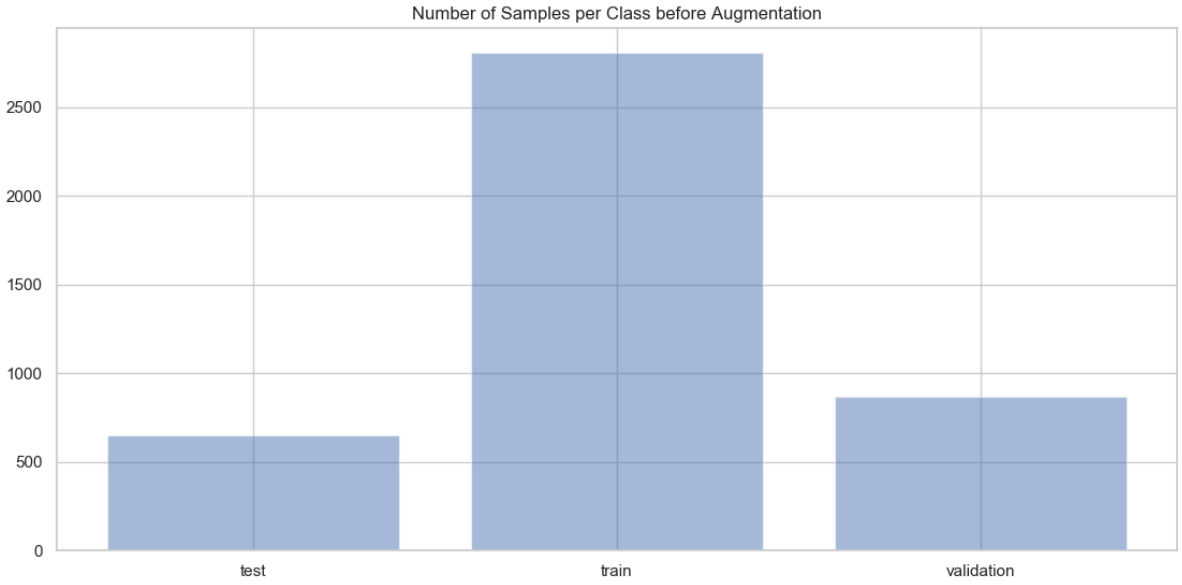
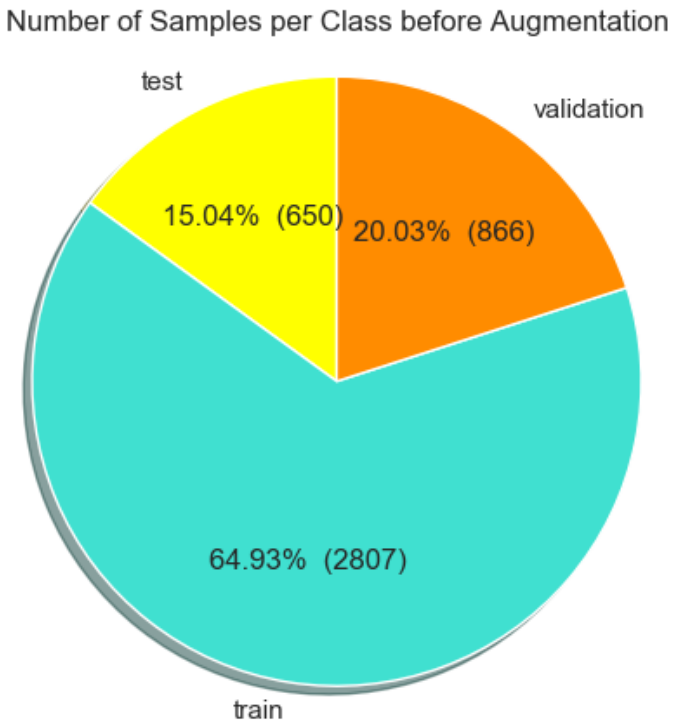
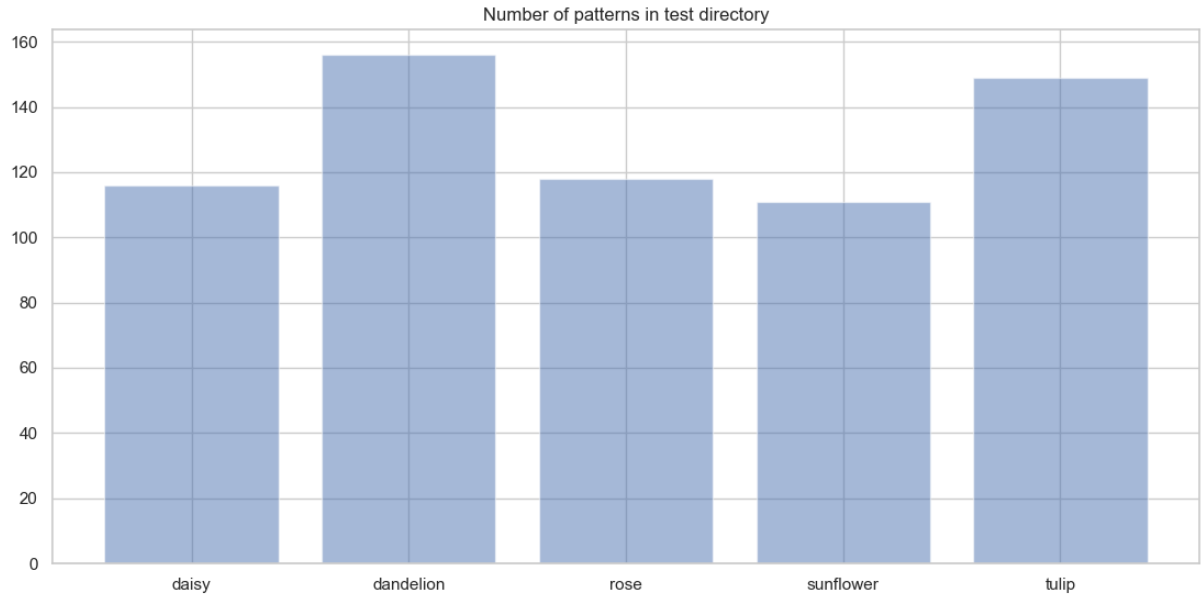
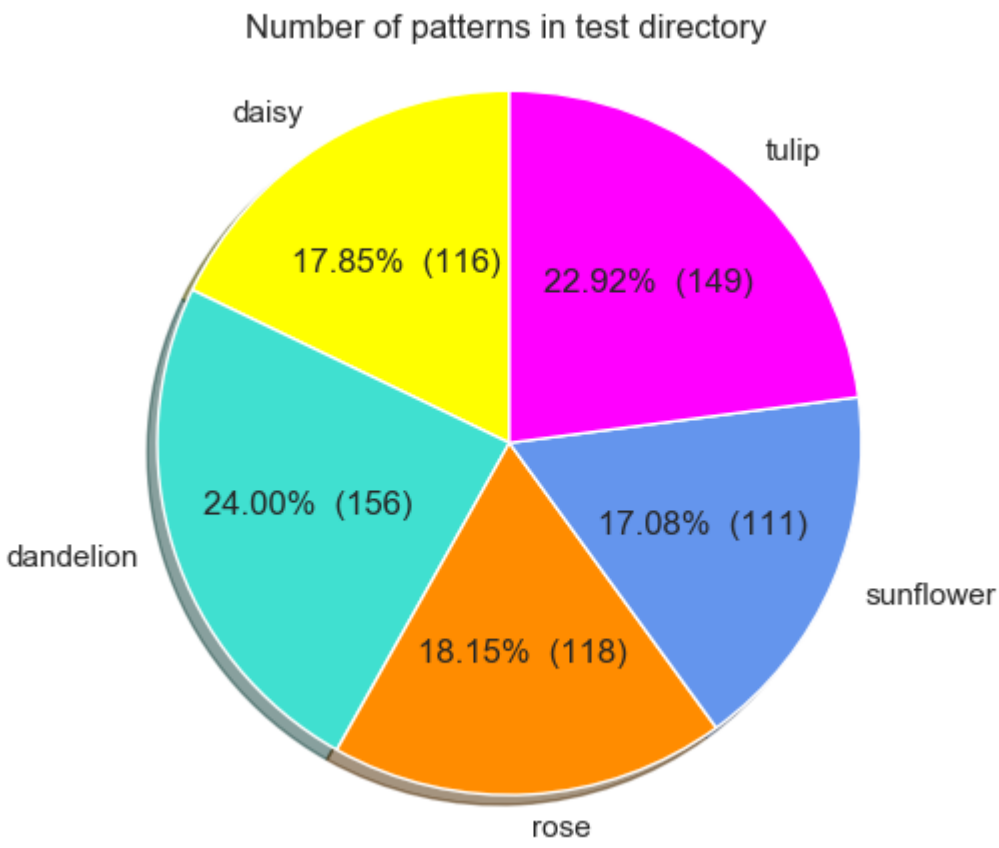
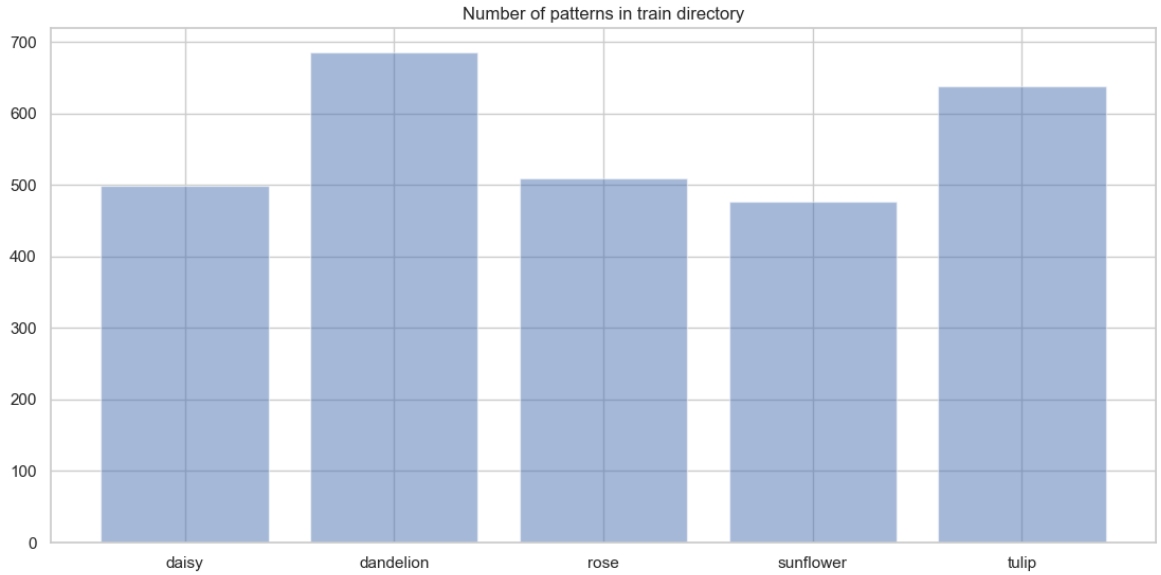
NEW SET DISTRIBUTION AUG-NORM

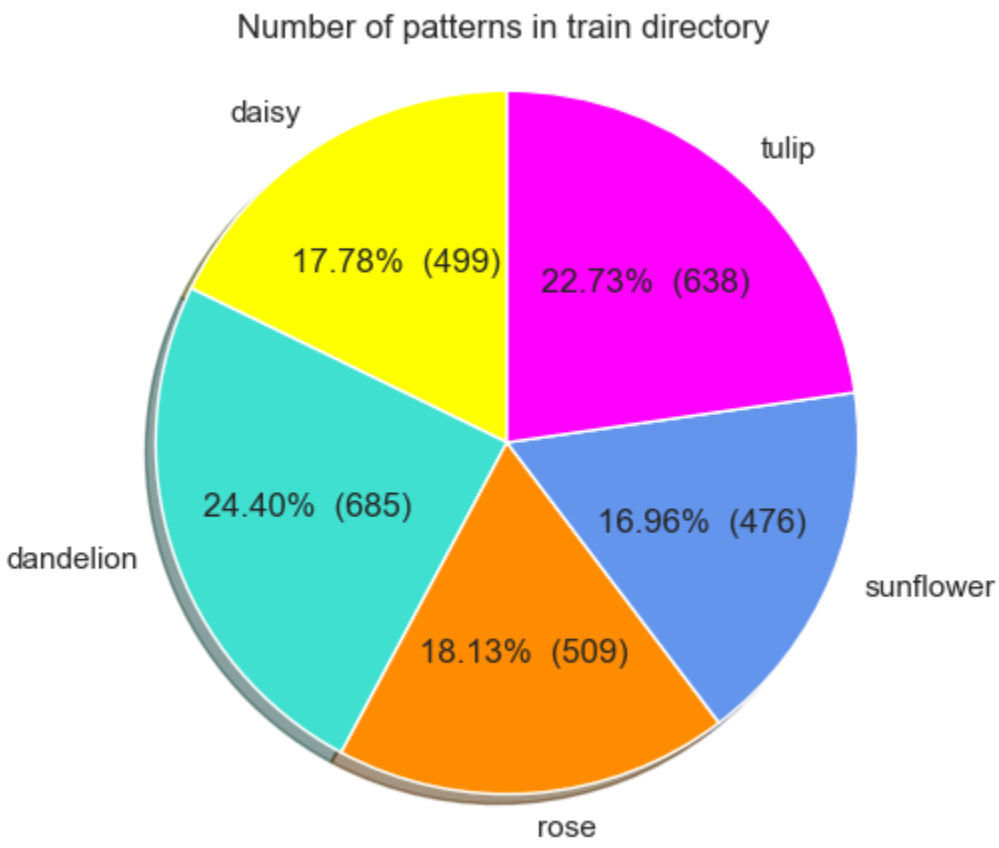


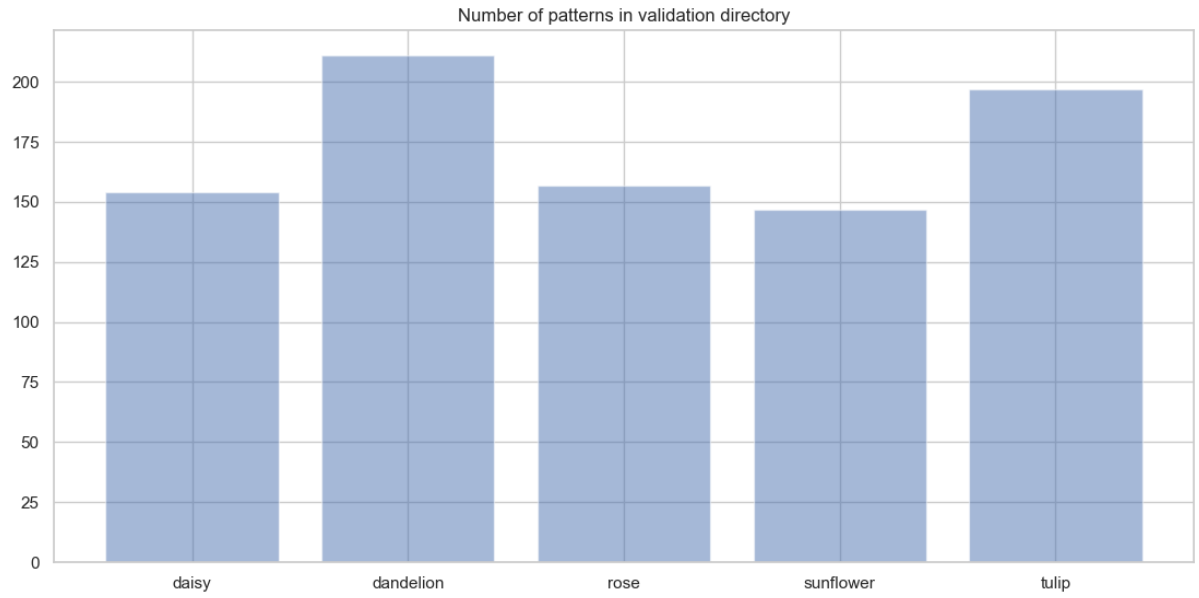


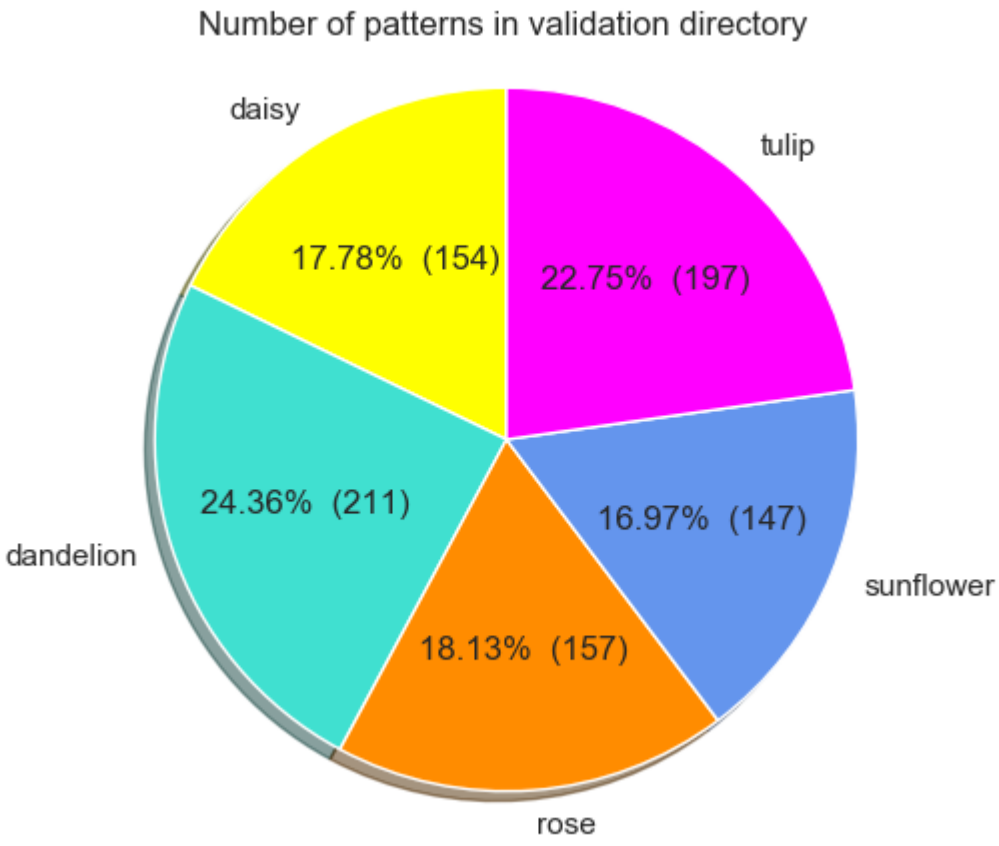

Number of patterns in test directory
160
140
120
100
80
60
40
20
0
daisy
dandelion
rose
sunflower
tulip


Number of patterns in test directory
daisy
tulip
17.85% (116)
22.92% (149)
24.00% (156)
dandelion
17.08% (111)
sunflower
18.15% (118)
rose

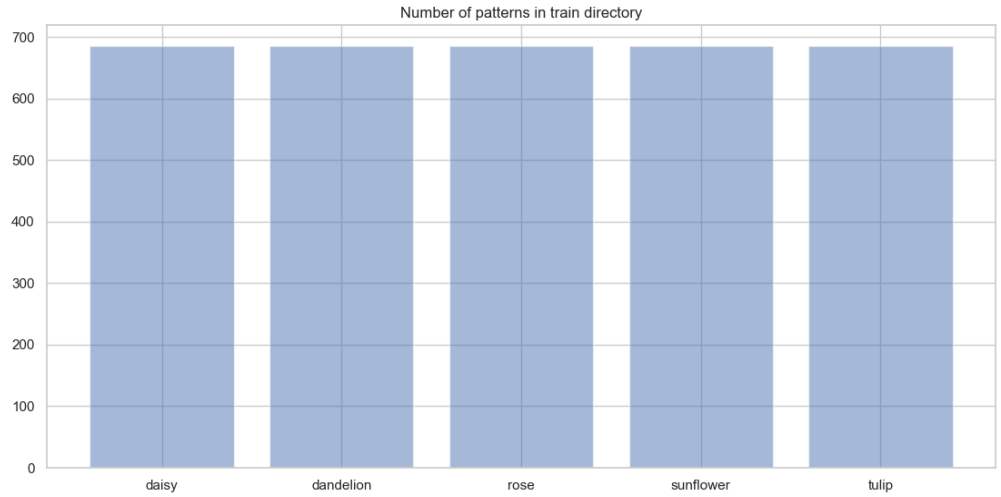

Number of patterns in train directory
700
600
500
400
300
200
100
0
daisy
dandelion
rose
sunflower
tulip

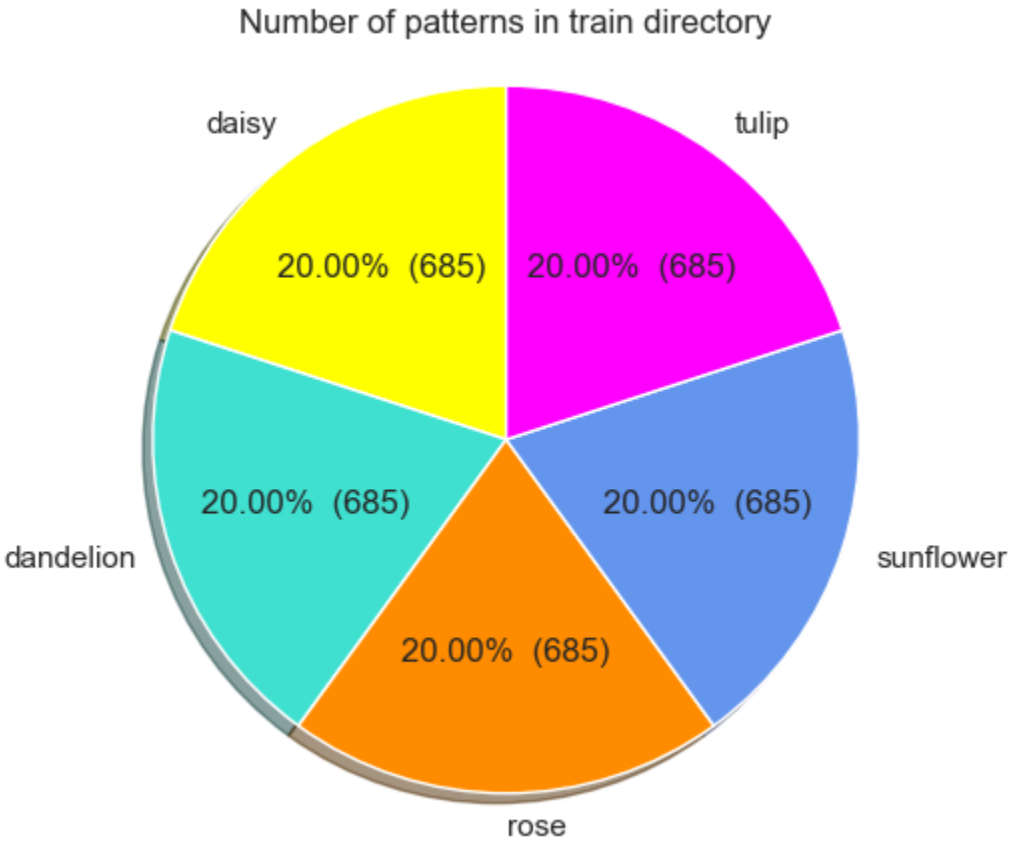

Number of patterns in train directory
daisy
tulip
17.78% (499)
22.73% (638)
24.40% (685)
16.96% (476)
dandelion
sunflower
18.13% (509)
rose

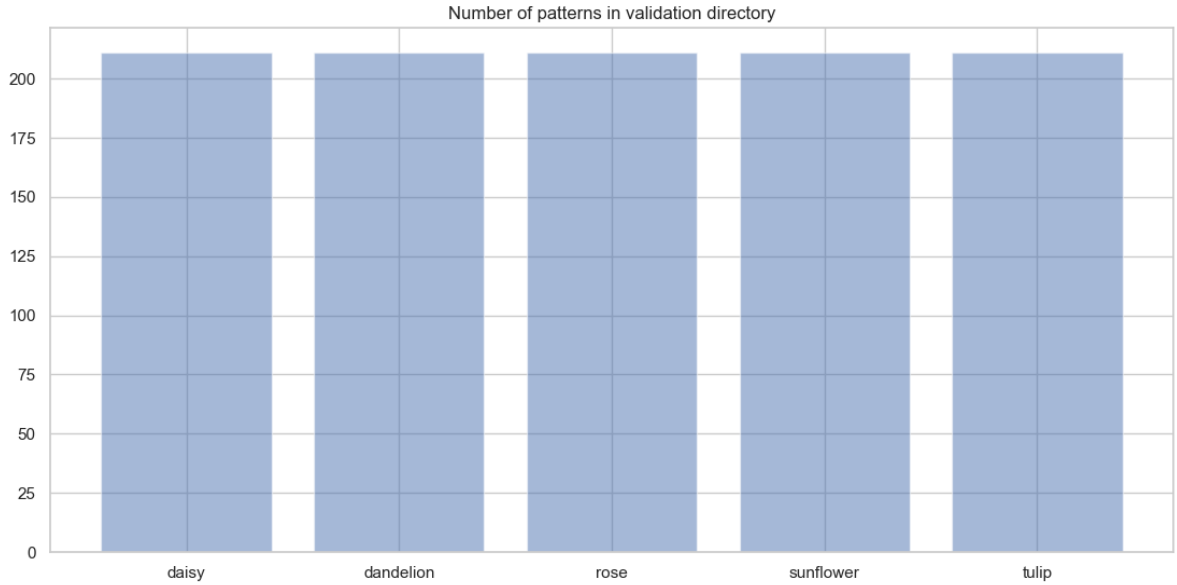

Number of patterns in validation directory
200
175
150
125
100
75
50
25
0
daisy
dandelion
rose
sunflower
tulip

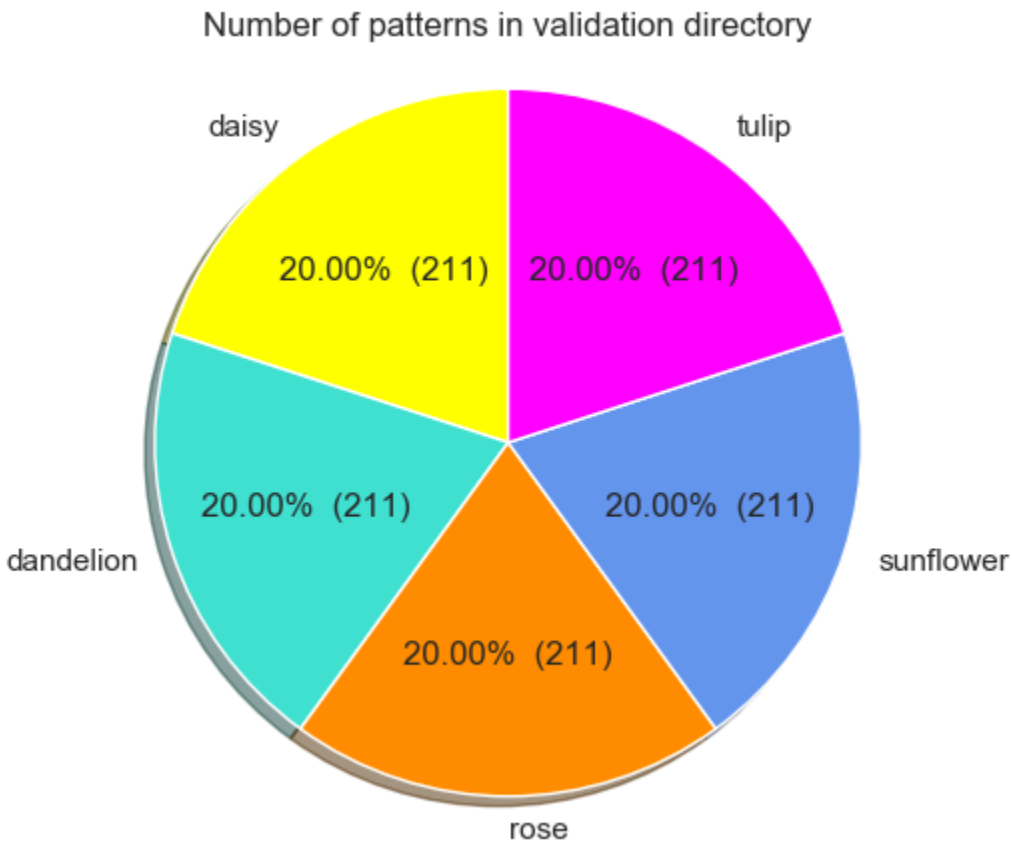

Number of patterns in validation directory
daisy
tulip
17.78% (154)
22.75% (197)
24.36% (211)
16.97% (147)
dandelion
sunflower
18.13% (157)
rose

AFTER OVERSAMPLING






Number of patterns in validation directory
200
175
150
125
100
75
50
25
0
daisy
dandelion
rose
sunflower
tulip


Number of patterns in validation directory
daisy
tulip
20.00% (211)
20.00% (211)
20.00% (211)
20.00% (211)
20.00% (211)
dandelion
sunflower
rose

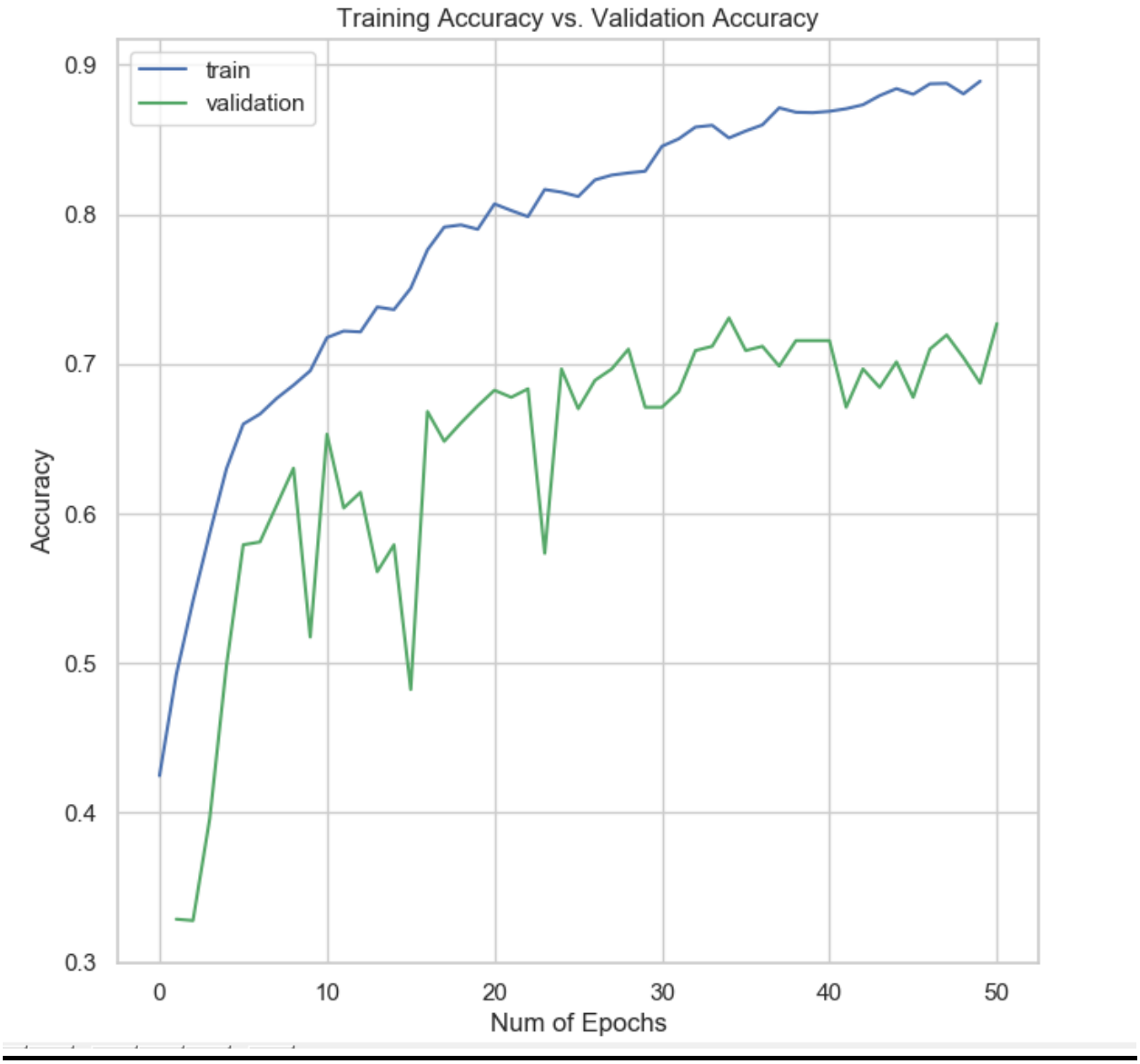
```
Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_1 (Conv2D)            (None, 128, 128, 32)      2432
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 64, 64, 32)        0
_________________________________________________________________
batch_normalization_1 (Batch (None, 64, 64, 32)        128
_________________________________________________________________
conv2d_2 (Conv2D)            (None, 64, 64, 64)        18496
_________________________________________________________________
max_pooling2d_2 (MaxPooling2 (None, 32, 32, 64)        0
_________________________________________________________________
batch_normalization_2 (Batch (None, 32, 32, 64)        256
_________________________________________________________________
conv2d_3 (Conv2D)            (None, 32, 32, 96)        55392
_________________________________________________________________
max_pooling2d_3 (MaxPooling2 (None, 16, 16, 96)        0
_________________________________________________________________
batch_normalization_3 (Batch (None, 16, 16, 96)        384
_________________________________________________________________
conv2d_4 (Conv2D)            (None, 16, 16, 96)        83040
_________________________________________________________________
max_pooling2d_4 (MaxPooling2 (None, 8, 8, 96)          0
_________________________________________________________________
batch_normalization_4 (Batch (None, 8, 8, 96)          384
_________________________________________________________________
flatten_1 (Flatten)          (None, 6144)              0
_________________________________________________________________
dropout_1 (Dropout)          (None, 6144)              0
_________________________________________________________________
dense_1 (Dense)              (None, 512)               3146240
_________________________________________________________________
activation_1 (Activation)    (None, 512)               0
_________________________________________________________________
dense_2 (Dense)              (None, 5)                 2565
=================================================================
Total params: 3,309,317
Trainable params: 3,308,741
Non-trainable params: 576
```

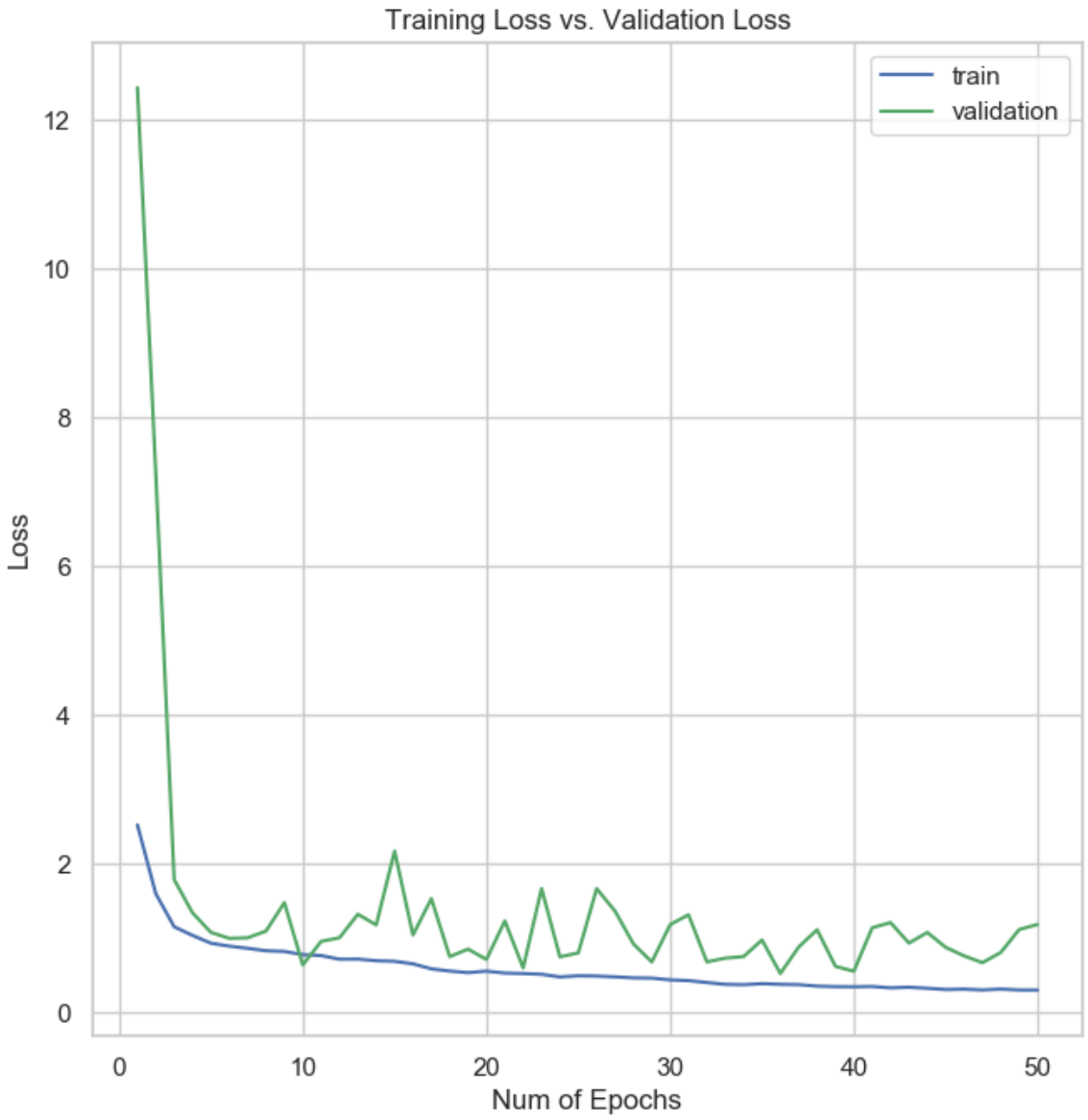
```
Epoch 16/50
changing learning rate to .0005 at epoch 15
new learning rate =  0.0005
```

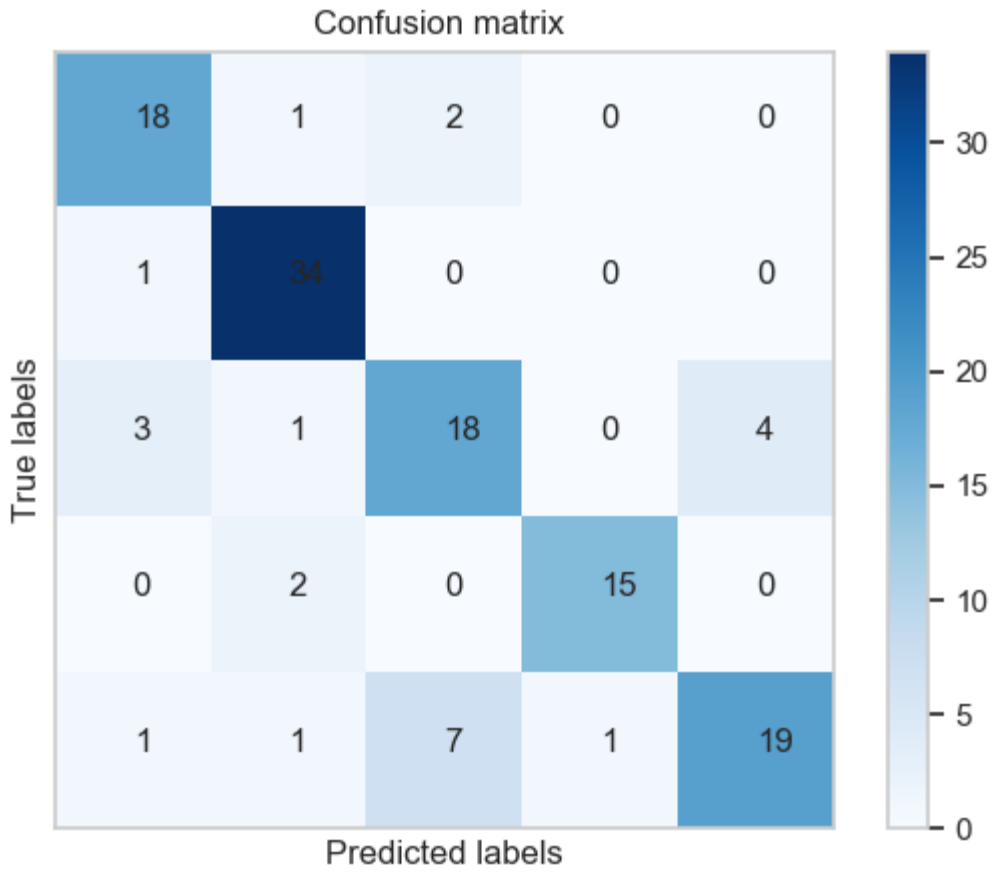
```
Epoch 31/50
changing learning rate to .0003 at epoch 30
new learning rate =  0.0003
```

RESULTS

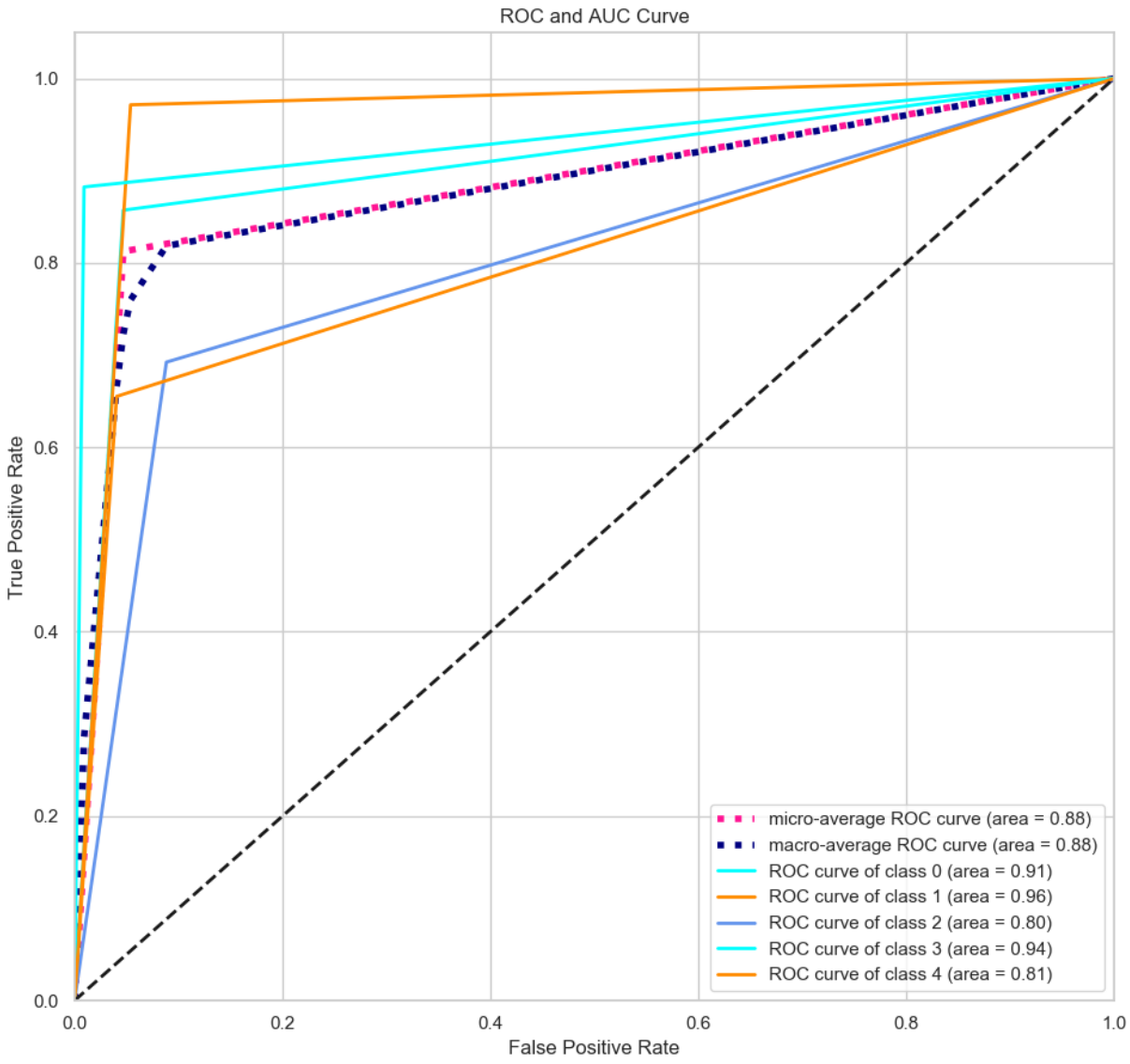
acc	val_acc	loss	val_loss
0.425	0.329	2.53	12.4
0.492	0.328	1.6	7.25
0.542	0.396	1.16	1.79
0.587	0.499	1.04	1.35
0.63	0.579	0.938	1.08
0.66	0.581	0.898	1.0
0.667	0.606	0.869	1.01
0.677	0.63	0.836	1.1
0.686	0.518	0.827	1.48
0.695	0.653	0.784	0.646
0.718	0.604	0.772	0.962
0.722	0.614	0.723	1.01
0.721	0.561	0.724	1.33
0.738	0.579	0.702	1.18
0.736	0.482	0.695	2.18
0.751	0.668	0.66	1.05
0.776	0.648	0.593	1.54
0.792	0.661	0.563	0.758
0.793	0.672	0.542	0.859
0.79	0.682	0.562	0.719
0.807	0.678	0.536	1.24
0.803	0.683	0.53	0.605
0.799	0.573	0.521	1.67
0.817	0.697	0.484	0.755
0.815	0.67	0.5	0.807
0.812	0.689	0.497	1.67
0.823	0.697	0.486	1.37
0.826	0.71	0.472	0.929
0.828	0.671	0.469	0.686
0.829	0.671	0.445	1.19
0.846	0.682	0.435	1.32
0.851	0.709	0.41	0.687
0.858	0.712	0.385	0.737
0.86	0.731	0.38	0.758
0.851	0.709	0.394	0.981
0.856	0.712	0.385	0.531
0.86	0.699	0.381	0.887
0.871	0.716	0.361	1.12
0.868	0.716	0.354	0.626
0.868	0.716	0.353	0.561
0.868	0.716	0.353	0.561
0.869	0.671	0.356	1.15
0.871	0.697	0.338	1.22
0.873	0.684	0.346	0.939
0.879	0.701	0.332	1.08
0.884	0.678	0.315	0.882
0.88	0.71	0.32	0.768
0.887	0.719	0.309	0.676
0.888	0.704	0.321	0.814
0.881	0.687	0.309	1.12
0.889	0.727	0.308	1.19

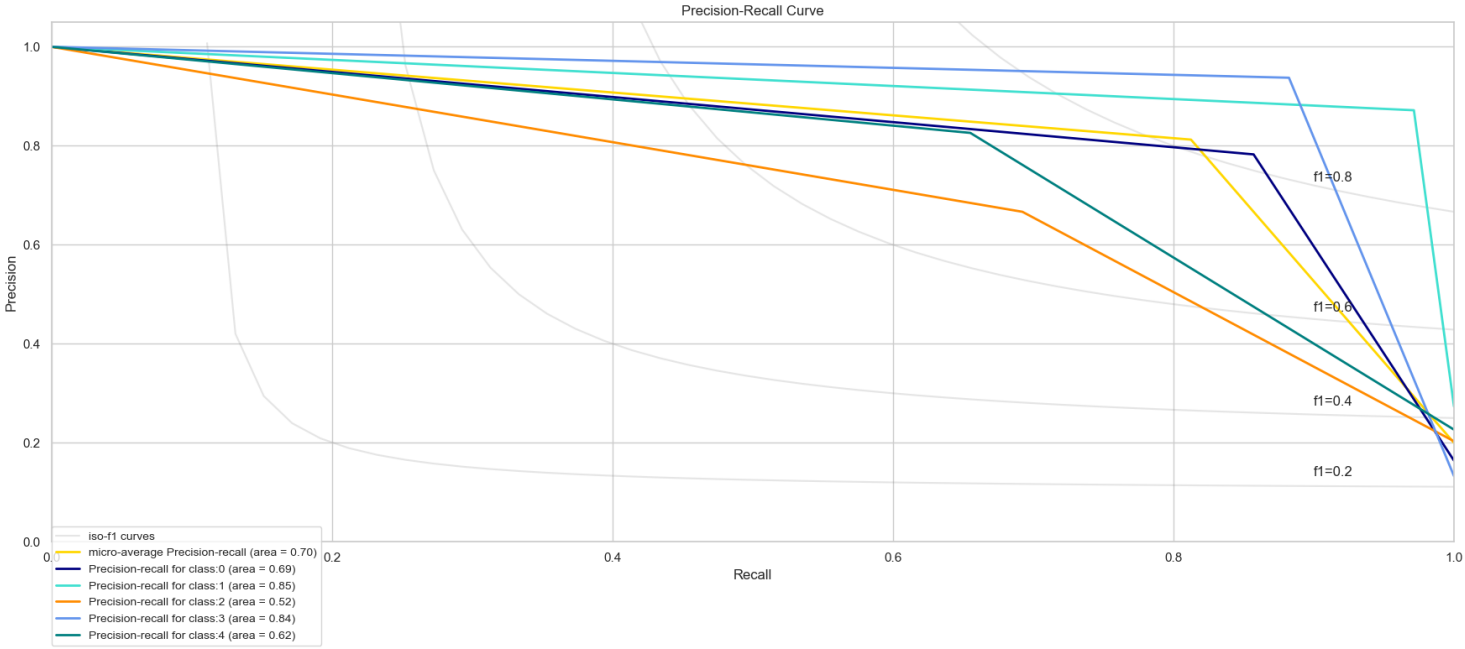

Training Accuracy vs. Validation Accuracy
train
validation
Accuracy
Num of Epochs
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0
10
20
30
40
50


Training Loss vs. Validation Loss
train
validation
Loss
Num of Epochs
0
2
4
6
8
10
12
0
10
20
30
40
50

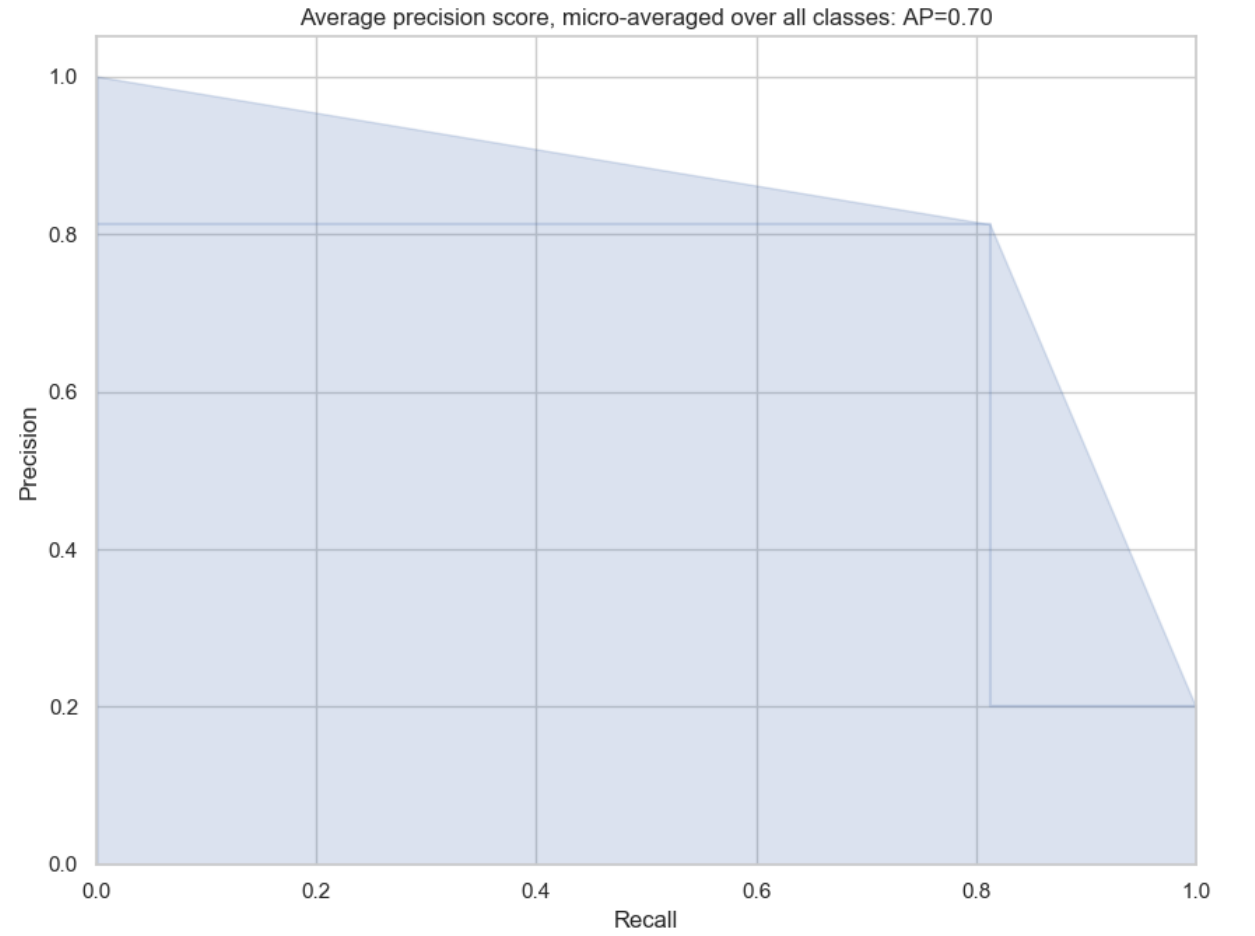

Confusion matrix
18 1 2 0 0
1 34 0 0 0
3 1 18 0 4
0 2 0 15 0
1 1 7 1 19
True labels
Predicted labels
30
25
20
15
10
5
0

```
ROC_AUC_Score: 0.8820263719495166
Average precision score, micro-averaged over all classes: 0.70
```





	precision	recall	f1-score	support
daisy	0.78	0.86	0.82	21
dandelion	0.87	0.97	0.92	35
rose	0.67	0.69	0.68	26
sunflower	0.94	0.88	0.91	17
tulip	0.83	0.66	0.73	29
accuracy			0.81	128
macro avg	0.82	0.81	0.81	128
weighted avg	0.81	0.81	0.81	128


Average precision score, micro-averaged over all classes: AP=0.70
Precision
Recall
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0