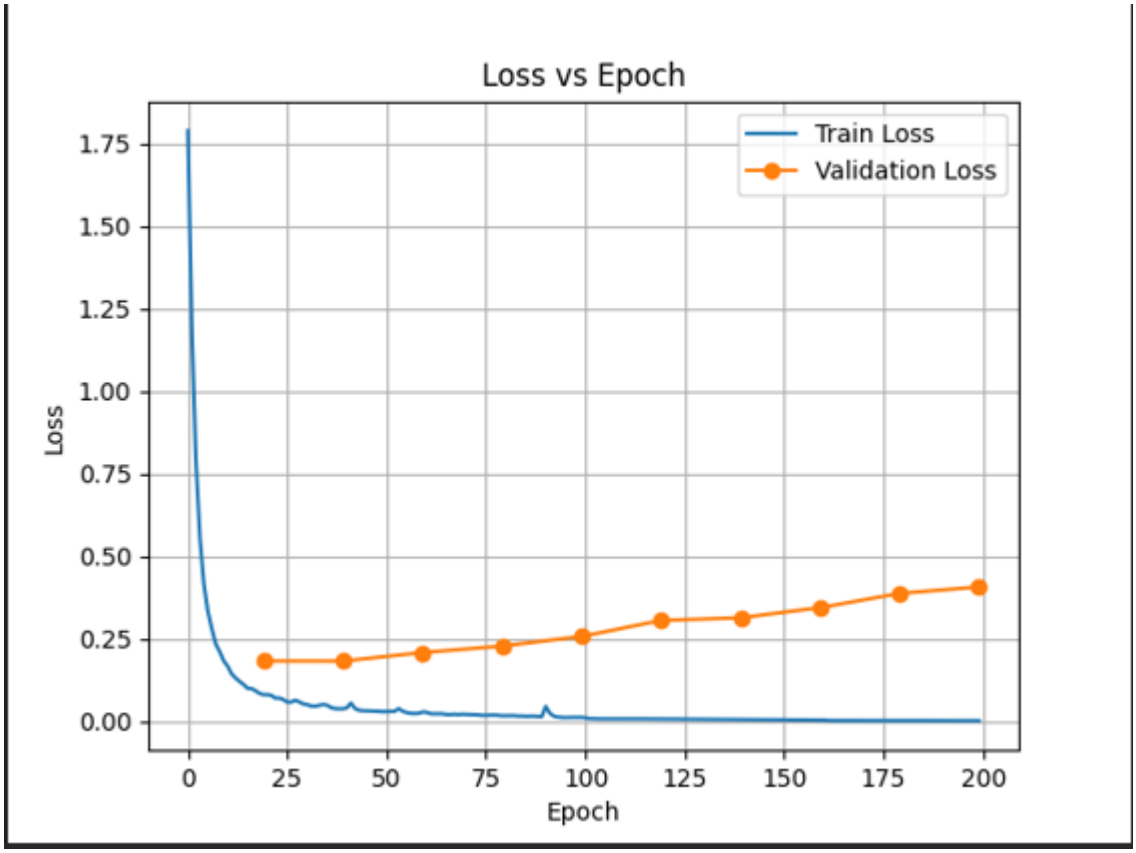
DINOv2 with U-Net Segmentation Head

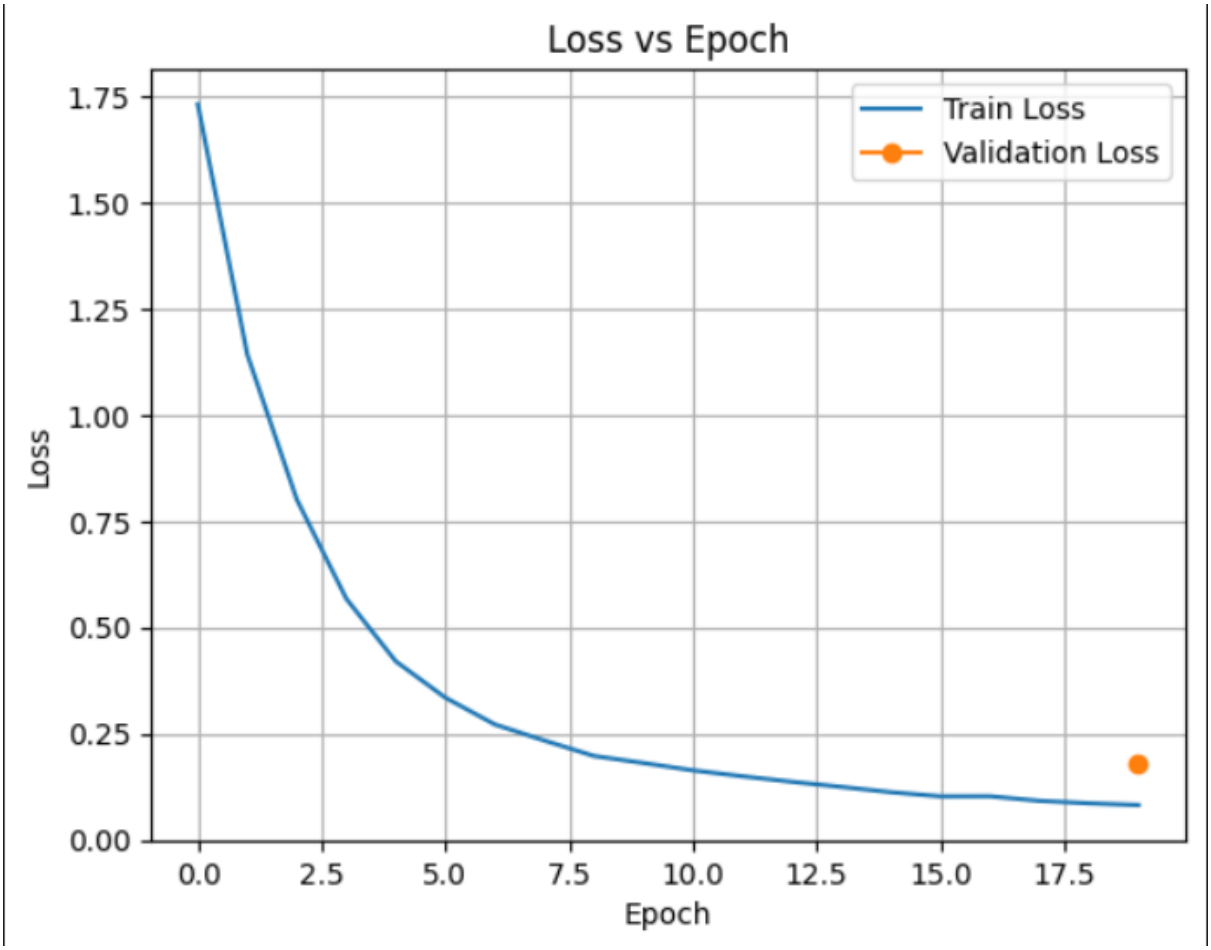
Observation:

1.) Tried first without fine tuning the DINOv2 weights. We see some kind of Overfitting (could be due to more numbers of epoch). With 100 epoch the validation loss was ok. So, tried with Reduced epoch with other architecture.

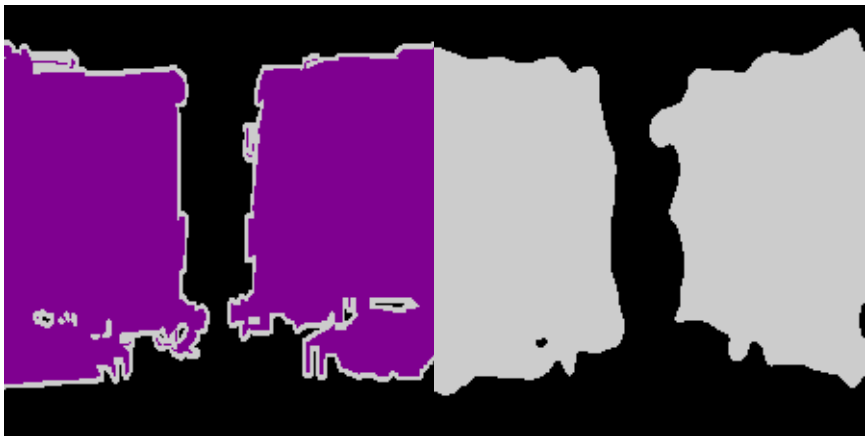
With 200 epochs. Case of OVERFITTING



When train for only 20 Epochs. Validation is after 20th Epoch.



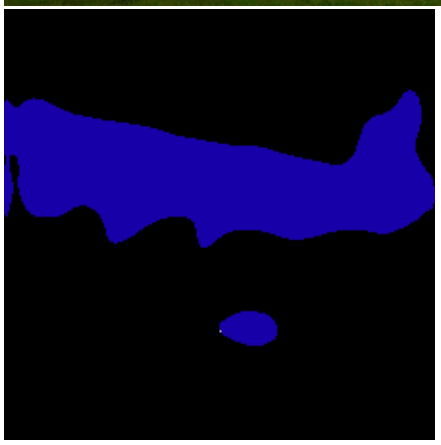
2.) Few results on the validation set. Left is GT and Right is Pred.



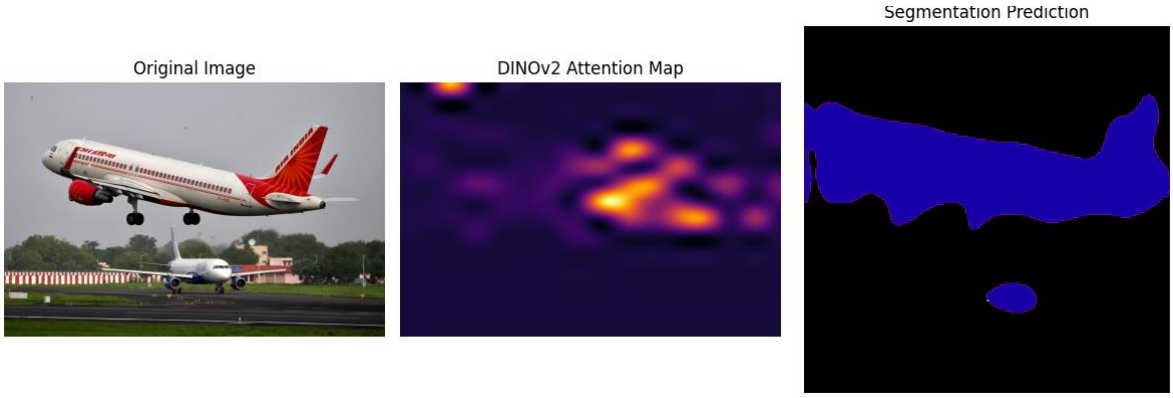
3.) Found fine-tuning DINO weights was even more OVERFITTING. Guessing that the data is to less for this model to get fine-tuned. We can use this setting here to turn fine-tuning on and off.

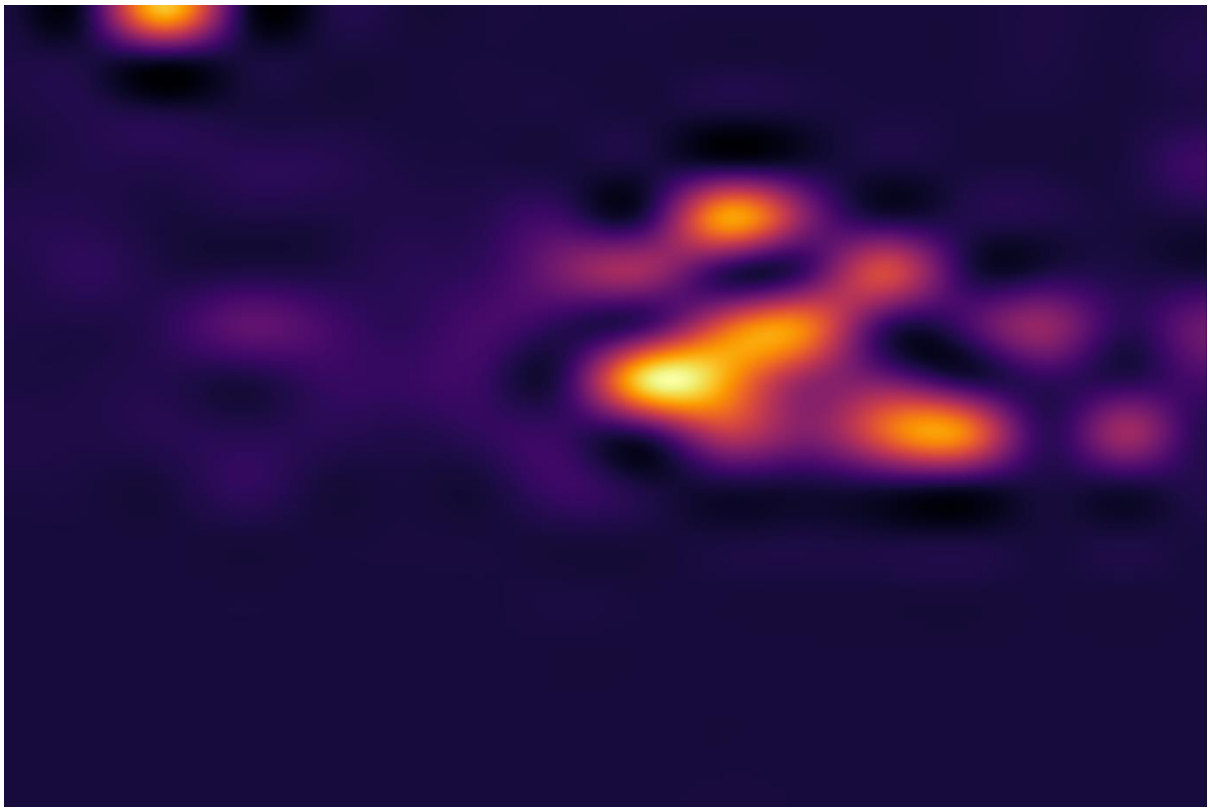
```python
class DinoSegModel(nn.Module):
    def __init__(self, freeze_dino=True, num_classes=21):
        super().__init__()
        self.dino = Dinov2Model.from_pretrained("facebook/dinov2-large")
        self.decoder = UNetDecoder(in_channels=1024, num_classes=num_classes)

        if freeze_dino:
            for param in self.dino.parameters():
                param.requires_grad = False
```

3.) Result on Test Data (Not from the train or validation set).

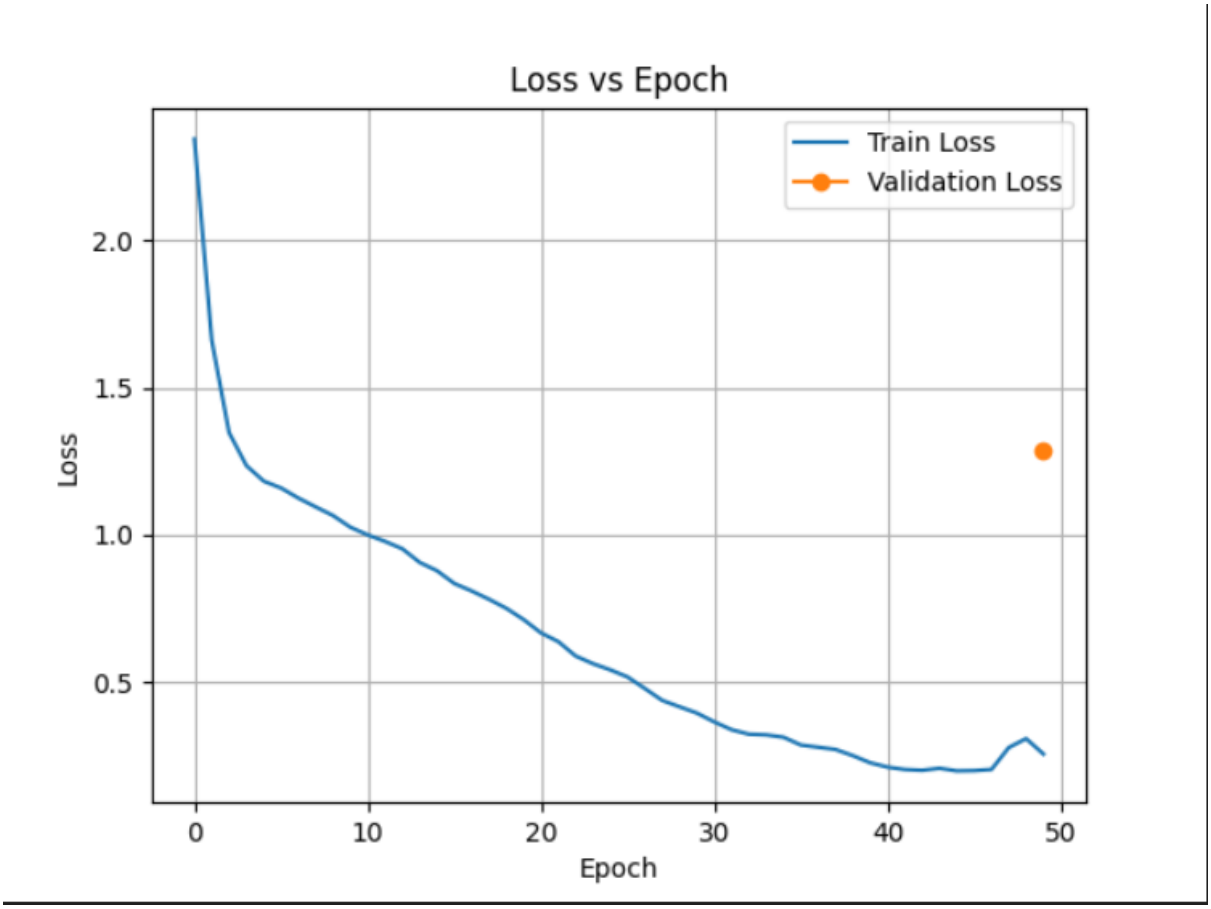


4.) Attention Visualization.



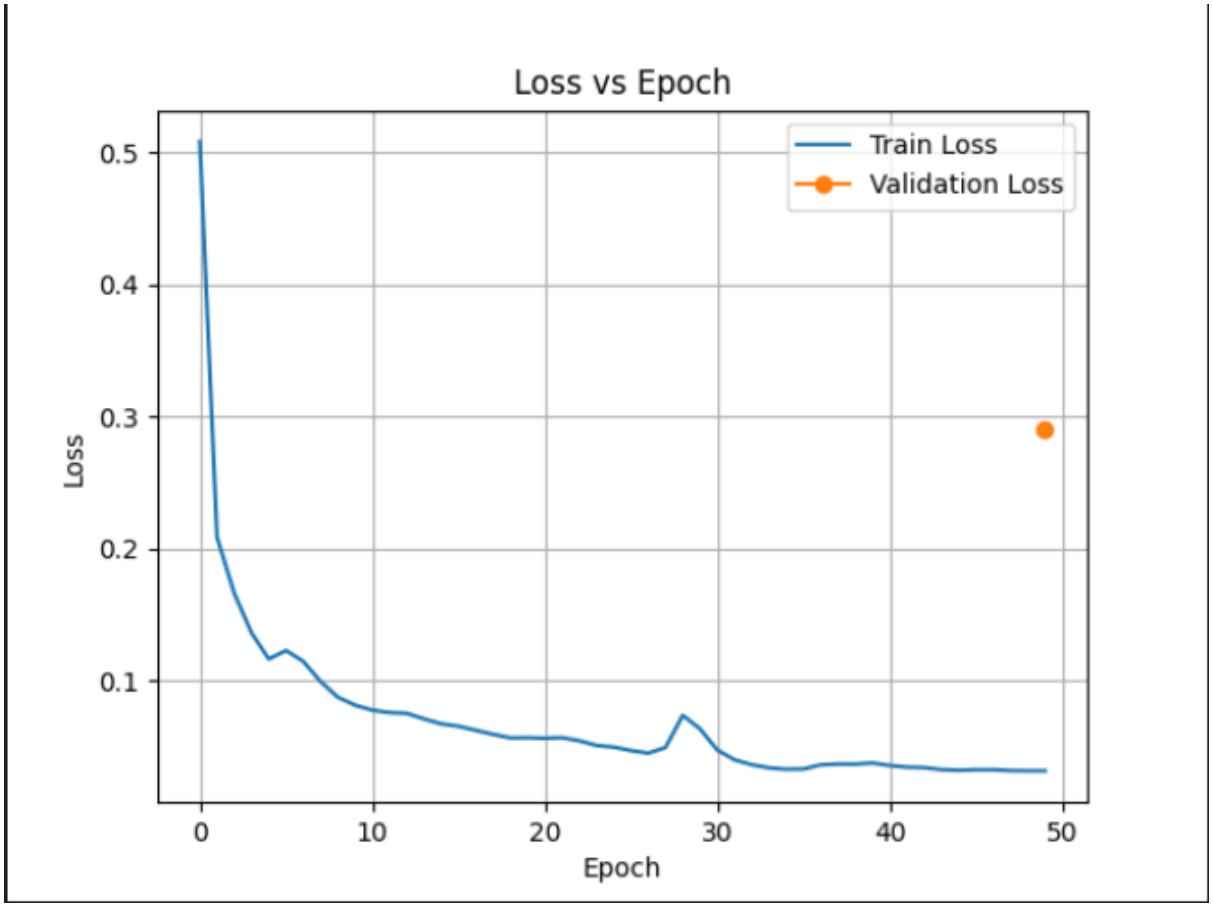


5.) Using DeepLab. Trained for 50 Epochs.



Result was not good as we have trained the DINO weights as well and as observer in U-Net Architecture also that when training DINO the result is not great. I guess we need larger dataset to fit to this complex model.

6.) When Attention Based Segmentation Head is used.

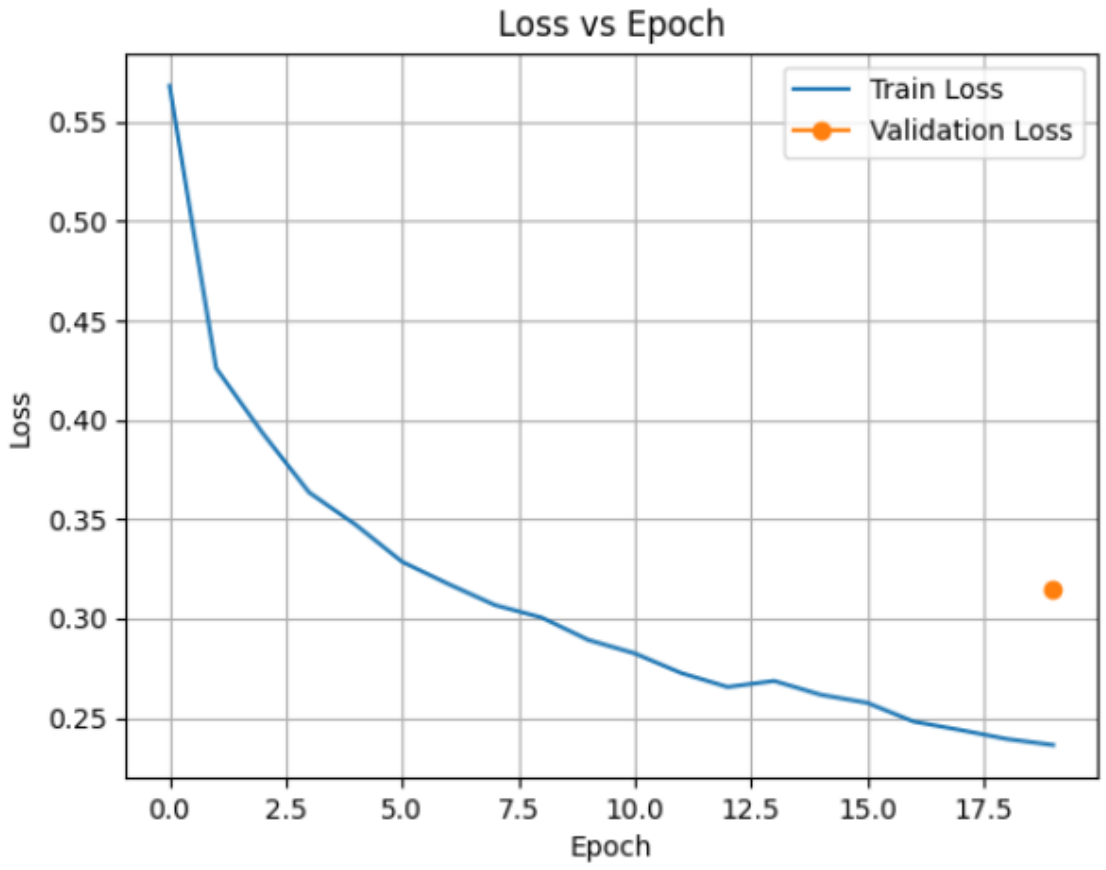



```
Epoch 50 | Train Loss: 0.0317 | Val Loss: 0.2896 | Val mIoU: 0.7437
Saved best model at epoch 50 with val loss 0.2896
Checkpoint saved at epoch 50
```

Few prediction:

Inference Result:

7.) Lovasz Loss function.



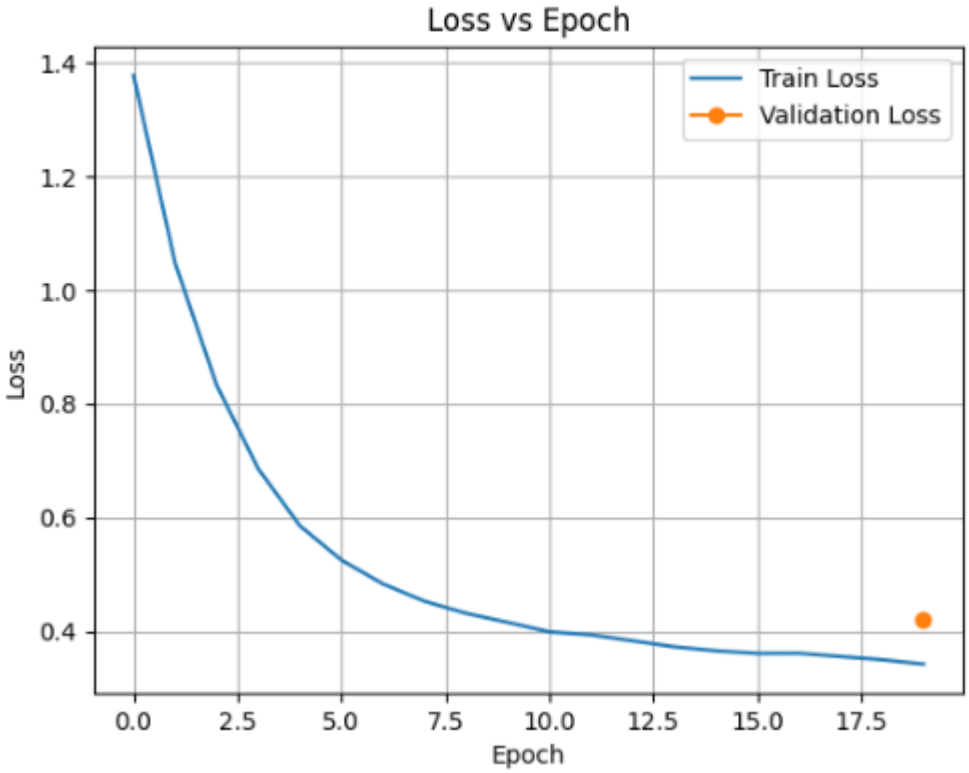

```
Epoch 20 | Train Loss: 0.2363 | Val Loss: 0.3148 | Val mIoU: 0.7681
Saved best model at epoch 20 with val loss 0.3148
Checkpoint saved at epoch 20
```

Validation Results:

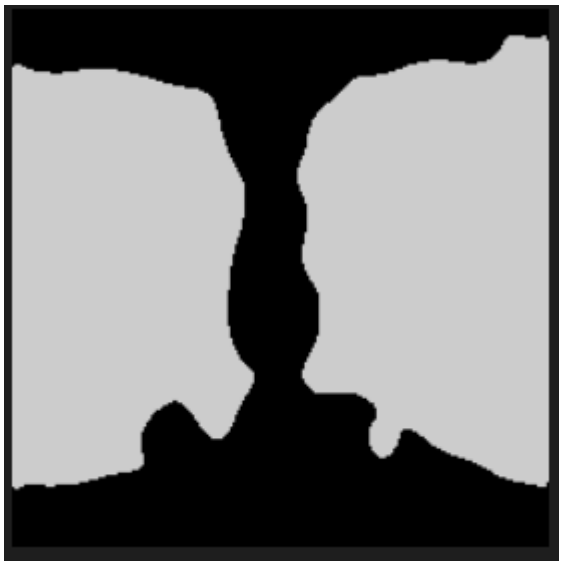
Inference Result:

8.) Dice+CE Loss Function:

```
Epoch 20 | Train Loss: 0.3426 | Val Loss: 0.4204 | Val mIoU: 0.7659
Saved best model at epoch 20 with val loss 0.4204
Checkpoint saved at epoch 20
```



Validation Result:



Inference: