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While working on the project myself, I used 16, 32, and 64 batch sizes. Finally, I decided on 32 and applied the same batch size to all of them to see the results of each model in common. I used Adam and RMSprop as optimizers, I decided to continue with Adam. I did not change the learning rate. I tried epochs numbers as 16,20,32. However, since others took so long time, I thought 20 would be appropriate, and I used that for all of them. Layer numbers vary in each model. Since I thought that you would like to see the results of each model under equal conditions, I proceeded by deciding on one. However, I assure you that I have tried other values as well. I used 6 models in the project. I have included them all in this report as well. Here are the methods I use for data augmentation: RandomRotation, RandomZoom, ReLU, RandomFlip.

Q1) For your base model:

a) Summarize your model in a short two/three sentences: (6 pts)

As the base model, I used MLP, which is not usually used for image classification, to distinguish it from other models. It contains only flatten dense, and additional dropout layer.

b) Answer the questions below: (12 pts)

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	No
Did you use any pretrained model?	No
Number of layers?	4 (Flatten,Dense,Dropout,Desne)
Number of epochs?	20
Batch size?	32
Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.3452
Validation accuracy:	0.3269
Test accuracy:	0.50

c) Any hyper parameter tuning? (The hyperparameters to tune are the number of neurons, activation function, optimizer, learning rate, batch size, and epochs. The second step is to tune the number of layers.) (12 pts)

In this model, I used data augmentation as a difference. The result didn't change.

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	Yes
Did you use any pretrained model?	No
Number of layers?	5

Number of epochs?	20
Batch size?	32
Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.3452
Validation accuracy:	0.3296
Test accuracy:	0.50

Q2) For your second model:

a) Summarize your model in a short two/three sentences: (6 pts)

In this model, I created a model using the features such as CONV2D, MaxPooling, Batch Normalization, and Dropout that CNN offered to us. I tried multiple times with different filter numbers and sizes to improve the result. I used softmax in the last layer and relu as an activation function in all the others. I also used augmentation techniques.

b) Answer the questions below: (12 pts)

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	Yes
Did you use any pretrained model?	No
Number of layers?	14
Number of epochs?	20
Batch size?	32
Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.8991
Validation accuracy:	0.8626
Test accuracy:	0.913

c) Any hyper parameter tuning? (The hyperparameters to tune are the number of neurons, activation function, optimizer, learning rate, batch size, and epochs. The second step is to tune the number of layers.) (12 pts)

In this part, instead of the sequential model (previous model), I created a functional model by playing with the previous model. I changed the number of layers, and the number of neurons.

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	Yes
Did you use any pretrained model?	No
Number of layers?	23
Number of epochs?	20

Batch size?	32
Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.9993
Validation accuracy:	0.730
Test accuracy:	-

Q3) For your third model:

a) Summarize your model in a short two/three sentences: (6 pts)

In this model, I performed transfer learning using the pre-trained model. I used DenseNet-169 as a pre-trained model. I added GlobalAveragePooling2D, Batch Normalization, Dense, Dropout layers additionally. I also added data augmentation.

b) Answer the questions below: (12 pts)

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	Yes
Did you use any pretrained model?	Yes
Number of layers?	8 (DenseNet is taken by being 1 layer.)
Number of epochs?	20
Batch size?	32
Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.9520
Validation accuracy:	0.9231
Test accuracy:	0.935

c) Any hyper parameter tuning? (The hyperparameters to tune are the number of neurons, activation function, optimizer, learning rate, batch size, and epochs. The second step is to tune the number of layers.) (12 pts)

Although not exactly hyperparameter tuning, I modified my pre-trained model to see the model differences. This time I also used efficient net-b3. As an extra, I used GlobalAveragePooling2D, Batch Normalization, Dense, data augmentation, and rescaling. Things like other optimizers are worth the same. Early stopping was used in each model, and all were evaluated according to valid. accuracy.

Input data	Images of Apple Tree Leaves
Input size	(180,180,3) * Number of images (1458 for training, 364 for validation)
Did you use any augmentation technique?	Yes
Did you use any pretrained model?	Yes
Number of layers?	6
Number of epochs?	20
Batch size?	32

Optimizer?	Adam
Learning rate?	0.001
Train accuracy:	0.9739
Validation accuracy:	0.8929
Test accuracy:	0.941