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' '21691' '--' 'c:\Users\tgillard\Desktop\internship\0\_Final\_Code\data\_augmentation.py'

train -0 nothing : 100%|████████████████████████████████████████████████| 2218/2218 [00:00<00:00, 372744.86files/s]

train -1stem : 100%|██████████████████████████████████████████████████| 640/640 [00:00<00:00, 317938.48files/s]

train -2calyx : 100%|██████████████████████████████████████████████████| 444/444 [00:00<00:00, 298823.97files/s]

train -3defect : 100%|██████████████████████████████████████████████████| 785/785 [00:00<00:00, 395879.36files/s]

test -0 nothing : 100%|██████████████████████████████████████████████████| 379/379 [00:00<00:00, 375180.84files/s]

test -1stem : 100%|██████████████████████████████████████████████████| 110/110 [00:00<00:00, 221601.08files/s]

test -2calyx : 100%|████████████████████████████████████████████████████| 71/71 [00:00<00:00, 143170.95files/s]

test -3defect : 100%|██████████████████████████████████████████████████| 130/130 [00:00<00:00, 262775.67files/s]

number of classes in processed dataset= 4

the maximum files in any class in train\_df is 2107 the minimum files in any class in train\_df is 422

train\_df length: 3882 test\_df length: 690 valid\_df length: 205

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

Initial length of dataframe is 3882

Found 745 validated image filenames. for class 3defect creating 55 augmented images

Found 608 validated image filenames. for class 1stem creating 192 augmented images

Found 422 validated image filenames. for class 2calyx creating 378 augmented images

Total Augmented images created= 625

Length of augmented dataframe is now 4507

Found 4507 validated image filenames belonging to 4 classes. for train generator

Found 205 validated image filenames belonging to 4 classes. for valid generator

Found 690 validated image filenames belonging to 4 classes. for test generator

test batch size: 69 test steps: 10 number of classes : 4

Created EfficientNet B7 model with initial learning rate set to 0.001

Epoch 1/40

226/226 [==============================] - 733s 3s/step - loss: 6.9067 - accuracy: 0.8289 - val\_loss: 5.1354 - val\_accuracy: 0.9024

Epoch 2/40

226/226 [==============================] - 658s 3s/step - loss: 4.0759 - accuracy: 0.9210 - val\_loss: 3.2209 - val\_accuracy: 0.9463

Epoch 3/40

226/226 [==============================] - 842s 4s/step - loss: 2.6593 - accuracy: 0.9454 - val\_loss: 2.1963 - val\_accuracy: 0.9659

Epoch 4/40

226/226 [==============================] - 727s 3s/step - loss: 1.7582 - accuracy: 0.9563 - val\_loss: 1.3786 - val\_accuracy: 0.9659

Epoch 5/40

226/226 [==============================] - 873s 4s/step - loss: 1.1627 - accuracy: 0.9661 - val\_loss: 0.9333 - val\_accuracy: 0.9756

Epoch 6/40

226/226 [==============================] - 639s 3s/step - loss: 0.8102 - accuracy: 0.9707 - val\_loss: 0.7119 - val\_accuracy: 0.9561

Epoch 7/40

226/226 [==============================] - 695s 3s/step - loss: 0.5923 - accuracy: 0.9738 - val\_loss: 0.5119 - val\_accuracy: 0.9707

Epoch 8/40

226/226 [==============================] - 983s 4s/step - loss: 0.4486 - accuracy: 0.9758 - val\_loss: 0.4601 - val\_accuracy: 0.9561

Epoch 9/40

226/226 [==============================] - 848s 4s/step - loss: 0.3588 - accuracy: 0.9816 - val\_loss: 0.3638 - val\_accuracy: 0.9561

Epoch 10/40

226/226 [==============================] - 963s 4s/step - loss: 0.3105 - accuracy: 0.9838 - val\_loss: 0.3087 - val\_accuracy: 0.9805

Epoch 11/40

226/226 [==============================] - 701s 3s/step - loss: 0.2796 - accuracy: 0.9807 - val\_loss: 0.3857 - val\_accuracy: 0.9415

Epoch 12/40

226/226 [==============================] - 704s 3s/step - loss: 0.2398 - accuracy: 0.9856 - val\_loss: 0.3000 - val\_accuracy: 0.9610

Epoch 13/40

226/226 [==============================] - 727s 3s/step - loss: 0.2143 - accuracy: 0.9900 - val\_loss: 0.2822 - val\_accuracy: 0.9561

Epoch 14/40

226/226 [==============================] - 710s 3s/step - loss: 0.2017 - accuracy: 0.9871 - val\_loss: 0.2738 - val\_accuracy: 0.9512

Epoch 15/40

226/226 [==============================] - 608s 3s/step - loss: 0.2069 - accuracy: 0.9836 - val\_loss: 0.2635 - val\_accuracy: 0.9707

Epoch 16/40

226/226 [==============================] - 624s 3s/step - loss: 0.1721 - accuracy: 0.9907 - val\_loss: 0.3128 - val\_accuracy: 0.9512

Epoch 17/40

226/226 [==============================] - 578s 3s/step - loss: 0.1730 - accuracy: 0.9880 - val\_loss: 0.2129 - val\_accuracy: 0.9756

Epoch 18/40

226/226 [==============================] - 574s 3s/step - loss: 0.1530 - accuracy: 0.9933 - val\_loss: 0.1911 - val\_accuracy: 0.9659

Epoch 19/40

226/226 [==============================] - 606s 3s/step - loss: 0.1426 - accuracy: 0.9938 - val\_loss: 0.2866 - val\_accuracy: 0.9512

Epoch 20/40

226/226 [==============================] - 589s 3s/step - loss: 0.1477 - accuracy: 0.9931 - val\_loss: 0.2047 - val\_accuracy: 0.9659

Epoch 21/40

226/226 [==============================] - 559s 2s/step - loss: 0.1431 - accuracy: 0.9929 - val\_loss: 0.2332 - val\_accuracy: 0.9512

Epoch 22/40

226/226 [==============================] - 604s 3s/step - loss: 0.1337 - accuracy: 0.9942 - val\_loss: 0.1954 - val\_accuracy: 0.9756

Epoch 23/40

226/226 [==============================] - 606s 3s/step - loss: 0.1232 - accuracy: 0.9960 - val\_loss: 0.3000 - val\_accuracy: 0.9512

Epoch 24/40

226/226 [==============================] - 583s 3s/step - loss: 0.1202 - accuracy: 0.9949 - val\_loss: 0.2047 - val\_accuracy: 0.9707

Epoch 25/40

226/226 [==============================] - 568s 3s/step - loss: 0.1133 - accuracy: 0.9958 - val\_loss: 0.1874 - val\_accuracy: 0.9707

Epoch 26/40

226/226 [==============================] - 575s 3s/step - loss: 0.1175 - accuracy: 0.9945 - val\_loss: 0.2415 - val\_accuracy: 0.9707

Epoch 27/40

226/226 [==============================] - 606s 3s/step - loss: 0.1176 - accuracy: 0.9958 - val\_loss: 0.2088 - val\_accuracy: 0.9756

Epoch 28/40

226/226 [==============================] - 670s 3s/step - loss: 0.1135 - accuracy: 0.9953 - val\_loss: 0.2087 - val\_accuracy: 0.9610

Epoch 29/40

226/226 [==============================] - 645s 3s/step - loss: 0.1180 - accuracy: 0.9938 - val\_loss: 0.1701 - val\_accuracy: 0.9659

Epoch 30/40

226/226 [==============================] - 698s 3s/step - loss: 0.1082 - accuracy: 0.9949 - val\_loss: 0.1788 - val\_accuracy: 0.9707

Epoch 31/40

226/226 [==============================] - 543s 2s/step - loss: 0.1046 - accuracy: 0.9953 - val\_loss: 0.1424 - val\_accuracy: 0.9805

Epoch 32/40

226/226 [==============================] - 574s 3s/step - loss: 0.1081 - accuracy: 0.9964 - val\_loss: 0.2734 - val\_accuracy: 0.9415

Epoch 33/40

226/226 [==============================] - 565s 2s/step - loss: 0.1009 - accuracy: 0.9969 - val\_loss: 0.1726 - val\_accuracy: 0.9756

Epoch 34/40

226/226 [==============================] - 554s 2s/step - loss: 0.0913 - accuracy: 0.9973 - val\_loss: 0.1592 - val\_accuracy: 0.9707

Epoch 35/40

226/226 [==============================] - 559s 2s/step - loss: 0.0960 - accuracy: 0.9969 - val\_loss: 0.1563 - val\_accuracy: 0.9659

Epoch 36/40

226/226 [==============================] - 551s 2s/step - loss: 0.0989 - accuracy: 0.9949 - val\_loss: 0.1844 - val\_accuracy: 0.9561

Epoch 37/40

226/226 [==============================] - 555s 2s/step - loss: 0.0919 - accuracy: 0.9962 - val\_loss: 0.1907 - val\_accuracy: 0.9610

Epoch 38/40

226/226 [==============================] - 559s 2s/step - loss: 0.1006 - accuracy: 0.9938 - val\_loss: 0.1937 - val\_accuracy: 0.9707

Epoch 39/40

226/226 [==============================] - 533s 2s/step - loss: 0.0995 - accuracy: 0.9938 - val\_loss: 0.2429 - val\_accuracy: 0.9659

Epoch 40/40

226/226 [==============================] - 534s 2s/step - loss: 0.0882 - accuracy: 0.9976 - val\_loss: 0.1618 - val\_accuracy: 0.9756

10/10 [==============================] - 20s 1s/step

there were 13 errors in 690 tests for an accuracy of 98.12

Classification Report:

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precision recall f1-score support

0 nothing 0.9767 0.9947 0.9856 379

1stem 0.9818 0.9818 0.9818 110

2calyx 1.0000 0.9859 0.9929 71

3defect 0.9839 0.9385 0.9606 130

accuracy 0.9812 690

macro avg 0.9856 0.9752 0.9802 690

weighted avg 0.9813 0.9812 0.9811 690

Below is a list of test files that were miss classified

Test File Predicted as

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\0 nothing\11629000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\0 nothing\13413000.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\1stem\2701120.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\1stem\2724120.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\2calyx\2719220.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\1109300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\13709320.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\14829300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\16908300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\2123300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\2203300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\2226300.BMP

C:\Users\tgillard\Desktop\internship\DATA\_SET\T3 Granny Smith\_trie\Team\test\3defect\3726300.BMP

model was saved as ./Granny Smith-98.11.h5

