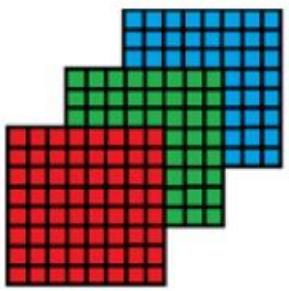
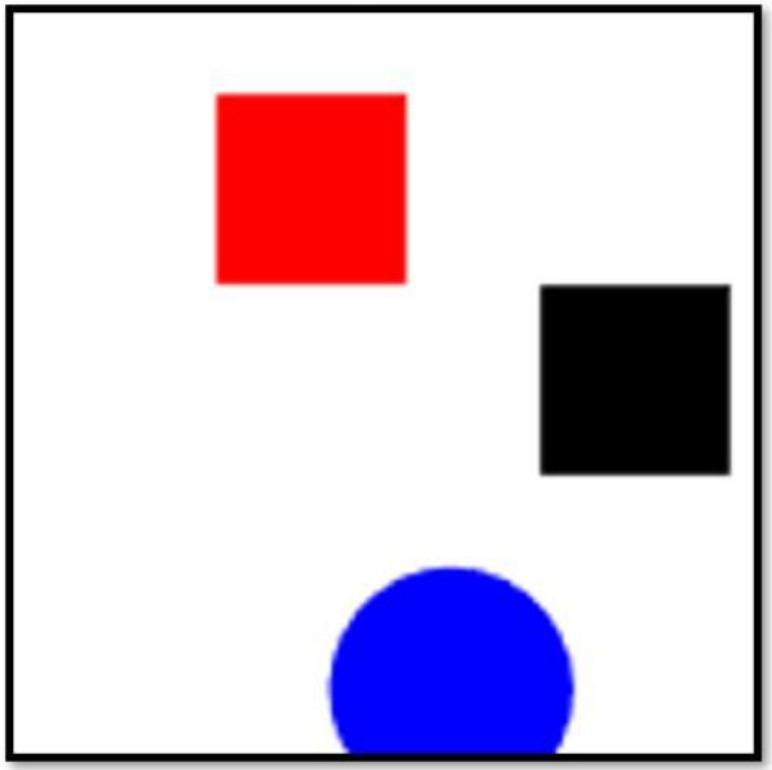
Dataset Creation

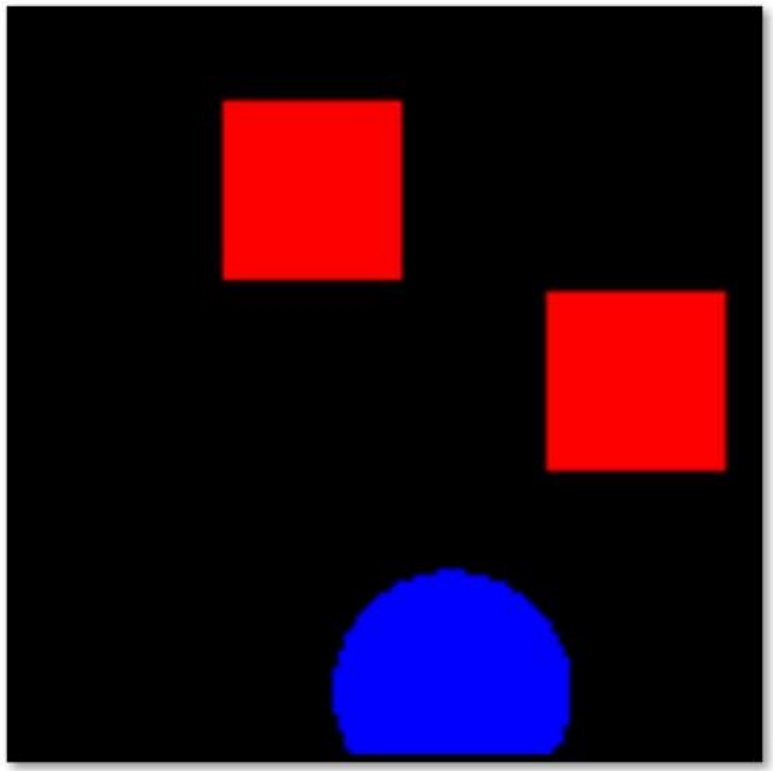


Input ("/image")

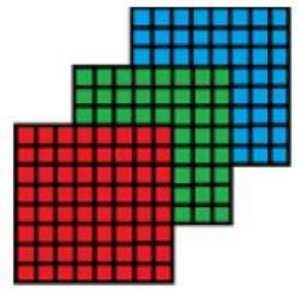


Input Shape : 3, 128, 128
Unique Elements : 0, 255

Output ("/gt_image")

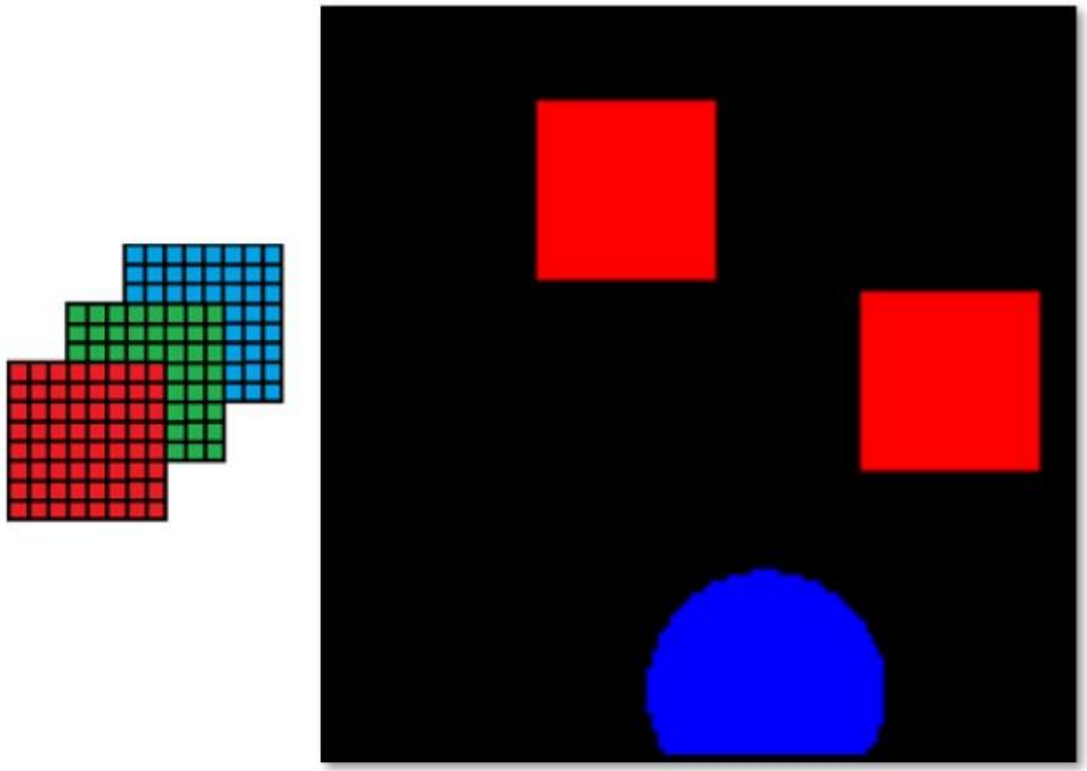


Output Shape : 3, 128, 128
Unique Elements : 0, 255



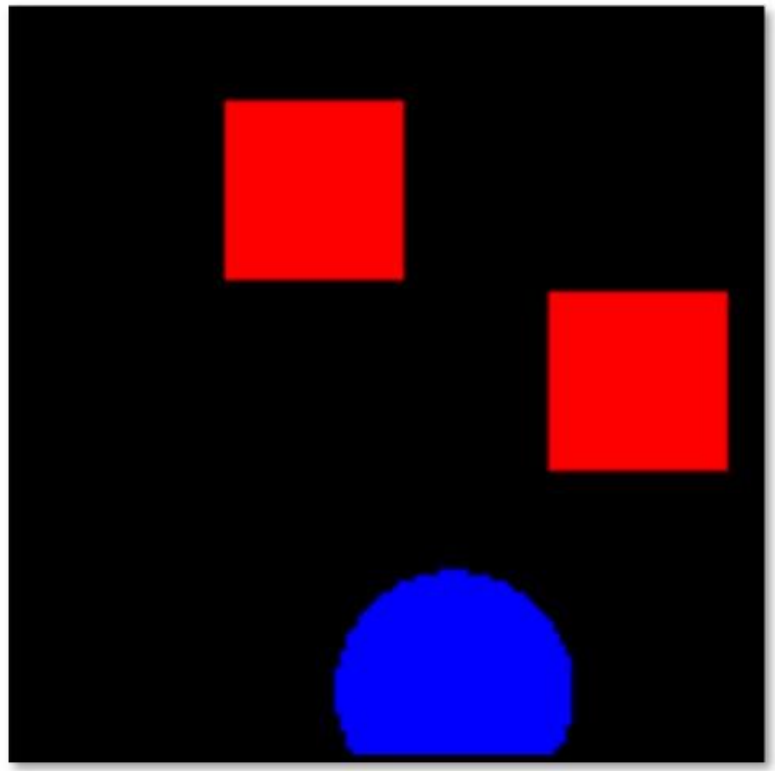
Dataset Creation

Output ("/gt_image")



Output Shape : 3, 128, 128
Unique Elements : 0, 255

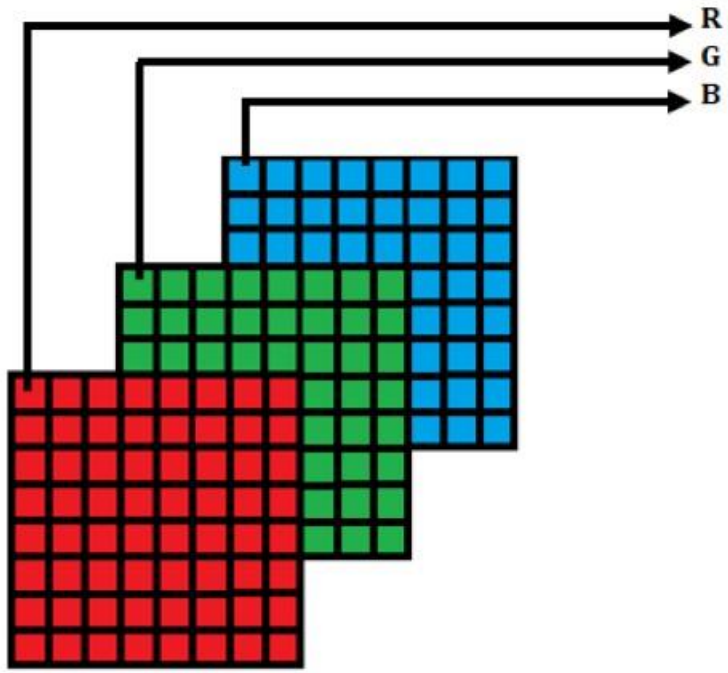
Output Mask



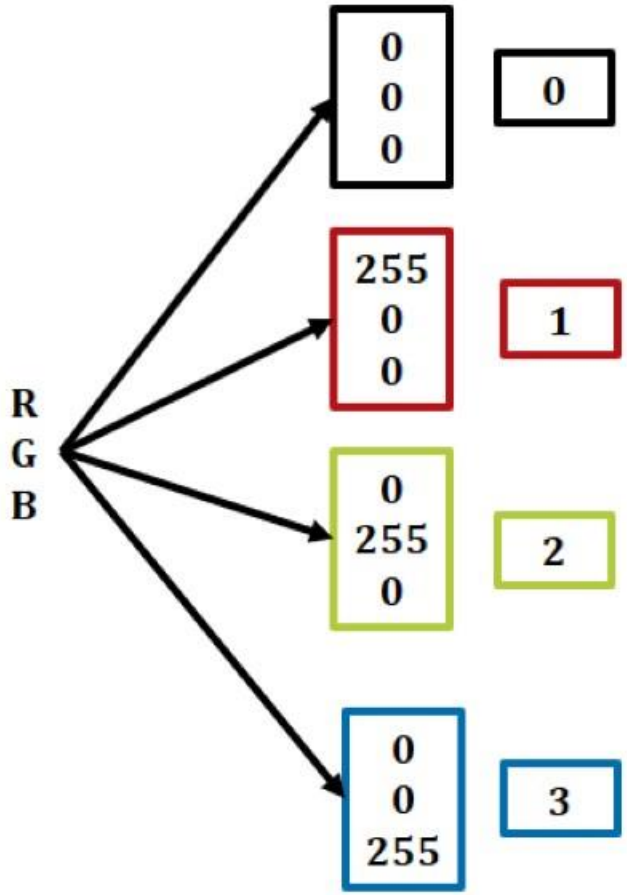
Output Mask Shape : 128, 128
Unique Elements : 0, 1, 2, 3

Dataset Creation

Output ("/gt_image")



Output Shape : 3, 128, 128
Unique Elements : 0, 255



Output Mask

0	0	0	0	0	0	0	0
0	0	2	3	0	0	0	0
0	2	0	0	0	0	2	1
0	0	0	0	2	0	0	0
0	1	0	0	0	0	1	0
0	0	3	1	0	0	3	0
0	0	0	0	0	2	0	0
0	0	0	0	0	0	0	0

Output Shape : 128, 128
Unique Elements : 0, 1, 2, 3

Loss Selection

Output Mask

0	0	0	0	0	0	0	0
0	0	2	3	0	0	0	0
0	2	0	0	0	0	2	1
0	0	0	0	2	0	0	0
0	1	0	0	0	0	1	0
0	0	3	1	0	0	3	0
0	0	0	0	0	2	0	0
0	0	0	0	0	0	0	0

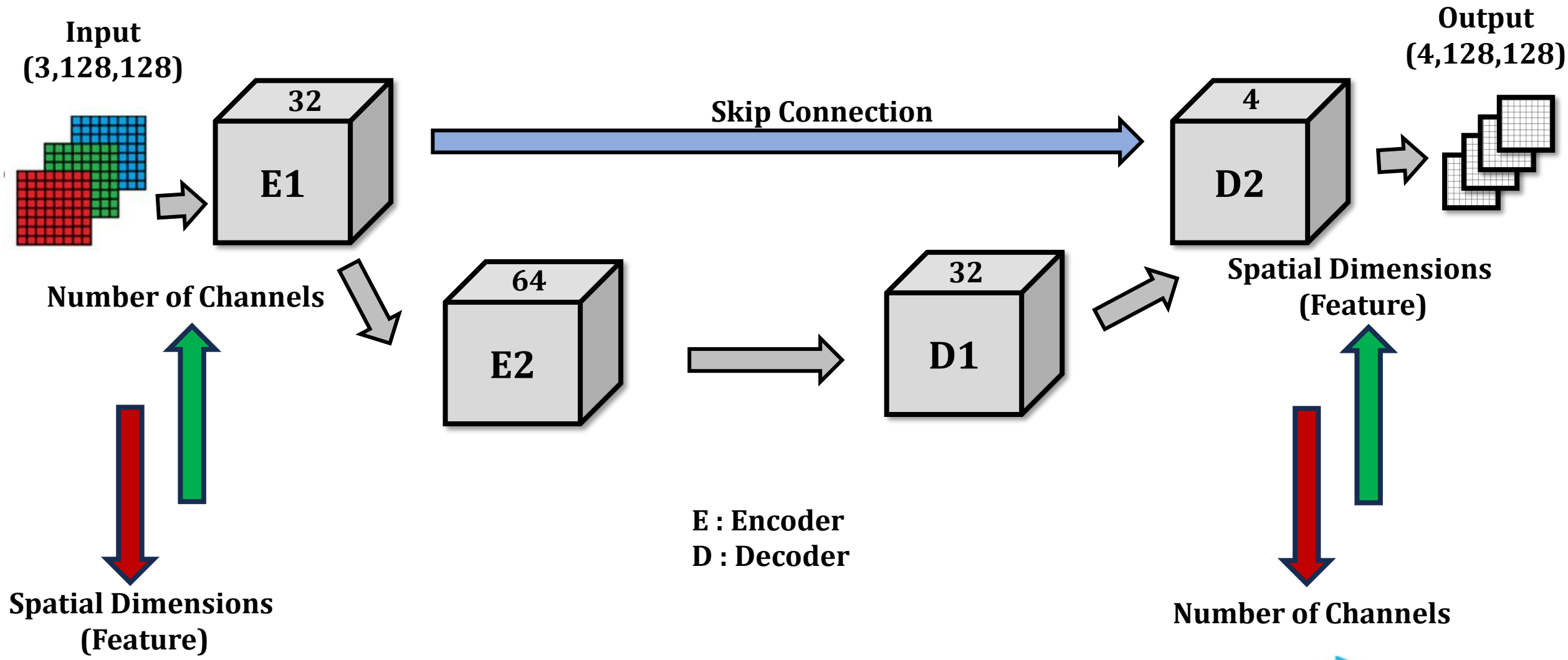
Output Shape : 128, 128
Unique Elements : 0, 1, 2, 3

The proportion of Class 0 is higher when compared to other classes (1 2 3)

Weighted Cross-Entropy

```
#criterion = torch.nn.CrossEntropyLoss().to(device)
class_weights = torch.tensor([0.04, 0.32, 0.32, 0.32])
criterion = torch.nn.CrossEntropyLoss(weight=class_weights).to(device)
```

Simple CNN Model



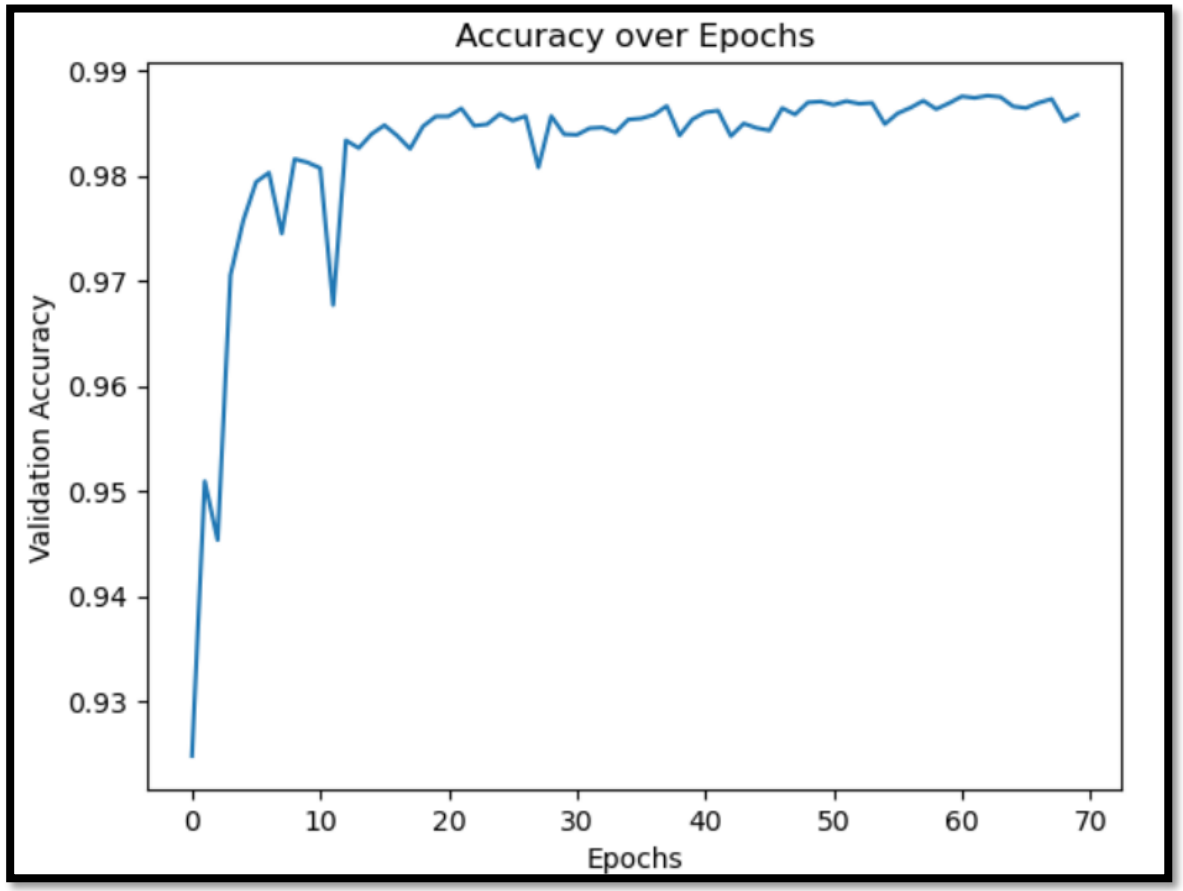
Accuracy Model

Predicted Output

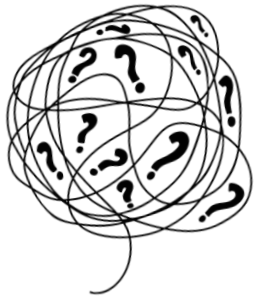
0	0	0	0	0	0	0	0
0	0	2	3	0	0	0	0
0	2	0	0	0	0	2	1
0	0	0	0	2	0	0	0
0	1	0	0	0	0	1	0
0	0	X	1	0	0	3	0
0	0	0	0	0	2	0	0
0	0	0	0	0	0	0	0

Total Accuracy of the Model = (63 / 64) x 100 = 98.45 %

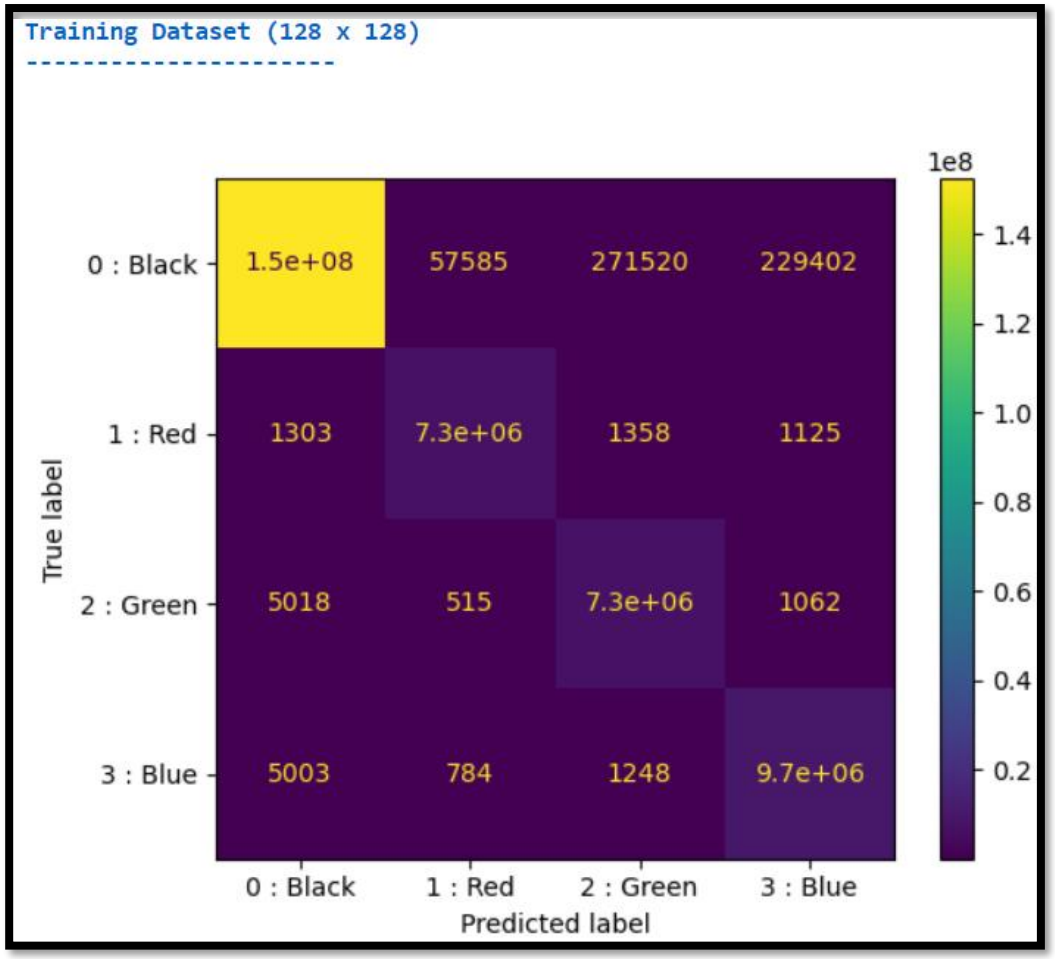
Accuracy of Class 3 (Blue)= (2 / 3) x 100 = 66.66 %

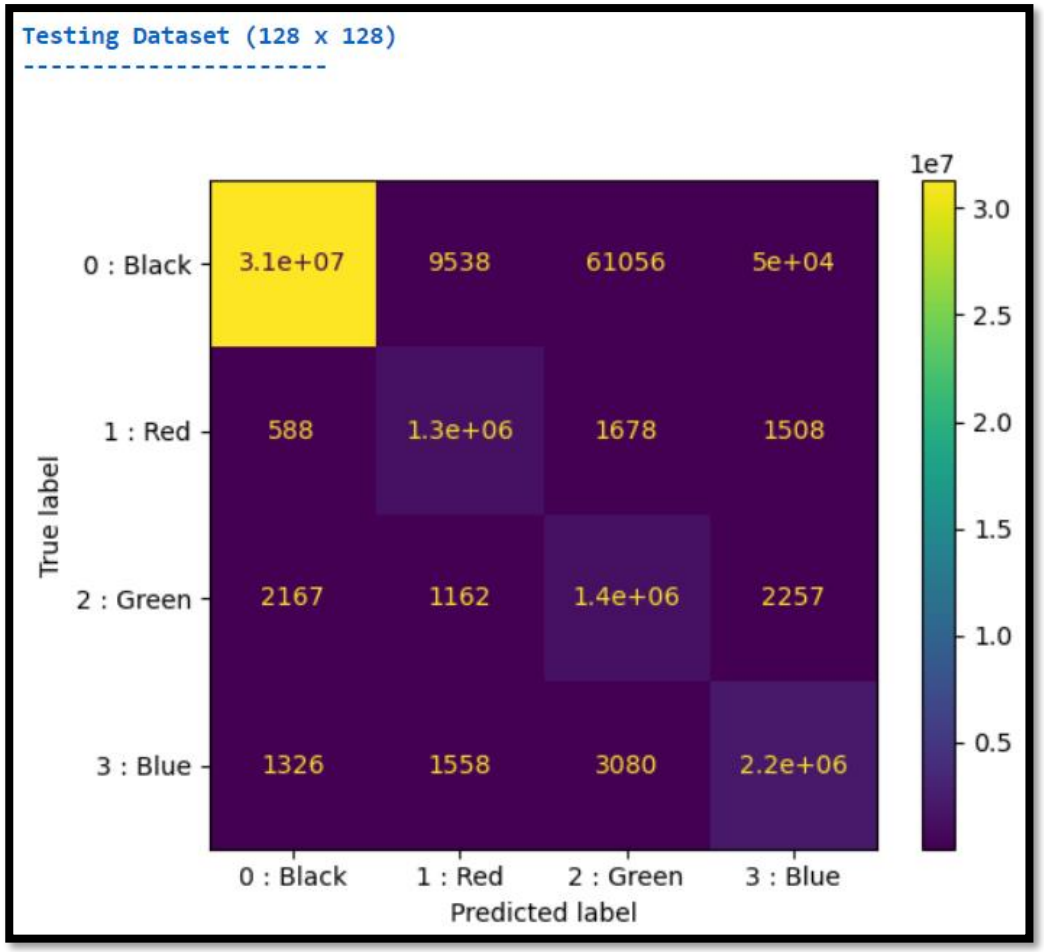


Accuracy Model

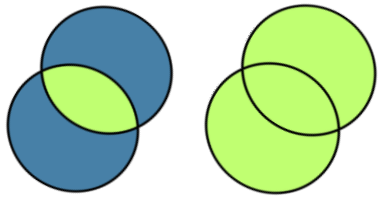


Confusion Matrix

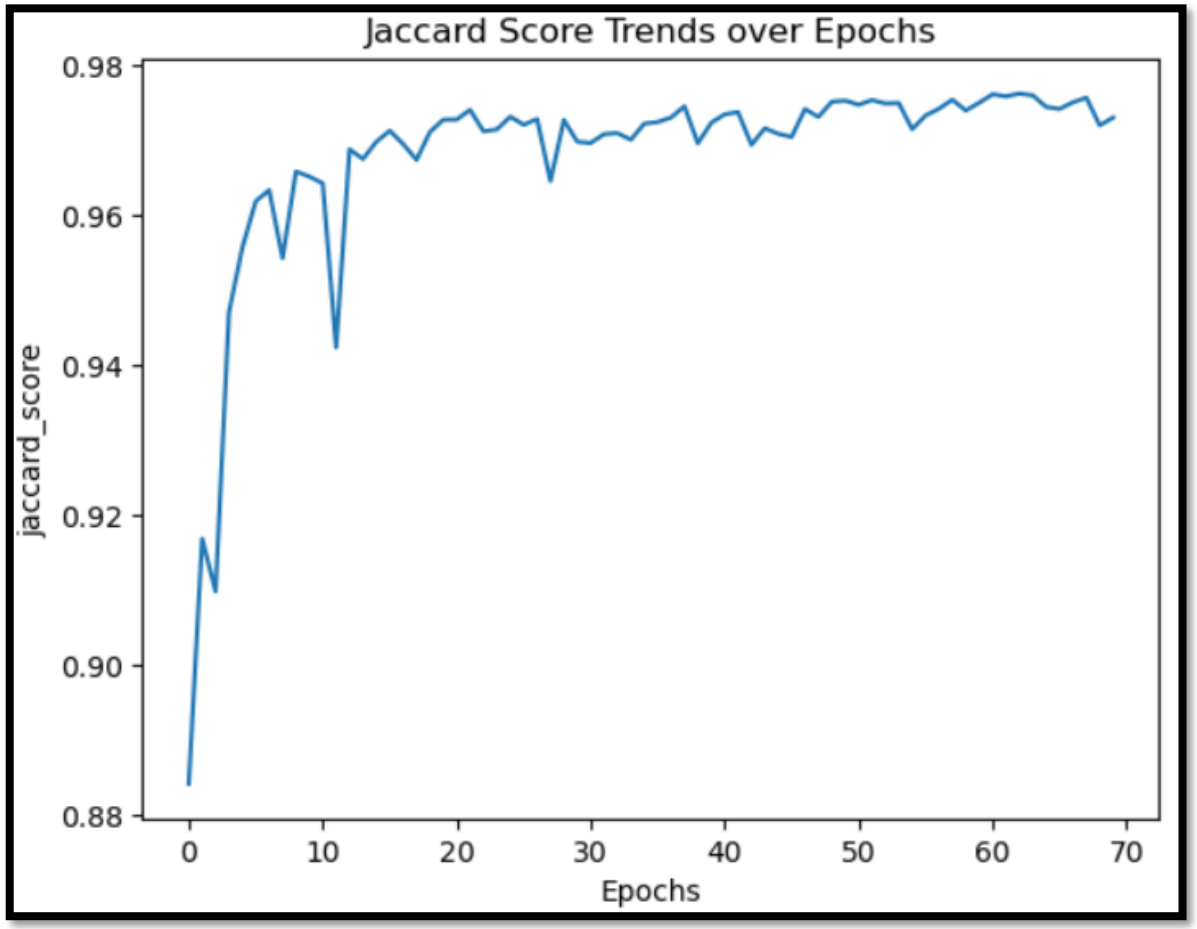




Accuracy Model



Intersection over Union

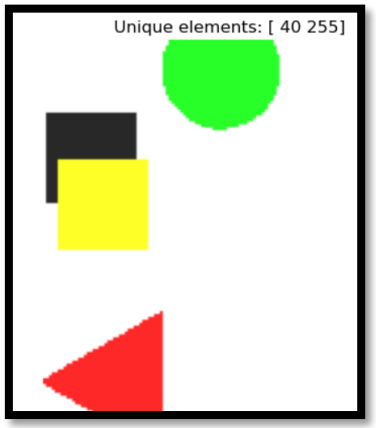



```
Test Dataet Loss : 0.07623241799218314
Test Dataet Accuracy : 0.9854813309403153
Test Dataet F1 Score : 0.9857840367927686
Test Dataet Jaccard Score : 0.9726374103915837
```

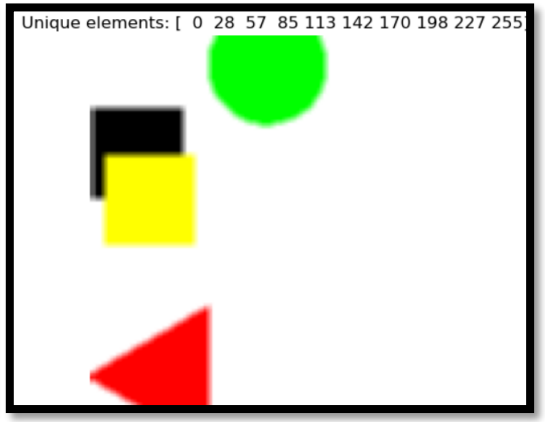
```
jaccard = jaccard_score(np.array(true_labels), np.array(predictions), average='weighted')
```

Augmentation

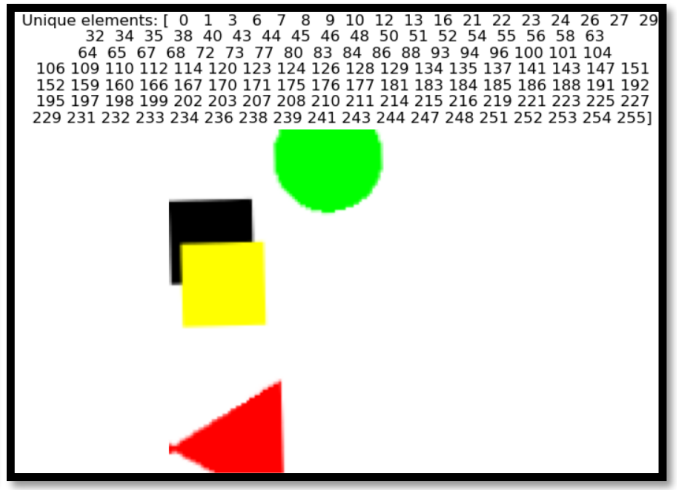
```
augmentations = [
    A.RandomBrightnessContrast(),
    A.Blur(),
    A.Rotate(limit=5),
    A.HorizontalFlip(p=0.1),
    A.VerticalFlip(p=0.1)
]
```



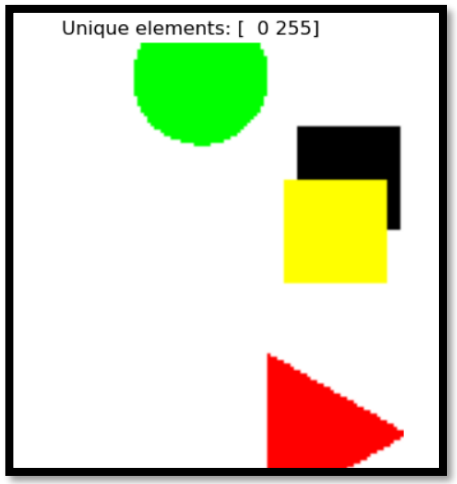
Random Brightness



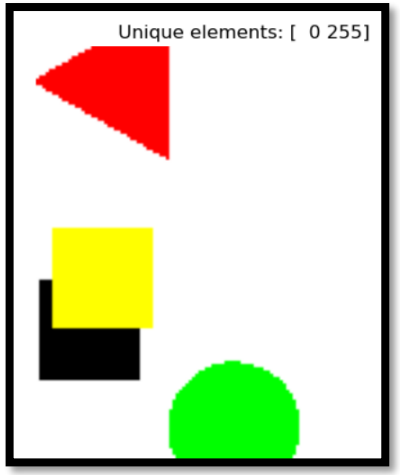
Blur



Rotate

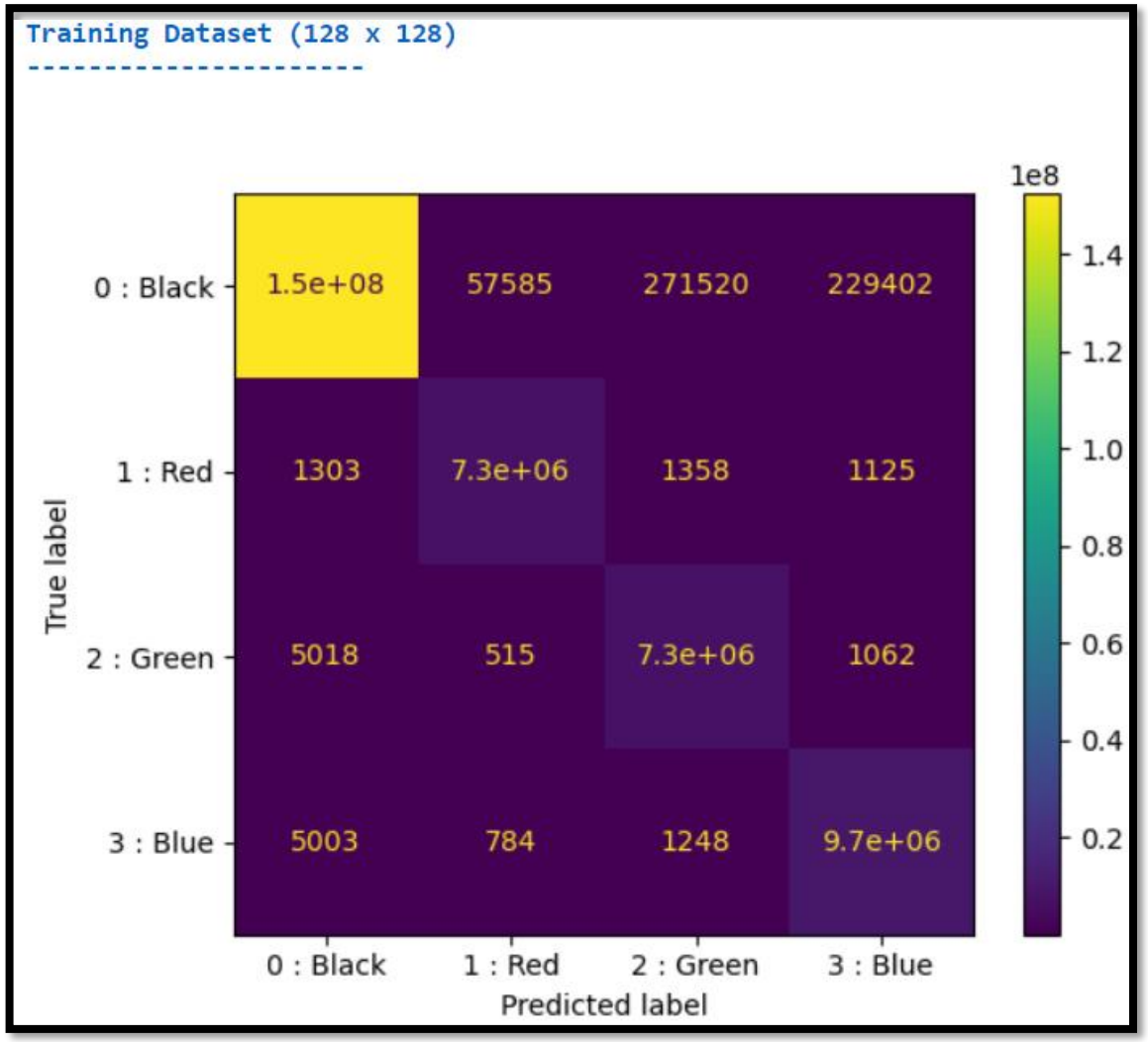


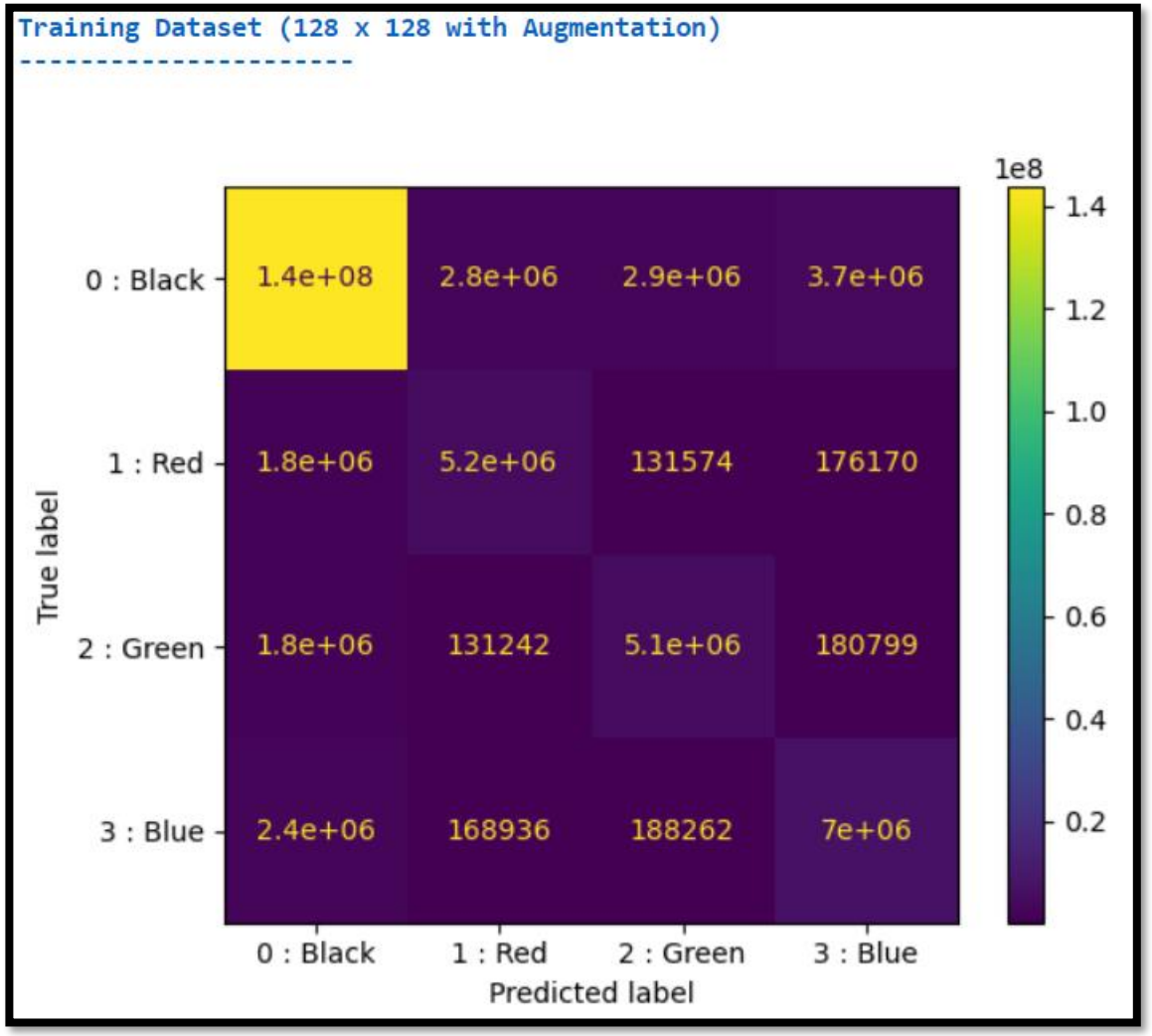
H Flip



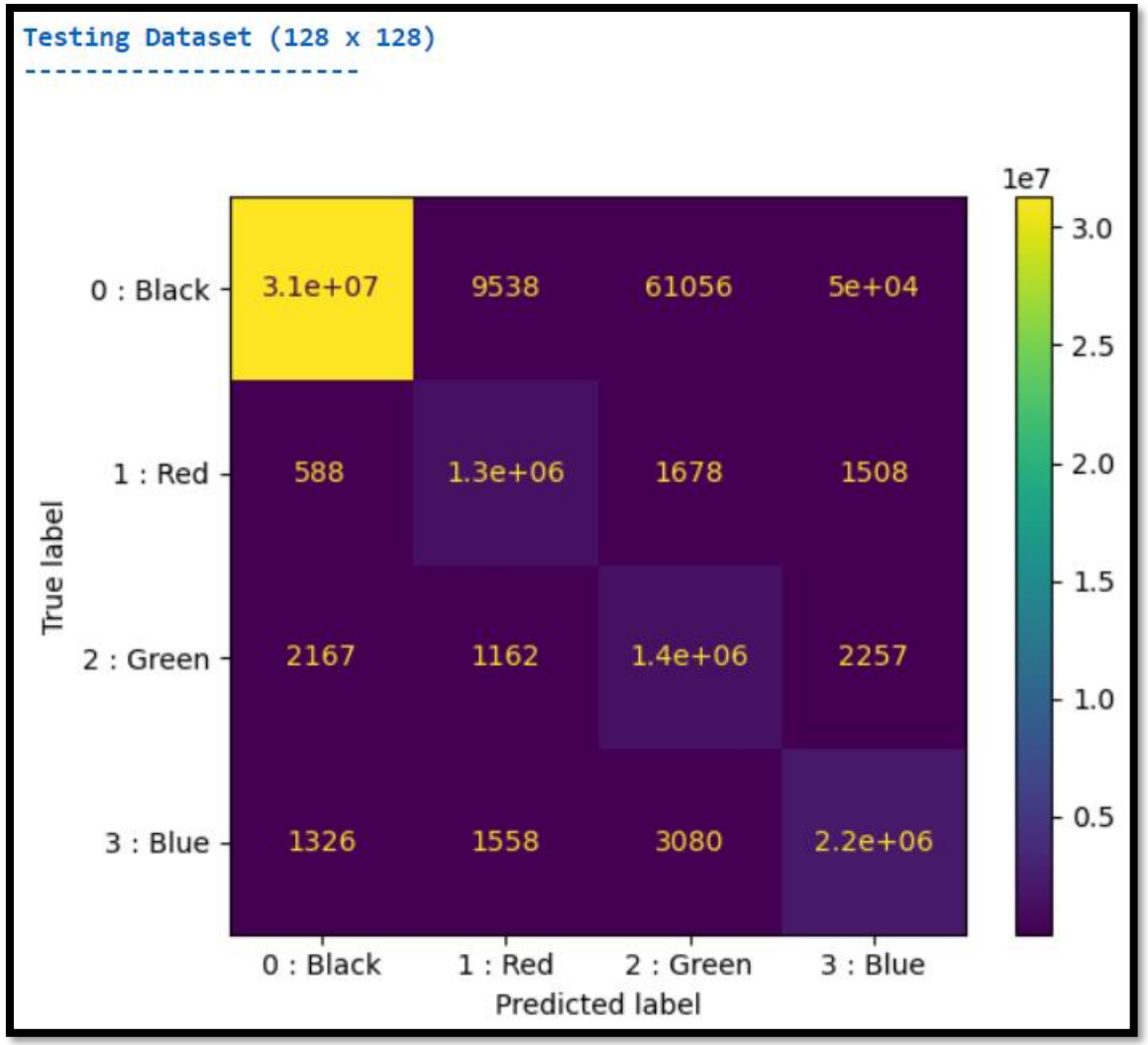
V Flip

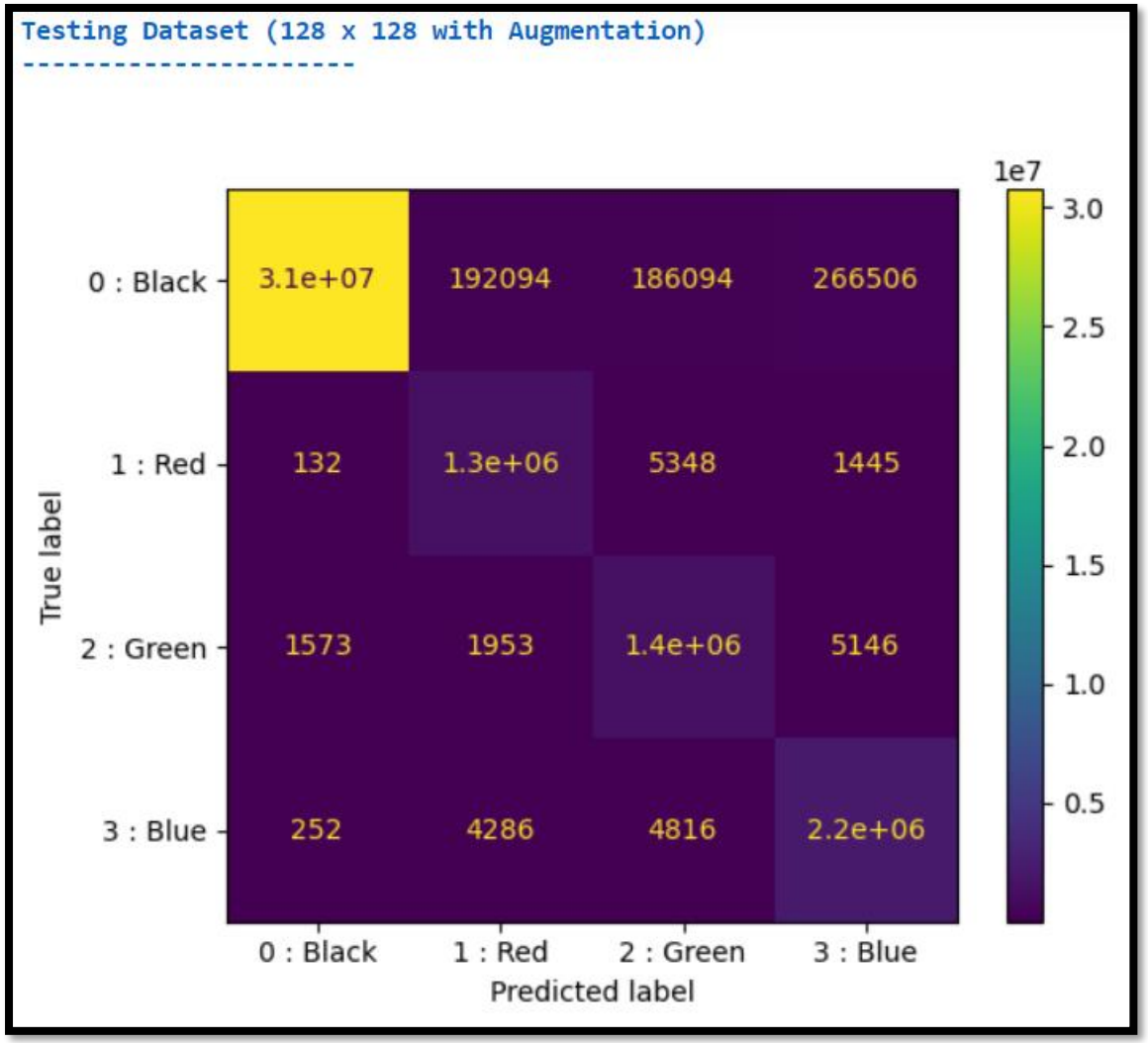
Result


Training Dataset (128 x 128)
1e8
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0 : Black
1 : Red
2 : Green
3 : Blue
True label
1.5e+08
57585
271520
229402
1303
7.3e+06
1358
1125
5018
515
7.3e+06
1062
5003
784
1248
9.7e+06
0 : Black
1 : Red
2 : Green
3 : Blue
Predicted label

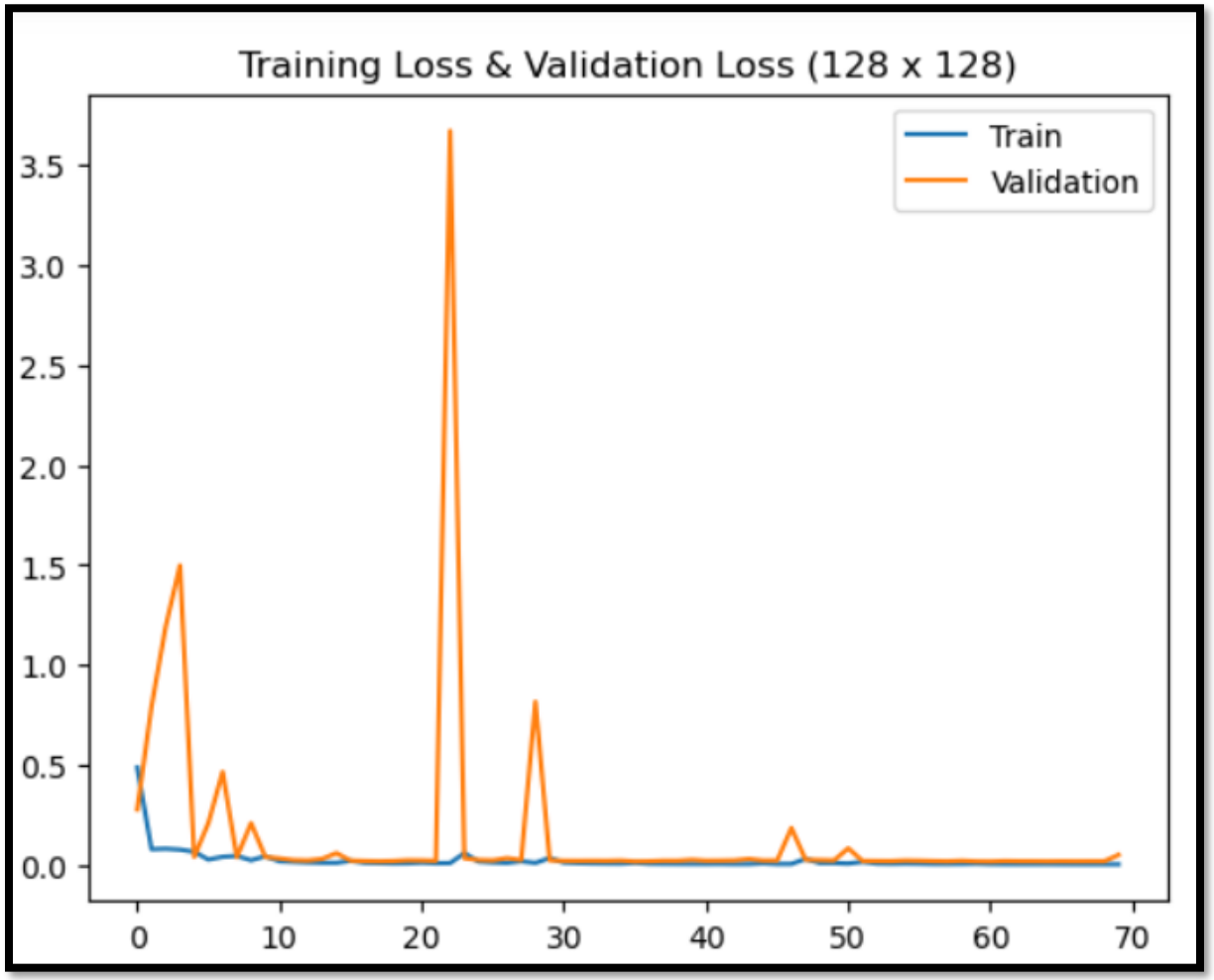

Training Dataset (128 x 128 with Augmentation)
1e8
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0 : Black
1 : Red
2 : Green
3 : Blue
True label
1.4e+08
2.8e+06
2.9e+06
3.7e+06
1.8e+06
5.2e+06
131574
176170
1.8e+06
131242
5.1e+06
180799
2.4e+06
168936
188262
7e+06
0 : Black
1 : Red
2 : Green
3 : Blue
Predicted label

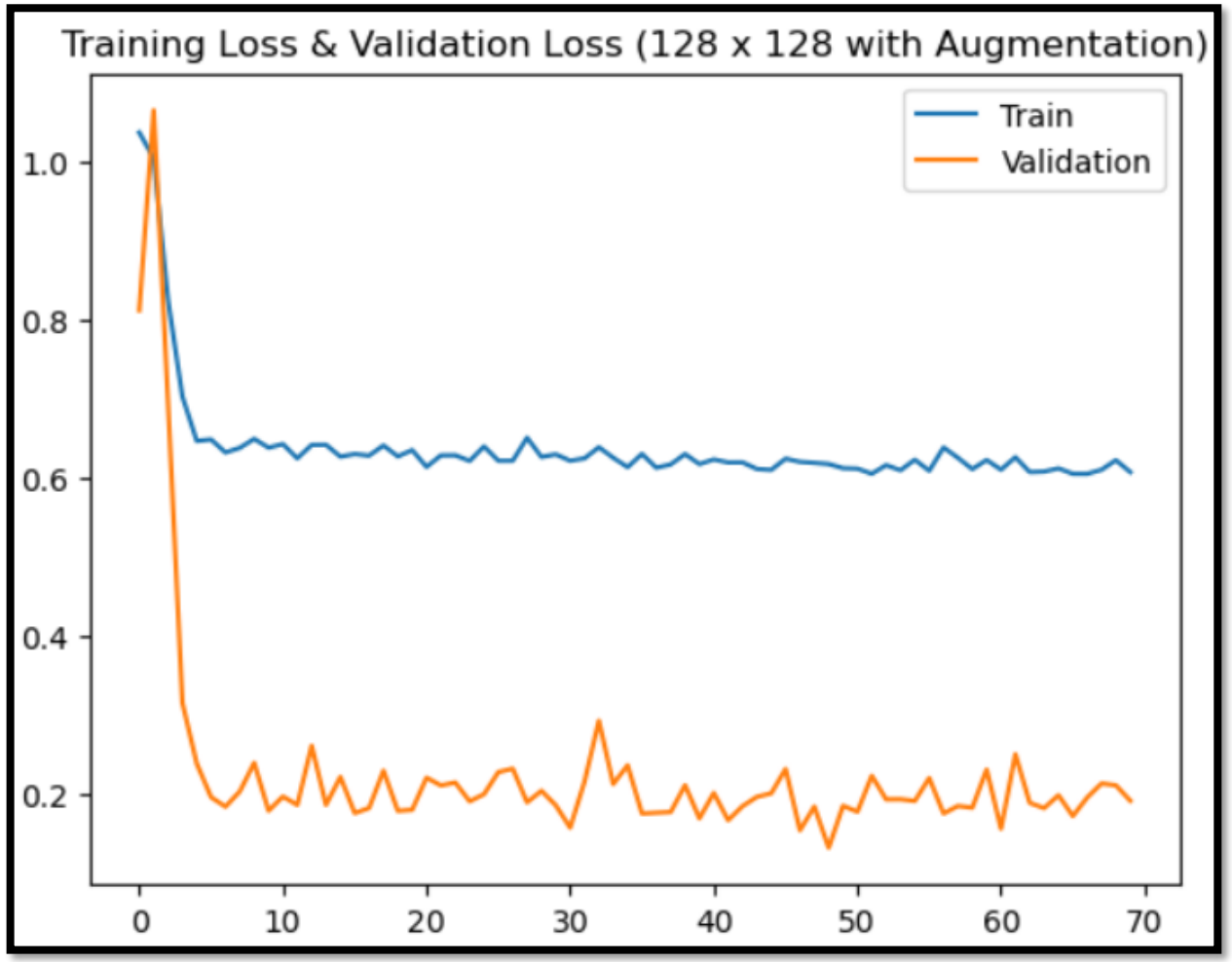
Result


Testing Dataset (128 x 128)
0 : Black
1 : Red
2 : Green
3 : Blue
True label
3.1e+07
9538
61056
5e+04
588
1.3e+06
1678
1508
2167
1162
1.4e+06
2257
1326
1558
3080
2.2e+06
0 : Black
1 : Red
2 : Green
3 : Blue
Predicted label
1e7
3.0
2.5
2.0
1.5
1.0
0.5


Testing Dataset (128 x 128 with Augmentation)
0 : Black
1 : Red
2 : Green
3 : Blue
True label
3.1e+07
192094
186094
266506
132
1.3e+06
5348
1445
1573
1953
1.4e+06
5146
252
4286
4816
2.2e+06
0 : Black
1 : Red
2 : Green
3 : Blue
Predicted label
1e7
3.0
2.5
2.0
1.5
1.0
0.5

Result


Training Loss & Validation Loss (128 x 128)
Train
Validation
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
10
20
30
40
50
60
70


Training Loss & Validation Loss (128 x 128 with Augmentation)
Train
Validation
1.0
0.8
0.6
0.4
0.2
0
10
20
30
40
50
60
70

Result

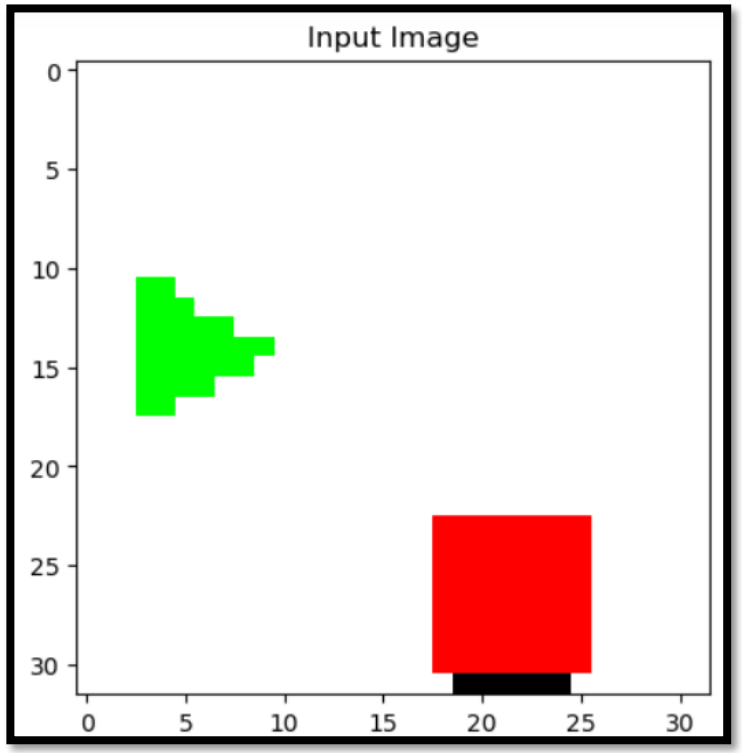
With out Augmentation

```
Test Dataet Loss : 0.01140751009806990 6
Test Dataet Accuracy : 0.996475632126266 9
Test Dataet F1 Score : 0.99649891697744 2
Test Dataet Jaccard Score : 0.993065918948244 1
```

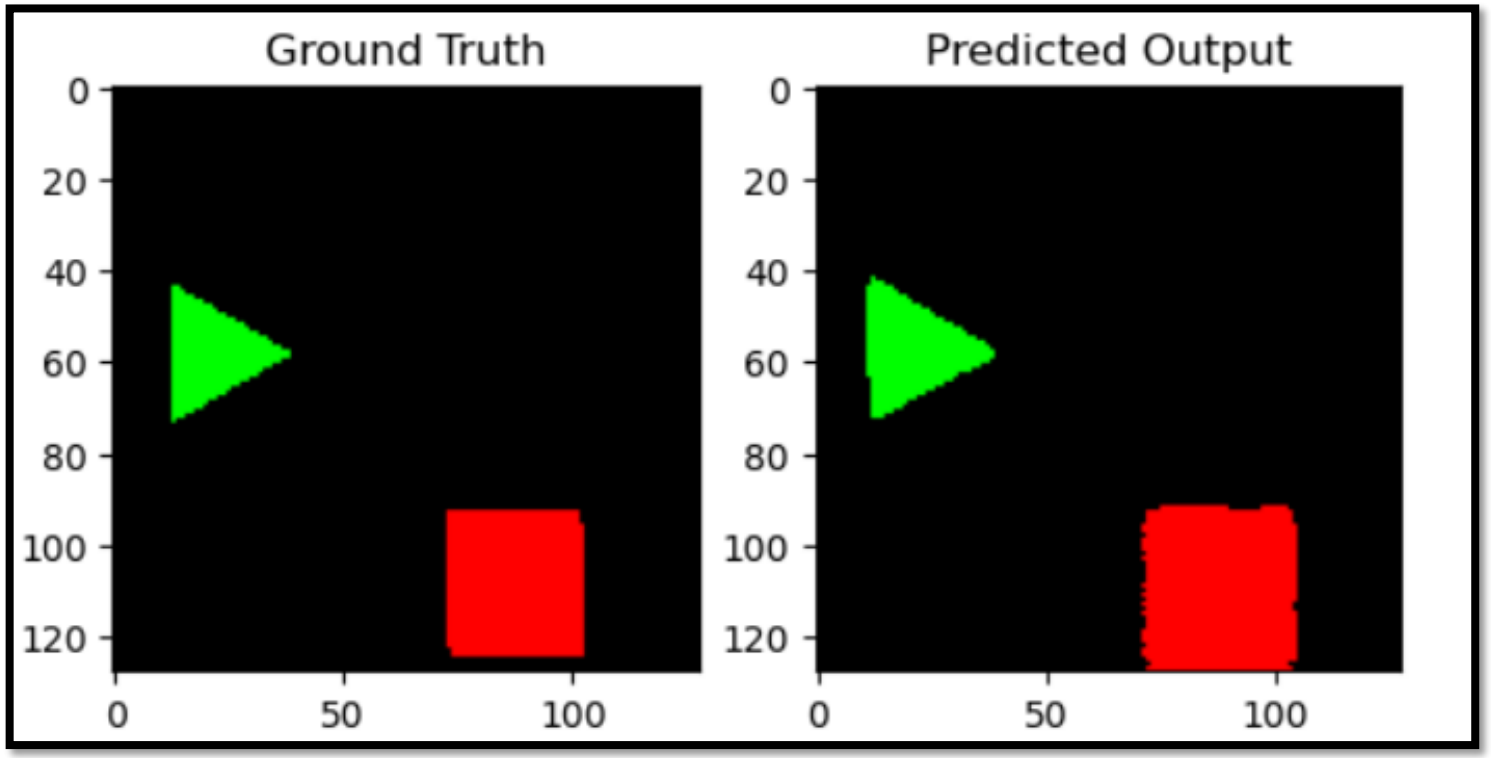
With Augmentation

```
Test Dataet Loss : 0.12721854341881617
Test Dataet Accuracy : 0.9847059920027449
Test Dataet F1 Score : 0.9850482510076124
Test Dataet Jaccard Score : 0.9710256710692631
```

Result

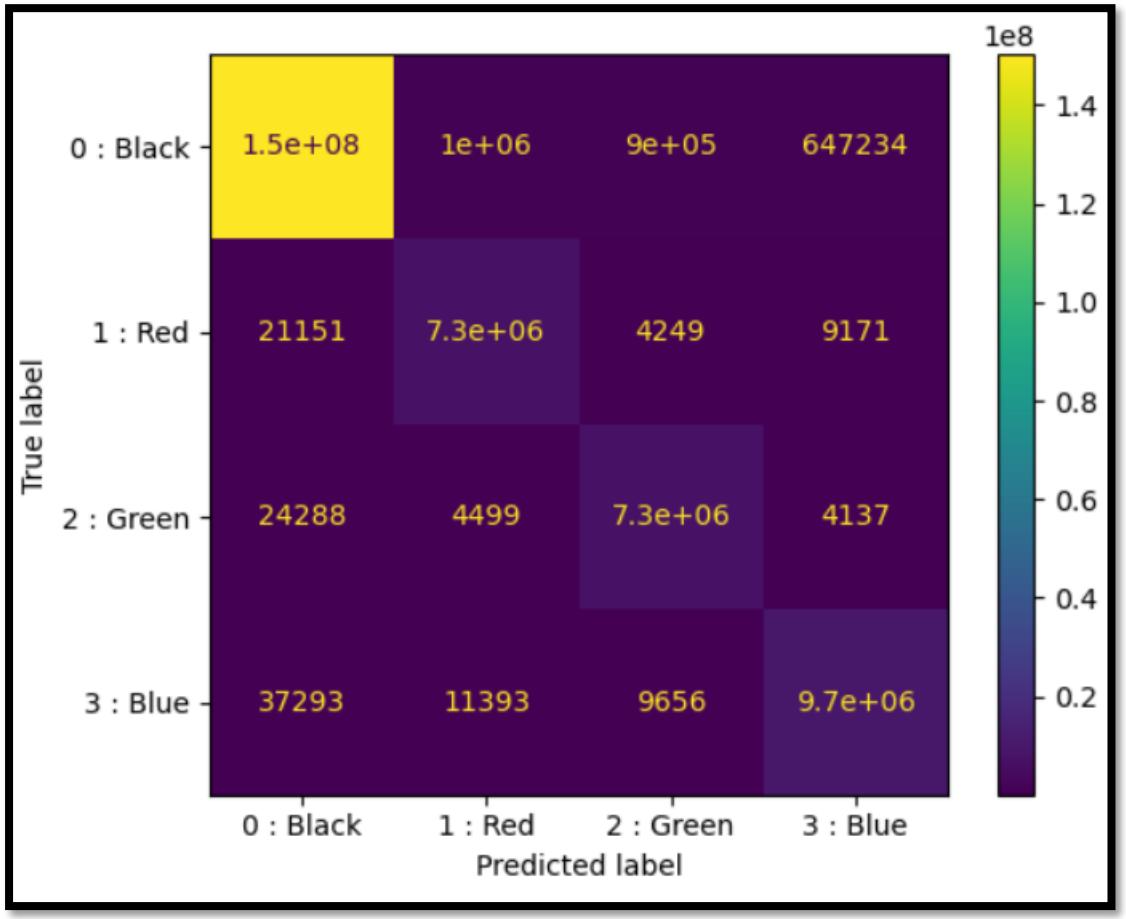


Input Shape (3, 32, 32)

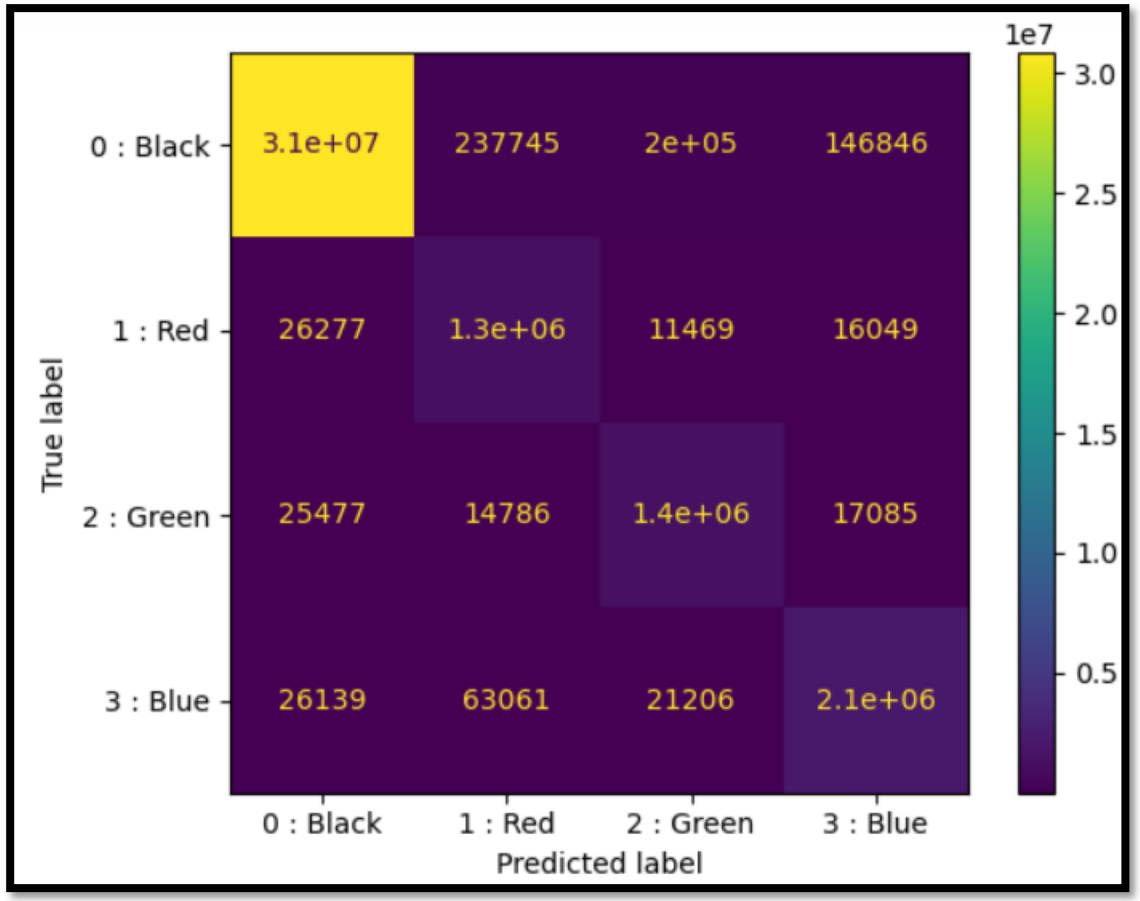


Output Shape ((128, 128) -→ 3, 128, 128)

Result



Training Dataset



Testing Dataset

Thank you!