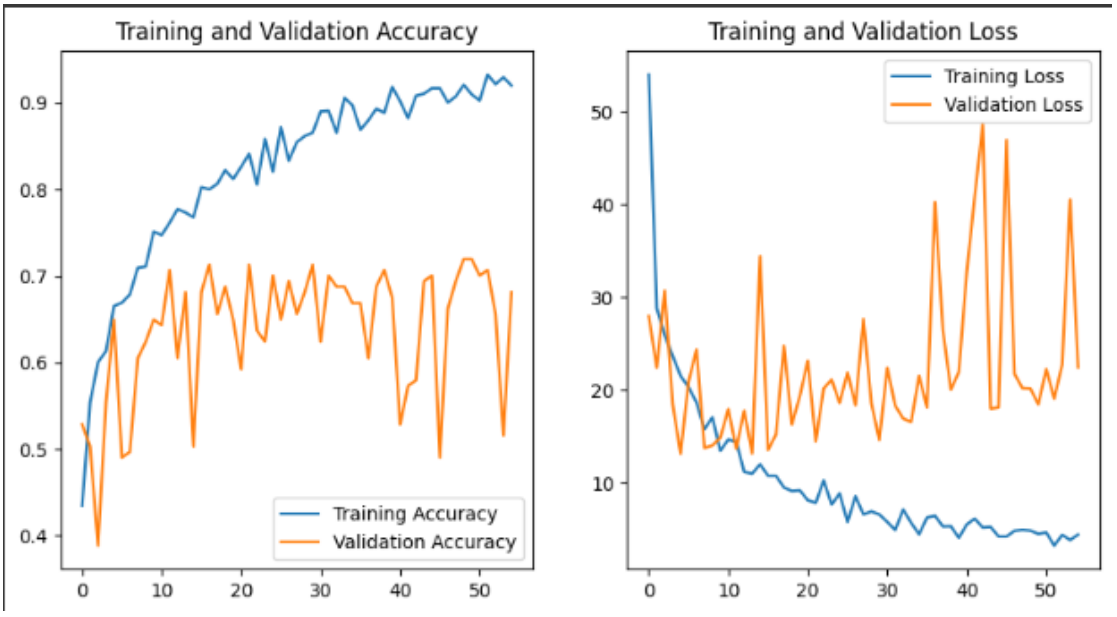
LR-learning rate, e-epochs, Bs-batch size

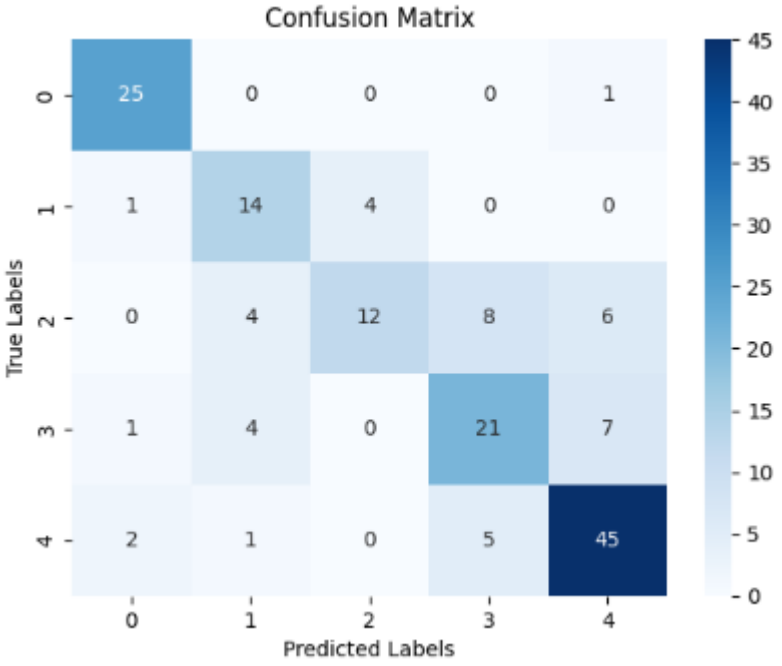
ResNet50v2:

Hyperparameters	Layers	Results
LR=0.1, e=100, bs=32 Without Early stopping RMSProp optimizer	Softmax after resnet RMSProp optimizer	train_acc=89.97% val_acc=77.43% test_acc=78.39%
LR=0.01, e=100, bs=32 Without Early stopping RMSProp optimizer	Softmax after resnet RMSProp optimizer	train_acc=90.87% val_acc=78.88% test_acc=79.80%
LR=0.001, e=100, bs=32 Without Early stopping RMSProp optimizer	Softmax after resnet	train_acc=91.39% val_acc=81.34% test_acc=83.91%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 61st epoch RMSProp optimizer	**Softmax after resnet RMSProp optimizer**	**train_acc=91.63% val_acc=83.43% test_acc=84.01%**
LR=0.01, e=100, bs=32 With Early stopping - Stopped at 58th epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	train_acc=91.37% val_acc=77.33% test_acc=79.29%
LR=0.001, e=100, bs=32 With Early stopping - Stopped at 51st epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	train_acc=93.76% val_acc=74.70% test_acc=77.53%
LR=0.1, e=200, bs=24 Without Early stopping RMSProp optimizer	Softmax after resnet RMSProp optimizer	train_acc=91.92% val_acc=78.34% test_acc=78.94%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 55th epoch Adam optimizer	Softmax after resnet Adam optimizer	train_acc=92.00% val_acc=81.24% test_acc=83.29%
LR=0.1, e=100, bs=32 With Early stopping Stopped at 57th epoch RMSProp optimizer	Resnet + MaxPooling+ ReLU + Softmax RMSprop Optimizer	train_acc=90.29% val_acc=80.08% test_acc=80.75%
LR=0.1, e=100, bs=32 RMSProp optimizer	Resnet + Flatten + ReLU + Tanh	train_acc=91.87% val_acc=81.14% test_acc=82.20%

LR=0.001, e=100, bs=32 With Early stopping - Stopped at 61st epoch RMSProp optimizer With noisy images	Softmax after resnet RMSProp optimizer	train_acc=90.39% val_acc=81.41% test_acc=82.33%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 60th epoch RMSProp optimizer With noisy images	Softmax after resnet RMSProp optimizer	train_acc=91.06% val_acc=80.97% test_acc=81.66%

Final Results:





0- diode, 1- dust, 2- multi, 3- pid, 4- single

Result - the maximum mis classifications occur while identifying multi class images. The reason for this could be its high feature similarity with pid and single classes.

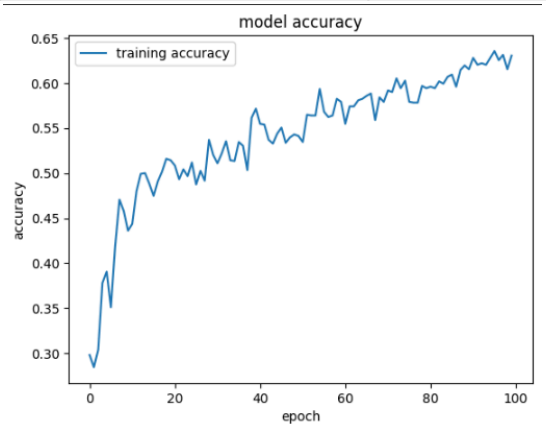
Reason RMSprop works better in this scenario:

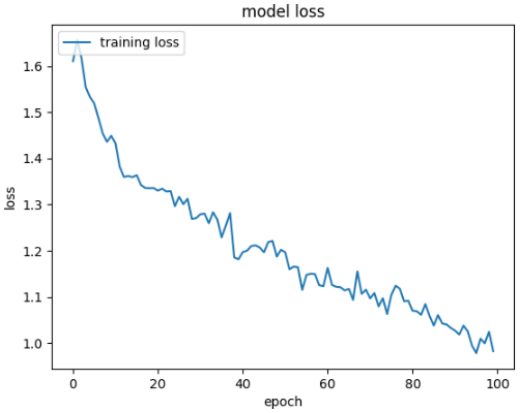
Adam is slower to change its direction, and then much slower to get back to the minimum. However, rmsprop with momentum reaches much further before it changes direction (when both use the same learning_rate).

EfficientNetB0:

Hyperparameters	Layers	Results
LR=0.1, e=100 RMSProp optimizer	Softmax after base model	train_acc=40.56% test_acc=39.89%
LR=0.01, e=100 RMSProp optimizer	Softmax after base model	train_acc=45.90% test_acc=43.04%
LR=0.001, e=100 RMSProp optimizer	**Softmax after base model**	**train_acc=64.06% test_acc=59.19%**
LR=0.1, e=200 RMSProp optimizer	Softmax after base model	train_acc=57.44% test_acc=54.12%

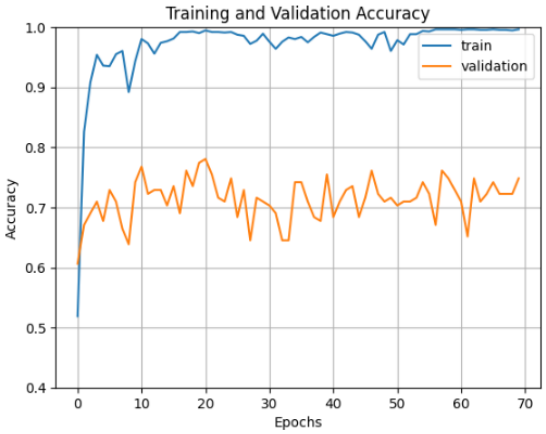
LR=0.001, e=100 Adam optimizer	Softmax after base model	train_acc=62.25% test_acc=53.80%
LR=0.001, e=100 RMSprop optimizer	Base model + Flatten + ReLU + Tanh	train_acc=48.25% test_acc=45.60%





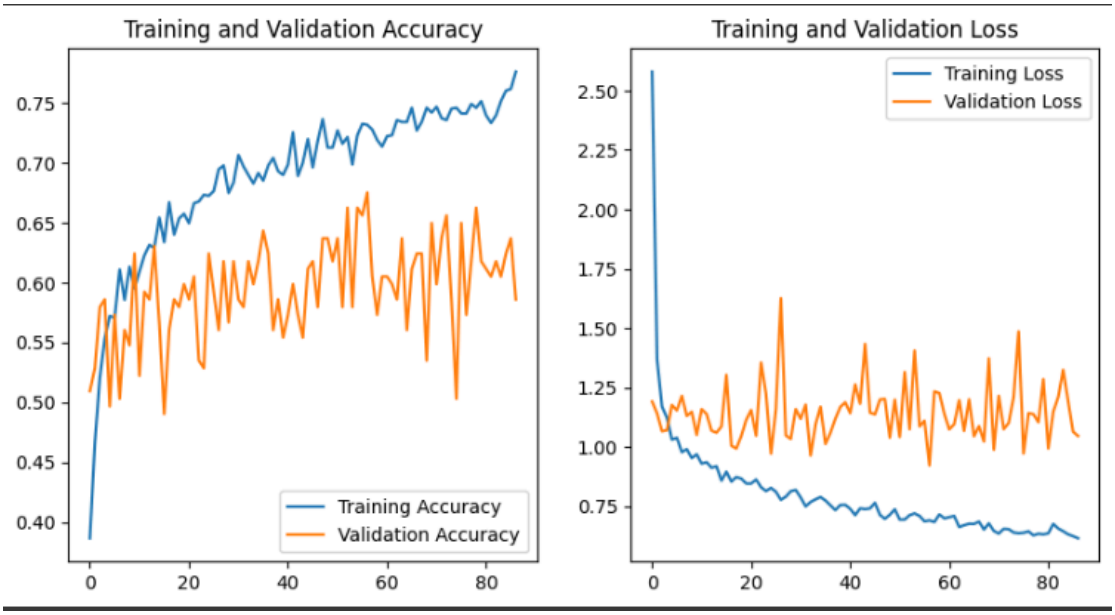
ResNet50:

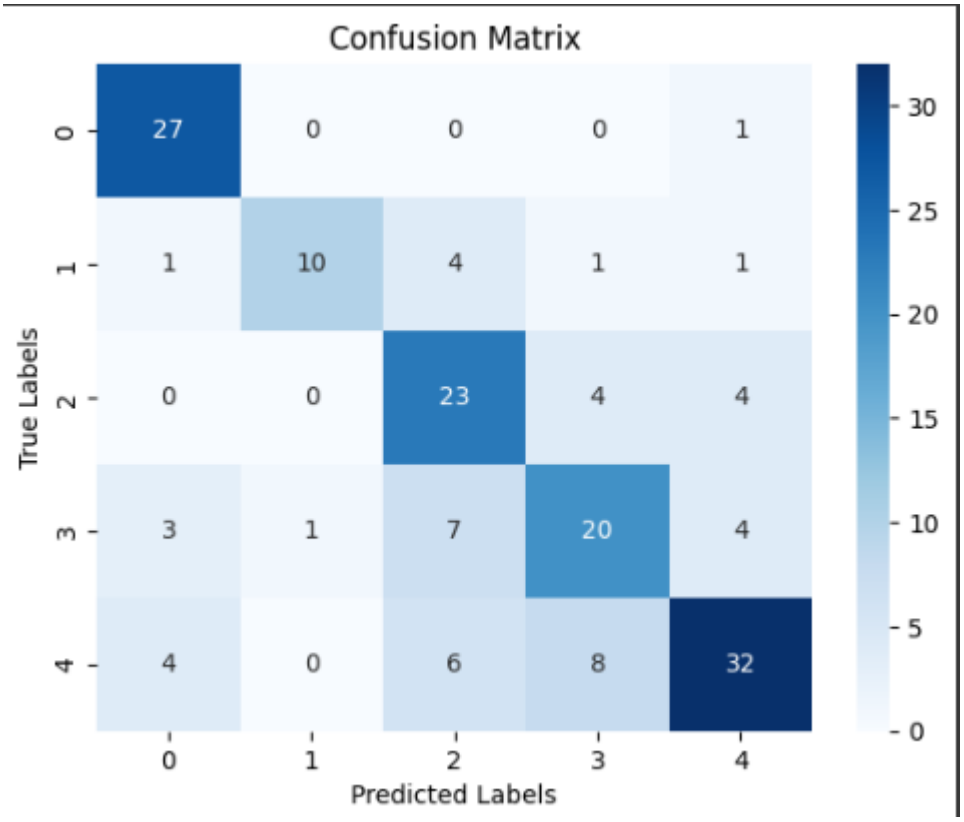
Hyperparameters	Layers	Results
LR=0.001, e=50, bs=32 Adam optimizer Without early stopping	Base model + flatten + ReLU + Softmax	train_acc=99.10% val_acc=74.32% test_acc=74.68%
LR=0.001, e=100, bs=32 Adam optimizer With early stopping Stopped at 70th epoch	Base model + flatten + ReLU + Softmax	train_acc=99.64% val_acc=74.84% test_acc=71.56%
LR=0.01, e=100,bs=32 Adam Optimizer With early stopping Stopped at 75th epoch	Base model + flatten + ReLU + Softmax	train_acc=99.64% val_acc=72.26% test_acc=74.37%
LR=0.001, e=100, bs=32 RMSprop optimizer With early stopping Stopped at 75th epoch	Base model + flatten + ReLU + Softmax	train_acc=98.37% val_acc=75.48% test_acc=70.31%
LR=0.001, e=100, bs=32 RMSprop optimizer Without early stopping	Base model + flatten + ReLU + Softmax	train_acc=99.55% val_acc=77.68 test_acc=72.81%



VGG16:

Hyperparameters	Layers	Results
LR=0.001, e=50, bs=32 Adam optimizer Without early stopping	VGG16 + Flatten + ReLU + Softmax	train_acc=74.90% val_acc=58.60% test_acc=65.83%
LR=0.001, e=100, bs=32 RMSprop optimizer With early stopping Stopped at 87th epoch	**VGG16 + Flatten + ReLU + Softmax**	**train_acc=77.58% val_acc=61.78% test_acc=69.56%**
LR=0.01, e=100,bs=32 RMSprop Optimizer With early stopping Stopped at 71st epoch	VGG16 + Flatten + ReLU + Softmax	train_acc=70.64% val_acc=51.96% test_acc=62.37%
LR=0.001, e=100, bs=32 RMSprop optimizer With early stopping Stopped at 75th epoch	VGG16 + Softmax	train_acc=68.37% val_acc=55.48% test_acc=60.31%
LR=0.1, e=100, bs=32 RMSprop optimizer With early stopping Stopped at 87th epoch	VGG16 + Flatten + ReLU + Softmax	train_acc=69.55% val_acc=57.68% test_acc=61.81%





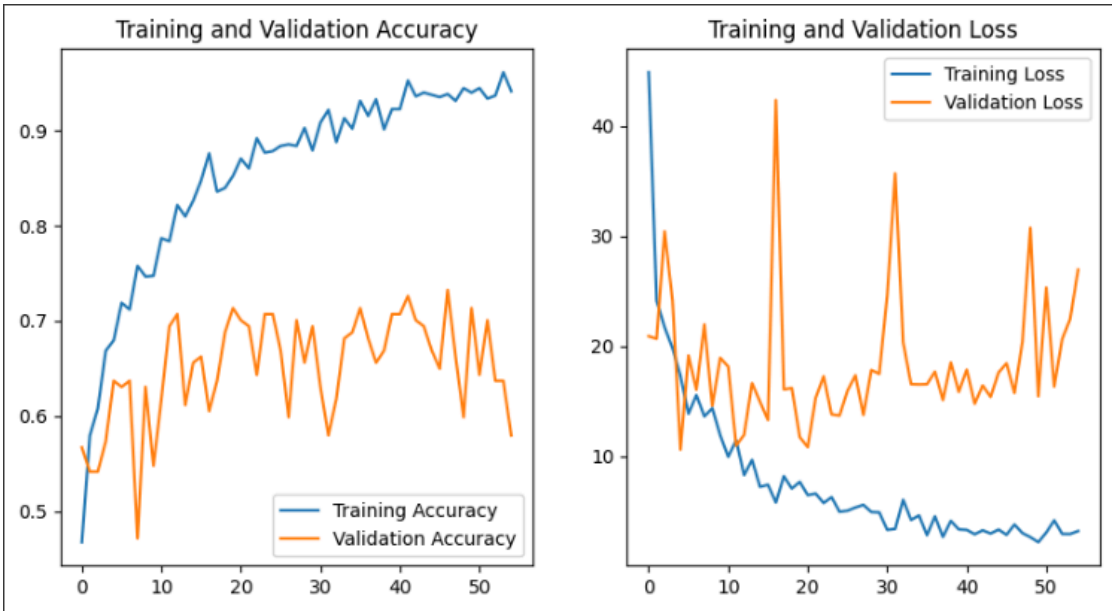
0- diode, 1- dust, 2- multi, 3- pid, 4- single

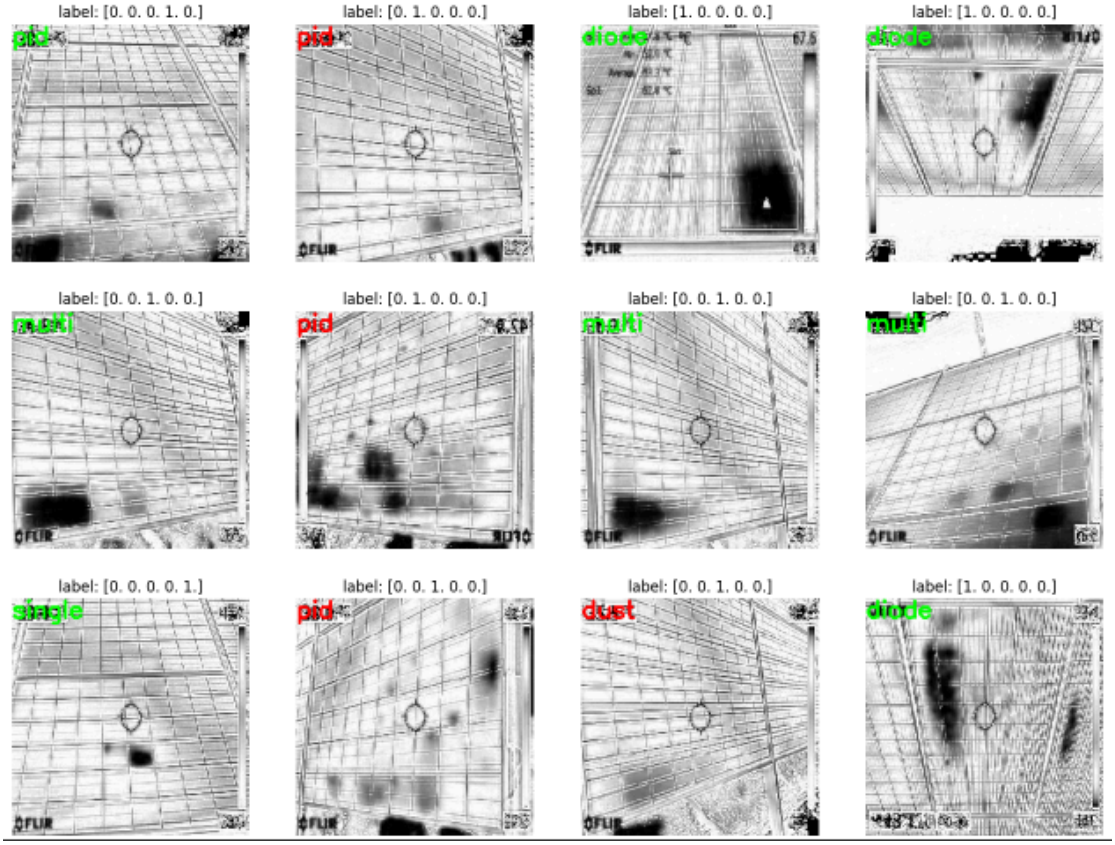
0- diode, 1- dust, 2- multi, 3- pid, 4- single

ResNet50v2 different colour channels:

Hyperparameters	Layers	Colour Channel	Results
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 61st epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	Thermal Images	train_acc=97.63% val_acc=69.43% test_acc=76.39%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 55th epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	Saturation layer	train_acc=94.16% val_acc=63.69% test_acc=68.94%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 67th epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	HSV Images	train_acc=94.48% val_acc=65.51% test_acc=75.77%
LR=0.1, e=100, bs=32 With Early stopping - Stopped at 54th epoch RMSProp optimizer	Softmax after resnet RMSProp optimizer	Blue Channel	train_acc=91.95% val_acc=71.97% test_acc=77.01%

Saturation Layer:

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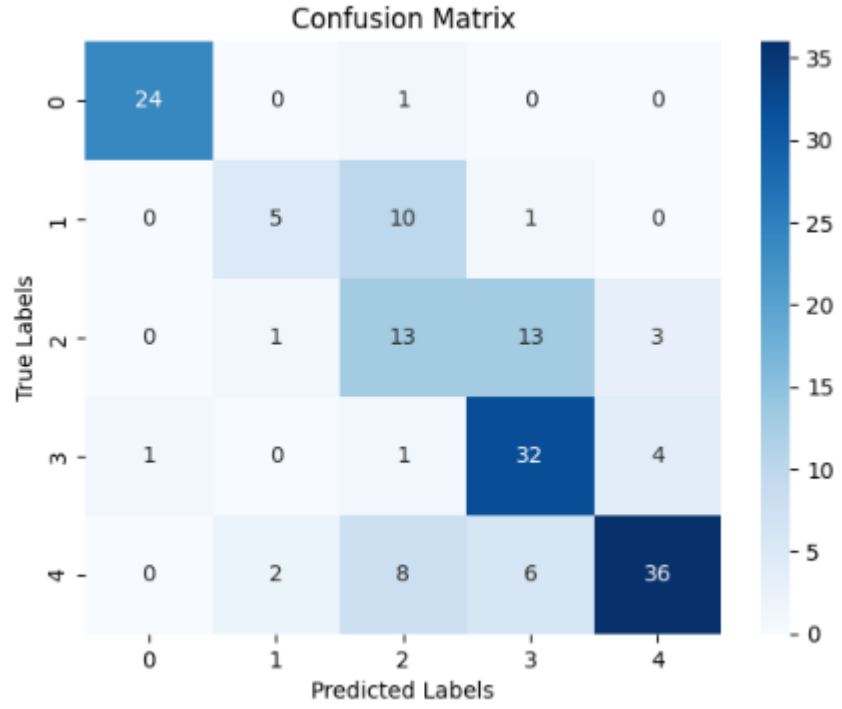
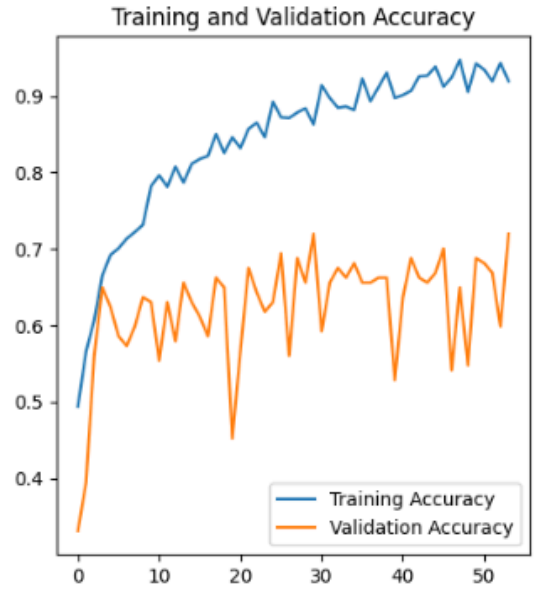
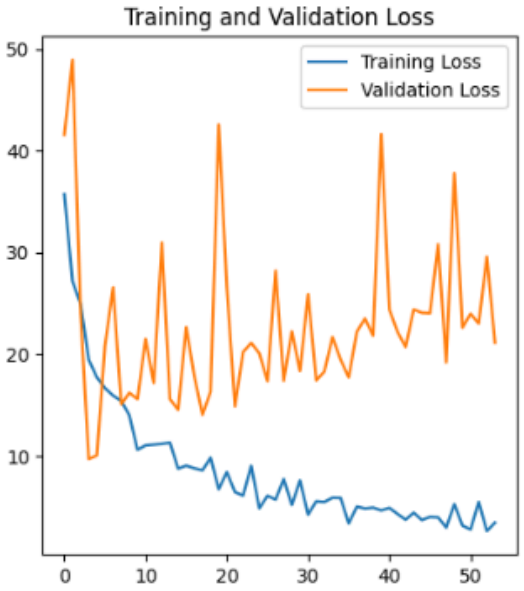
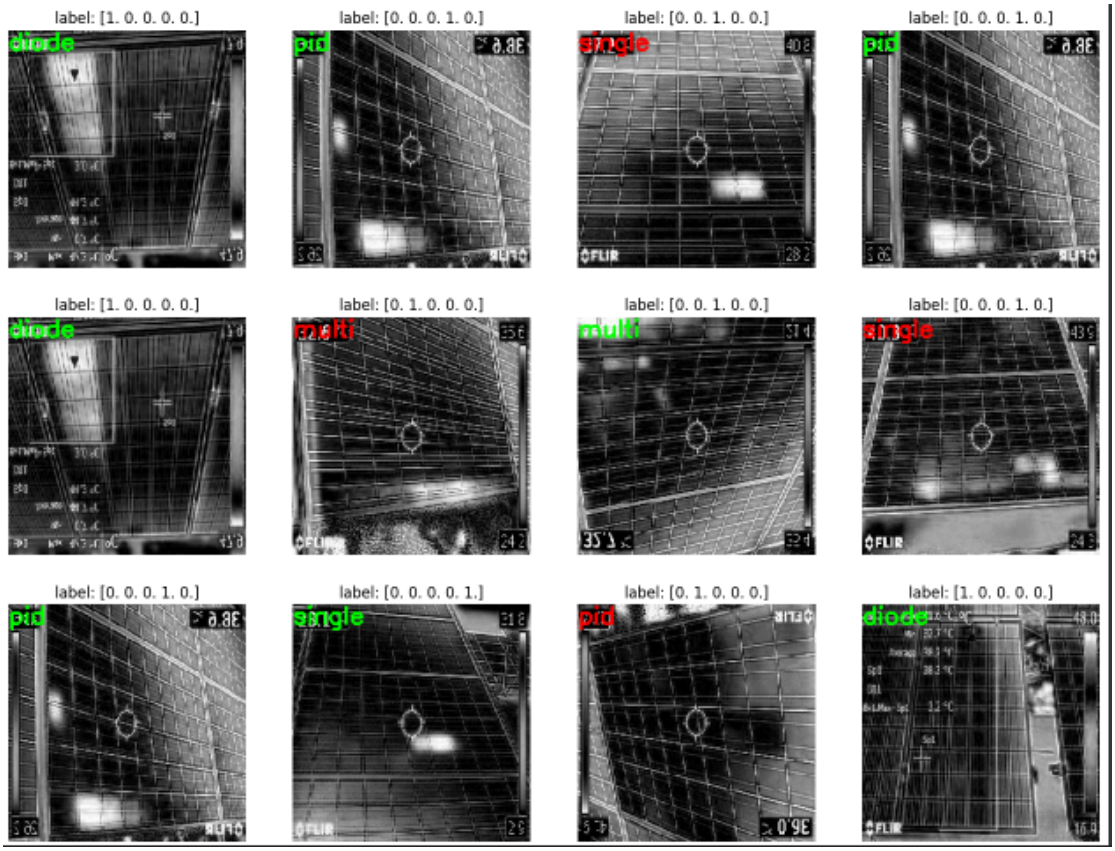
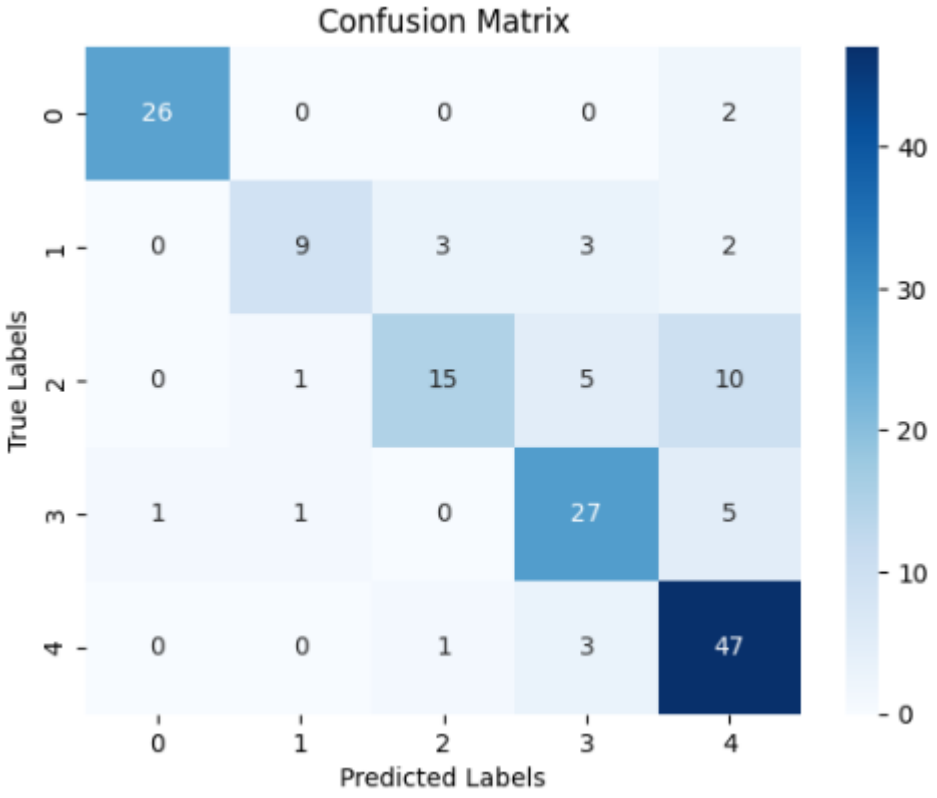

Confusion Matrix
True Labels
Predicted Labels
0
1
2
3
4
24 0 1 0 0
0 5 10 1 0
0 1 13 13 3
1 0 1 32 4
0 2 8 6 36
35
30
25
20
15
10
5
0

Blue channel:



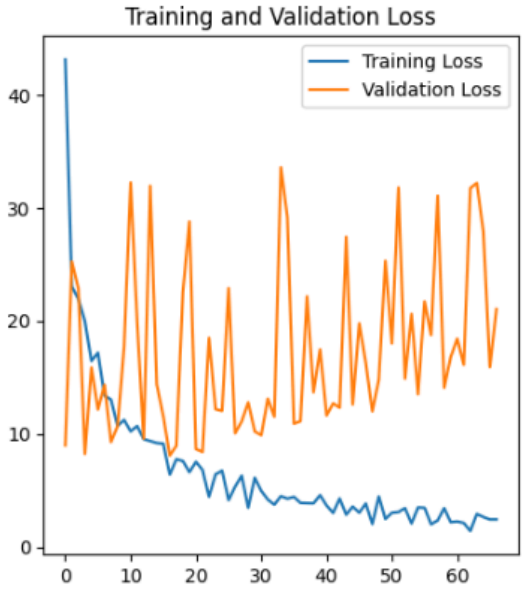


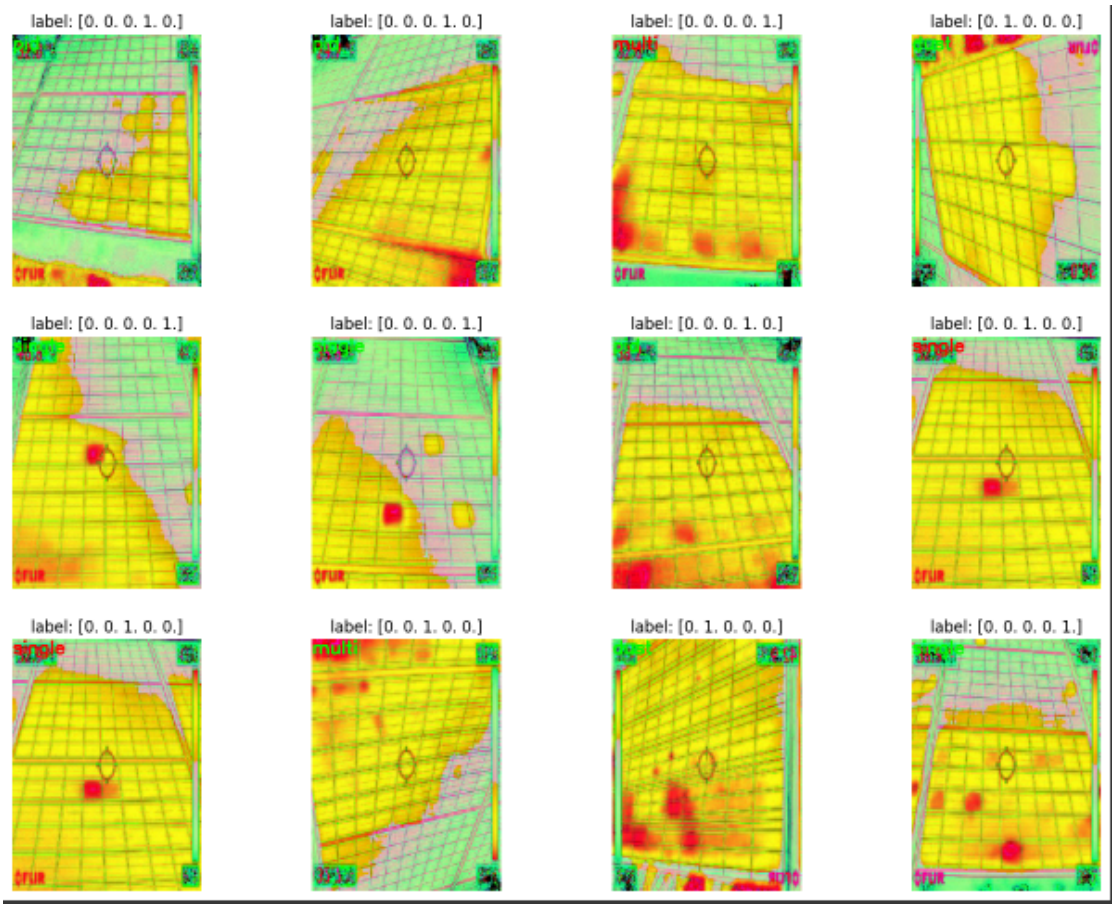



Confusion Matrix
True Labels
Predicted Labels
0
1
2
3
4
26 0 0 0 2
0 9 3 3 2
0 1 15 5 10
1 1 0 27 5
0 0 1 3 47
40
30
20
10
0

HSV Layer:


Training and Validation Accuracy
Training Accuracy
Validation Accuracy
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0
10
20
30
40
50
60


Training and Validation Loss
Training Loss
Validation Loss
40
30
20
10
0
0
10
20
30
40
50
60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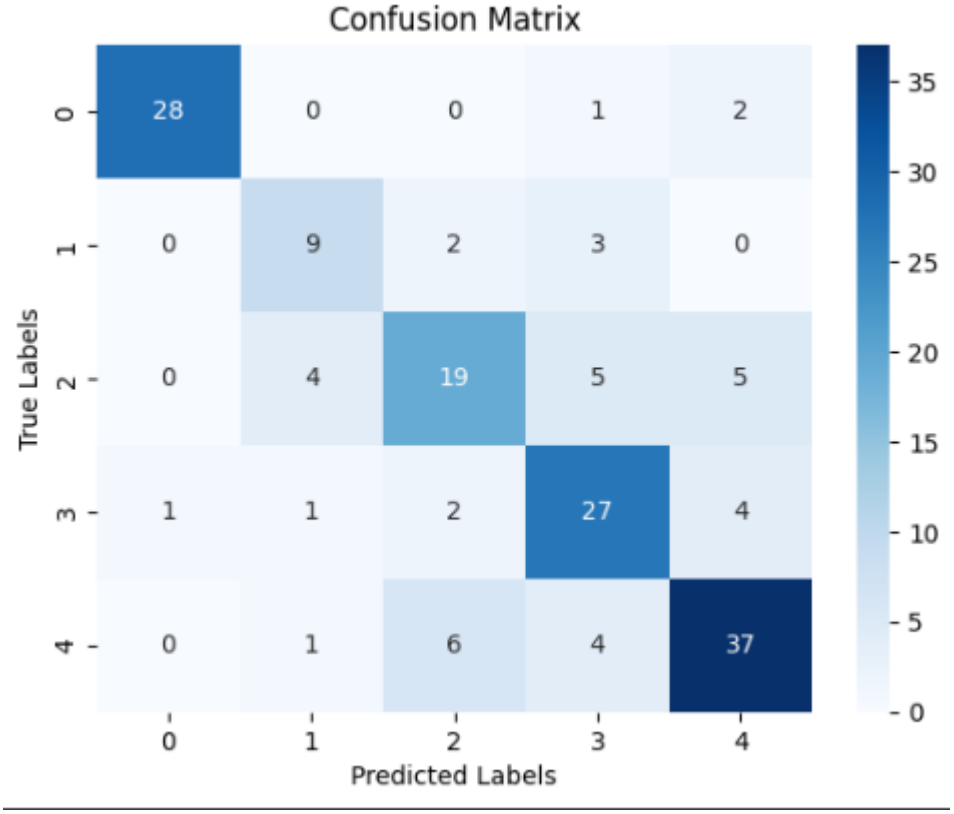
Confusion Matrix
True Labels
Predicted Labels
0
1
2
3
4
28 0 0 1 2
0 9 2 3 0
0 4 19 5 5
1 1 2 27 4
0 1 6 4 37
35
30
25
20
15
10
5
0