PS C:\Users\tgillard\Desktop\internship\0\_Final\_Code> c:; cd 'c:\Users\tgillard\Desktop\internship\0\_Final\_Code'; & 'C:\Users\tgillard\Anaconda3\envs\cnn\python.exe' 'c:\Users\tgillard\.vscode\extensions\ms-python.python-2022.18.2\pythonFiles\lib\python\debugpy\adapter/../..\debugpy\launcher' '29712' '--' 'c:\Users\tgillard\Desktop\internship\0\_Final\_Code\data\_augmentation.py'

train -0 nothing : 100%|████████████████████████████████████████████████| 2431/2431 [00:00<00:00, 288358.40files/s]

train -1stem : 100%|██████████████████████████████████████████████████| 503/503 [00:00<00:00, 112681.46files/s]

train -2calyx : 100%|██████████████████████████████████████████████████| 460/460 [00:00<00:00, 309245.05files/s]

train -3defect : 100%|██████████████████████████████████████████████████| 408/408 [00:00<00:00, 397786.15files/s]

test -0 nothing : 100%|██████████████████████████████████████████████████| 439/439 [00:00<00:00, 221150.55files/s]

test -1stem : 100%|█████████████████████████████████████████████████████| 87/87 [00:00<00:00, 87633.15files/s]

test -2calyx : 100%|████████████████████████████████████████████████████████████████| 79/79 [00:00<?, ?files/s]

test -3defect : 100%|████████████████████████████████████████████████████████████████| 67/67 [00:00<?, ?files/s]

number of classes in processed dataset= 4

the maximum files in any class in train\_df is 2309 the minimum files in any class in train\_df is 387

train\_df length: 3611 test\_df length: 672 valid\_df length: 191

average image height= 93 average image width= 93 aspect ratio h/w= 1.0

Initial length of dataframe is 3611

Found 437 validated image filenames. for class 2calyx creating 363 augmented images

Found 478 validated image filenames. for class 1stem creating 322 augmented images

Found 387 validated image filenames. for class 3defect creating 413 augmented images

Total Augmented images created= 1098

Length of augmented dataframe is now 4709

Found 4709 validated image filenames belonging to 4 classes. for train generator

Found 191 validated image filenames belonging to 4 classes. for valid generator

Found 672 validated image filenames belonging to 4 classes. for test generator

test batch size: 56 test steps: 12 number of classes : 4

Created EfficientNet B7 model with initial learning rate set to 0.001

Epoch 1/40

236/236 [==============================] - 676s 3s/step - loss: 7.2043 - accuracy: 0.8078 - val\_loss: 5.3017 - val\_accuracy: 0.9110

Epoch 2/40

236/236 [==============================] - 628s 3s/step - loss: 4.3886 - accuracy: 0.9102 - val\_loss: 3.5445 - val\_accuracy: 0.9319

Epoch 3/40

236/236 [==============================] - 651s 3s/step - loss: 2.8976 - accuracy: 0.9412 - val\_loss: 2.3330 - val\_accuracy: 0.9372

Epoch 4/40

236/236 [==============================] - 572s 2s/step - loss: 1.9422 - accuracy: 0.9575 - val\_loss: 1.6083 - val\_accuracy: 0.9319

Epoch 5/40

236/236 [==============================] - 598s 3s/step - loss: 1.3084 - accuracy: 0.9677 - val\_loss: 1.1004 - val\_accuracy: 0.9476

Epoch 6/40

236/236 [==============================] - 678s 3s/step - loss: 0.8973 - accuracy: 0.9747 - val\_loss: 0.8043 - val\_accuracy: 0.9476

Epoch 7/40

236/236 [==============================] - 668s 3s/step - loss: 0.6595 - accuracy: 0.9720 - val\_loss: 0.5916 - val\_accuracy: 0.9581

Epoch 8/40

236/236 [==============================] - 646s 3s/step - loss: 0.4878 - accuracy: 0.9819 - val\_loss: 0.4563 - val\_accuracy: 0.9634

Epoch 9/40

236/236 [==============================] - 623s 3s/step - loss: 0.4007 - accuracy: 0.9807 - val\_loss: 0.3741 - val\_accuracy: 0.9634

Epoch 10/40

236/236 [==============================] - 654s 3s/step - loss: 0.3573 - accuracy: 0.9756 - val\_loss: 0.4021 - val\_accuracy: 0.9581

Epoch 11/40

236/236 [==============================] - 640s 3s/step - loss: 0.2972 - accuracy: 0.9817 - val\_loss: 0.3180 - val\_accuracy: 0.9634

Epoch 12/40

236/236 [==============================] - 1065s 5s/step - loss: 0.2482 - accuracy: 0.9849 - val\_loss: 0.3213 - val\_accuracy: 0.9581

Epoch 13/40

236/236 [==============================] - 794s 3s/step - loss: 0.2262 - accuracy: 0.9856 - val\_loss: 0.2399 - val\_accuracy: 0.9791

Epoch 14/40

236/236 [==============================] - 633s 3s/step - loss: 0.2031 - accuracy: 0.9890 - val\_loss: 0.2251 - val\_accuracy: 0.9686

Epoch 15/40

236/236 [==============================] - 637s 3s/step - loss: 0.1854 - accuracy: 0.9919 - val\_loss: 0.2242 - val\_accuracy: 0.9791

Epoch 16/40

236/236 [==============================] - 655s 3s/step - loss: 0.1697 - accuracy: 0.9915 - val\_loss: 0.1887 - val\_accuracy: 0.9791

Epoch 17/40

236/236 [==============================] - 607s 3s/step - loss: 0.1805 - accuracy: 0.9885 - val\_loss: 0.2150 - val\_accuracy: 0.9738

Epoch 18/40

236/236 [==============================] - 606s 3s/step - loss: 0.1648 - accuracy: 0.9881 - val\_loss: 0.2110 - val\_accuracy: 0.9686

Epoch 19/40

236/236 [==============================] - 655s 3s/step - loss: 0.1464 - accuracy: 0.9926 - val\_loss: 0.2683 - val\_accuracy: 0.9634

Epoch 20/40

236/236 [==============================] - 625s 3s/step - loss: 0.1479 - accuracy: 0.9941 - val\_loss: 0.2174 - val\_accuracy: 0.9738

Epoch 21/40

236/236 [==============================] - 665s 3s/step - loss: 0.1448 - accuracy: 0.9930 - val\_loss: 0.1933 - val\_accuracy: 0.9686

Epoch 22/40

236/236 [==============================] - 608s 3s/step - loss: 0.1378 - accuracy: 0.9936 - val\_loss: 0.1915 - val\_accuracy: 0.9843

Epoch 23/40

236/236 [==============================] - 671s 3s/step - loss: 0.1338 - accuracy: 0.9932 - val\_loss: 0.1841 - val\_accuracy: 0.9843

Epoch 24/40

236/236 [==============================] - 650s 3s/step - loss: 0.1162 - accuracy: 0.9970 - val\_loss: 0.1982 - val\_accuracy: 0.9738

Epoch 25/40

236/236 [==============================] - 676s 3s/step - loss: 0.1224 - accuracy: 0.9951 - val\_loss: 0.1553 - val\_accuracy: 0.9843

Epoch 26/40

236/236 [==============================] - 628s 3s/step - loss: 0.1170 - accuracy: 0.9953 - val\_loss: 0.1891 - val\_accuracy: 0.9738

Epoch 27/40

236/236 [==============================] - 647s 3s/step - loss: 0.1203 - accuracy: 0.9926 - val\_loss: 0.2427 - val\_accuracy: 0.9634

Epoch 28/40

236/236 [==============================] - 690s 3s/step - loss: 0.1172 - accuracy: 0.9943 - val\_loss: 0.1578 - val\_accuracy: 0.9686

Epoch 29/40

236/236 [==============================] - 655s 3s/step - loss: 0.1156 - accuracy: 0.9943 - val\_loss: 0.2181 - val\_accuracy: 0.9634

Epoch 30/40

236/236 [==============================] - 646s 3s/step - loss: 0.1134 - accuracy: 0.9945 - val\_loss: 0.1989 - val\_accuracy: 0.9686

Epoch 31/40

236/236 [==============================] - 636s 3s/step - loss: 0.1023 - accuracy: 0.9964 - val\_loss: 0.1831 - val\_accuracy: 0.9738

Epoch 32/40

236/236 [==============================] - 592s 3s/step - loss: 0.1024 - accuracy: 0.9975 - val\_loss: 0.1969 - val\_accuracy: 0.9738

Epoch 33/40

236/236 [==============================] - 676s 3s/step - loss: 0.1053 - accuracy: 0.9953 - val\_loss: 0.2265 - val\_accuracy: 0.9686

Epoch 34/40

236/236 [==============================] - 678s 3s/step - loss: 0.1020 - accuracy: 0.9958 - val\_loss: 0.1884 - val\_accuracy: 0.9686

Epoch 35/40

236/236 [==============================] - 659s 3s/step - loss: 0.1112 - accuracy: 0.9934 - val\_loss: 0.2128 - val\_accuracy: 0.9686

Epoch 36/40

236/236 [==============================] - 594s 3s/step - loss: 0.0997 - accuracy: 0.9962 - val\_loss: 0.2123 - val\_accuracy: 0.9791

Epoch 37/40

236/236 [==============================] - 593s 3s/step - loss: 0.0933 - accuracy: 0.9966 - val\_loss: 0.1787 - val\_accuracy: 0.9738

Epoch 38/40

236/236 [==============================] - 668s 3s/step - loss: 0.0840 - accuracy: 0.9985 - val\_loss: 0.1874 - val\_accuracy: 0.9738

Epoch 39/40

236/236 [==============================] - 666s 3s/step - loss: 0.0861 - accuracy: 0.9977 - val\_loss: 0.1632 - val\_accuracy: 0.9791

Epoch 40/40

236/236 [==============================] - 653s 3s/step - loss: 0.0998 - accuracy: 0.9960 - val\_loss: 0.1690 - val\_accuracy: 0.9791

12/12 [==============================] - 22s 1s/step

there were 22 errors in 672 tests for an accuracy of 96.73

Classification Report:

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precision recall f1-score support

0 nothing 0.9772 0.9772 0.9772 439

1stem 0.9341 0.9770 0.9551 87

2calyx 1.0000 0.9873 0.9936 79

3defect 0.9062 0.8657 0.8855 67

accuracy 0.9673 672

macro avg 0.9544 0.9518 0.9529 672

weighted avg 0.9672 0.9673 0.9671 672

Below is a list of test files that were miss classified

Test File Predicted as

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\10324000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\11030000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\13005000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\13907000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\14224000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\14611000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\2506000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\4315000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\4316000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\0 nothing\8726000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\1stem\11312120.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\1stem\11506120.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\2calyx\502220.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\14506300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\14507300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\3917300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\3918300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\4017300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\6209310.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\803300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\8914300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T4 Royal Gala\_trie\Team\test\3defect\8915300.BMP

