```
clc; clear
cd 'G:\Jiaxu Flashdrive Backup\code';
addpath 'G:\Jiaxu Flashdrive Backup\code\functions'
```

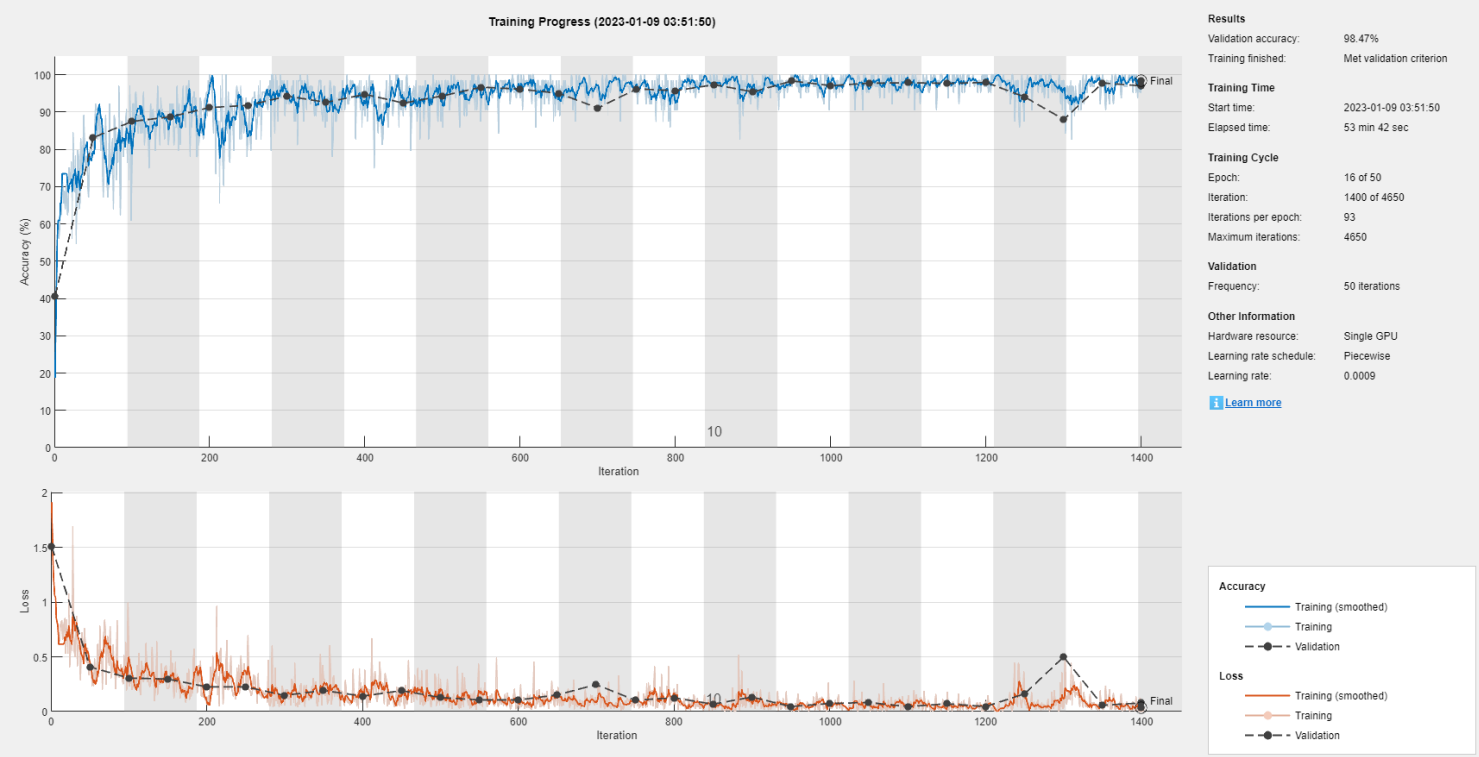
```
net = load("efficientnet_6class_untrained.mat");
% mobilenetV2_6va = net.mobilenetV2_6variable;
efficientnet_6var = net.efficientnet_6class;
fracTrainFiles = 0.8;
fracValFiles = 0.2;
training_imds = imageDatastore("G:\Machine Learning\NW_pitch_30_NWs_6_intervals\train", ...
    "IncludeSubfolders",true,...
    "LabelSource","foldernames");
shuffle_training_imds = shuffle(training_imds);
[trainImgs,validImgs] = splitEachLabel(shuffle_training_imds,fracTrainFiles,fracValFiles,"rando
numClasses = numel(categories(training_imds.Labels));
testing_imds = imageDatastore("G:\Machine Learning\NW_pitch_30_NWs_6_intervals\test" ...
    ,"IncludeSubfolders",true,...
    "LabelSource","foldernames");
```

```
options = trainingOptions('adam', ...
    'InitialLearnRate',0.001, ...
    'MaxEpochs',50, ...
    'Shuffle','every-epoch', ...
    'ValidationData',validImgs,...
    'MiniBatchSize',64,...
    'LearnRateSchedule','piecewise',...
    'LearnRateDropFactor',0.9,...
    'LearnRateDropPeriod',10,...
    'ValidationPatience',6,...
    'ExecutionEnvironment','multi-gpu',...
    'Plots','training-progress');

aug = imageDataAugmenter("RandScale",[0.8 1.3], ...
    "RandYTranslation",[-40 40], ...
    "RandXReflection",true, ...
    "RandYReflection",true);
auimds = augmentedImageDatastore([150 150 3],trainImgs,'DataAugmentation',aug);

% inputlayer = imageInputLayer([150,150,3],'Name','input','Normalization','none');
```

```
[efficientnet_6inv_pitchangle,info] = trainNetwork(auimds,efficientnet_6var,options);
```

```
Initializing input data normalization.
|=========================================================================================================================
|  Epoch  |  Iteration  |  Time Elapsed  |  Mini-batch  |  Validation  |  Mini-batch  |  Validation  |  Base Learni
|         |             |   (hh:mm:ss)   |   Accuracy   |   Accuracy   |     Loss     |     Loss     |      Rate
|=========================================================================================================================
|       1 |           1 |       00:00:09 |       18.75% |       40.67% |       1.9150 |       1.5072 |          0.0
|       1 |          50 |       00:02:02 |       81.25% |       83.13% |       0.4727 |       0.4088 |          0.0
|       2 |         100 |       00:03:56 |       79.69% |       87.47% |       0.3894 |       0.3068 |          0.0
|       2 |         150 |       00:05:51 |       90.62% |       88.73% |       0.2132 |       0.2973 |          0.0
|       3 |         200 |       00:07:45 |      100.00% |       91.20% |       0.0757 |       0.2263 |          0.0
|       3 |         250 |       00:09:39 |       85.94% |       91.80% |       0.3462 |       0.2261 |          0.0
```

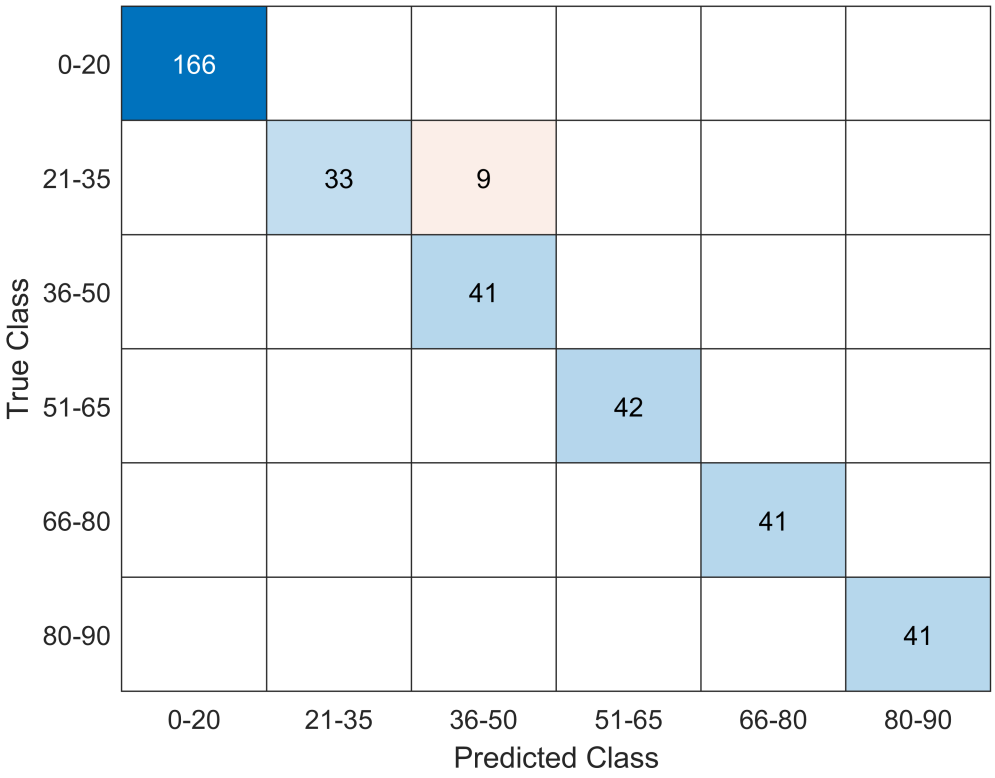
```
|       4 |         300 |       00:11:33 |       98.44% |       94.27% |       0.0618 |       0.1479 |          0.00
|       4 |         350 |       00:13:27 |       92.19% |       92.60% |       0.2880 |       0.1933 |          0.00
|       5 |         400 |       00:15:22 |       89.06% |       94.73% |       0.2278 |       0.1411 |          0.00
|       5 |         450 |       00:17:17 |       95.31% |       92.40% |       0.0891 |       0.1914 |          0.00
|       6 |         500 |       00:19:12 |       85.94% |       94.33% |       0.2939 |       0.1292 |          0.00
|       6 |         550 |       00:21:07 |       93.75% |       96.67% |       0.1119 |       0.1068 |          0.00
|       7 |         600 |       00:23:01 |       93.75% |       96.13% |       0.0934 |       0.1060 |          0.00
|       7 |         650 |       00:24:56 |       98.44% |       95.00% |       0.0597 |       0.1527 |          0.00
|       8 |         700 |       00:26:50 |       96.88% |       91.07% |       0.0723 |       0.2467 |          0.00
|       9 |         750 |       00:28:46 |       96.88% |       96.20% |       0.1108 |       0.1044 |          0.00
|       9 |         800 |       00:30:40 |       90.62% |       95.73% |       0.2083 |       0.1258 |          0.00
|      10 |         850 |       00:32:36 |      100.00% |       97.33% |       0.0235 |       0.0678 |          0.00
|      10 |         900 |       00:34:31 |       98.44% |       95.40% |       0.0731 |       0.1331 |          0.00
|      11 |         950 |       00:36:26 |       96.88% |       98.33% |       0.0428 |       0.0457 |          0.00
|      11 |        1000 |       00:38:21 |       98.44% |       97.07% |       0.0459 |       0.0746 |          0.00
|      12 |        1050 |       00:40:15 |       96.88% |       97.73% |       0.0691 |       0.0832 |          0.00
|      12 |        1100 |       00:42:10 |       93.75% |       97.87% |       0.1048 |       0.0453 |          0.00
|      13 |        1150 |       00:44:05 |      100.00% |       97.67% |       0.0117 |       0.0714 |          0.00
|      13 |        1200 |       00:45:59 |       96.88% |       97.93% |       0.0905 |       0.0462 |          0.00
|      14 |        1250 |       00:47:54 |       98.44% |       94.00% |       0.0859 |       0.1623 |          0.00
|      14 |        1300 |       00:49:48 |       98.44% |       88.00% |       0.0344 |       0.4993 |          0.00
|      15 |        1350 |       00:51:43 |      100.00% |       97.80% |       0.0207 |       0.0576 |          0.00
|      16 |        1400 |       00:53:38 |       98.44% |       97.00% |       0.0279 |       0.0793 |          0.00
|=========|=============|================|==============|==============|==============|==============|==============
Training finished: Met validation criterion.
```




```
testpreds = classify(efficientnet_6inv_pitchangle,testing_imds);
nnz(testpreds == testing_imds.Labels)/numel(testpreds)
```

```
ans = 0.9759
```

```
confusionchart(testing_imds.Labels,testpreds);
```


0-20
21-35
36-50
51-65
66-80
80-90
True Class
166
33
9
41
42
41
41
0-20
21-35
36-50
51-65
66-80
80-90
Predicted Class