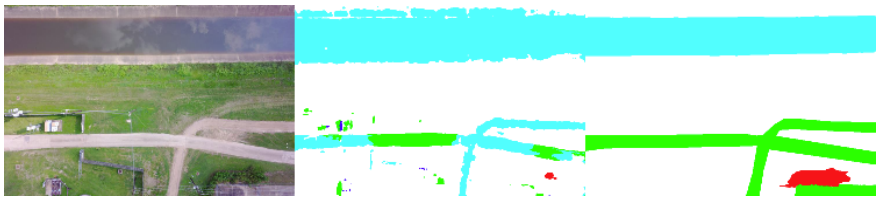

Figure 13: UNet prediction

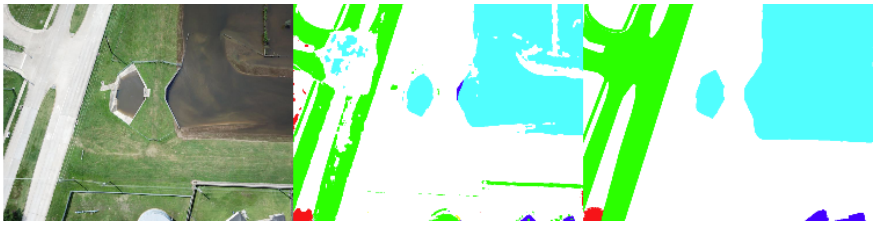

Figure 14: UNet prediction

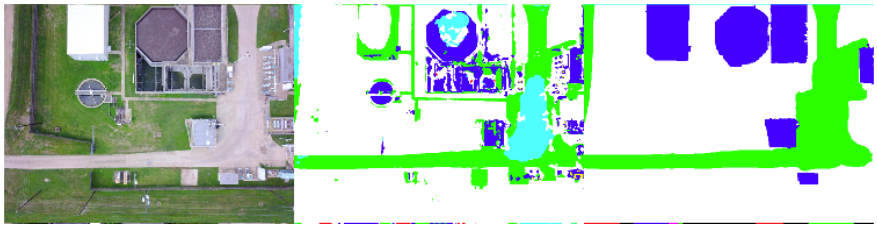

Figure 15: UNet prediction

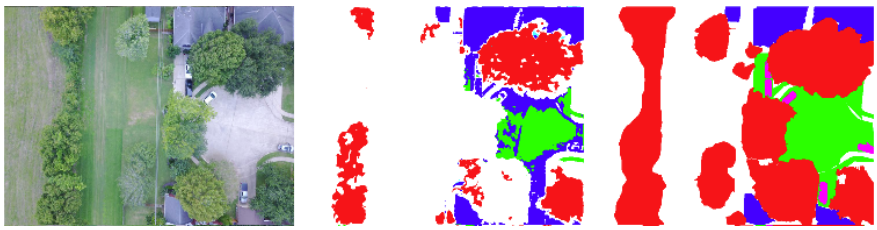

Figure 16: UNet prediction

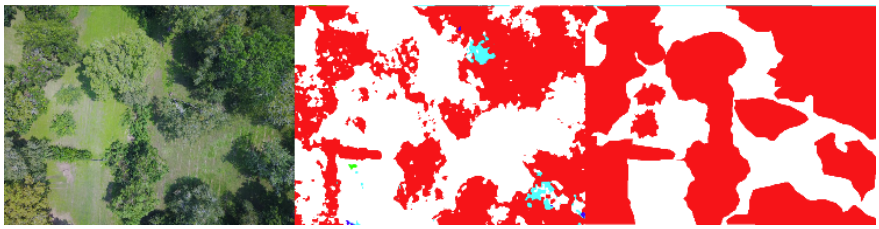

Figure 17: UNet prediction