

## Load the dataset ,resize it, divide it into training and validation set

```
FlowerData =imageDatastore("FLR_IMGS","IncludeSubfolders",true,"LabelSource","foldernames");

% size= 227;  % resize dimension for alexnet training 227 x 277 x 3
% for i=1:length(FlowerData.Files)
%
%     a =imread(char(FlowerData.Files(i)));
%     a=imresize(a,[size,size]);
%     imwrite(a,char(FlowerData.Files(i)));
% end

[imdsTrain, imdsValidation] = splitEachLabel(FlowerData,0.8); %
% Resize the images to match the network input layer.
augimdsTrain = augmentedImageDatastore([227 227 3],imdsTrain);
augimdsValidation = augmentedImageDatastore([227 227 3],imdsValidation);
```

## Set Training Options

Specify options to use when training.

```
opts = trainingOptions("sgdm",...
    "ExecutionEnvironment","auto",...
    "InitialLearnRate",0.001,...
    "MiniBatchSize",20,...
    "MaxEpochs",20,...
    "Shuffle","every-epoch",...
    "Plots","training-progress",...
    "ValidationData",augimdsValidation);
```

## Create Transfer Learning Layer model FlowerNet using Alexnet

```
FlowerNet = alexnet; % this will copy the layer architecture of alexnet into
                    % FlowerNet Varibale

layers = FlowerNet.Layers;
layers(end-2)=fullyConnectedLayer(30,'Name','Fully Connected '); % 30 types of flower
layers(end)=classificationLayer;
layers
```

```
layers =
    25x1 Layer array with layers:
```

1	'data'	Image Input	227x227x3 images with 'zerocenter' normalization
2	'conv1'	Convolution	96 11x11x3 convolutions with stride [4 4] and padding [0 0 0]
3	'relu1'	ReLU	ReLU
4	'norm1'	Cross Channel Normalization	cross channel normalization with 5 channels per element
5	'pool1'	Max Pooling	3x3 max pooling with stride [2 2] and padding [0 0 0]
6	'conv2'	Grouped Convolution	2 groups of 128 5x5x48 convolutions with stride [1 1] and padding [0 0 0]
7	'relu2'	ReLU	ReLU
8	'norm2'	Cross Channel Normalization	cross channel normalization with 5 channels per element
9	'pool2'	Max Pooling	3x3 max pooling with stride [2 2] and padding [0 0 0]
10	'conv3'	Convolution	384 3x3x256 convolutions with stride [1 1] and padding [0 0 0]
11	'relu3'	ReLU	ReLU
12	'conv4'	Grouped Convolution	2 groups of 192 3x3x192 convolutions with stride [1 1] and padding [0 0 0]
13	'relu4'	ReLU	ReLU

14	'conv5'	Grouped Convolution	2 groups of 128 3x3x192 convolutions with stride [1 1]
15	'relu5'	ReLU	ReLU
16	'pool5'	Max Pooling	3x3 max pooling with stride [2 2] and padding [0 0 0]
17	'fc6'	Fully Connected	4096 fully connected layer
18	'relu6'	ReLU	ReLU
19	'drop6'	Dropout	50% dropout
20	'fc7'	Fully Connected	4096 fully connected layer
21	'relu7'	ReLU	ReLU
22	'drop7'	Dropout	50% dropout
23	'Fully Connected '	Fully Connected	30 fully connected layer
24	'prob'	Softmax	softmax
25	''	Classification Output	crossentropyex

## Train Network

Train the network using the specified options and training data.

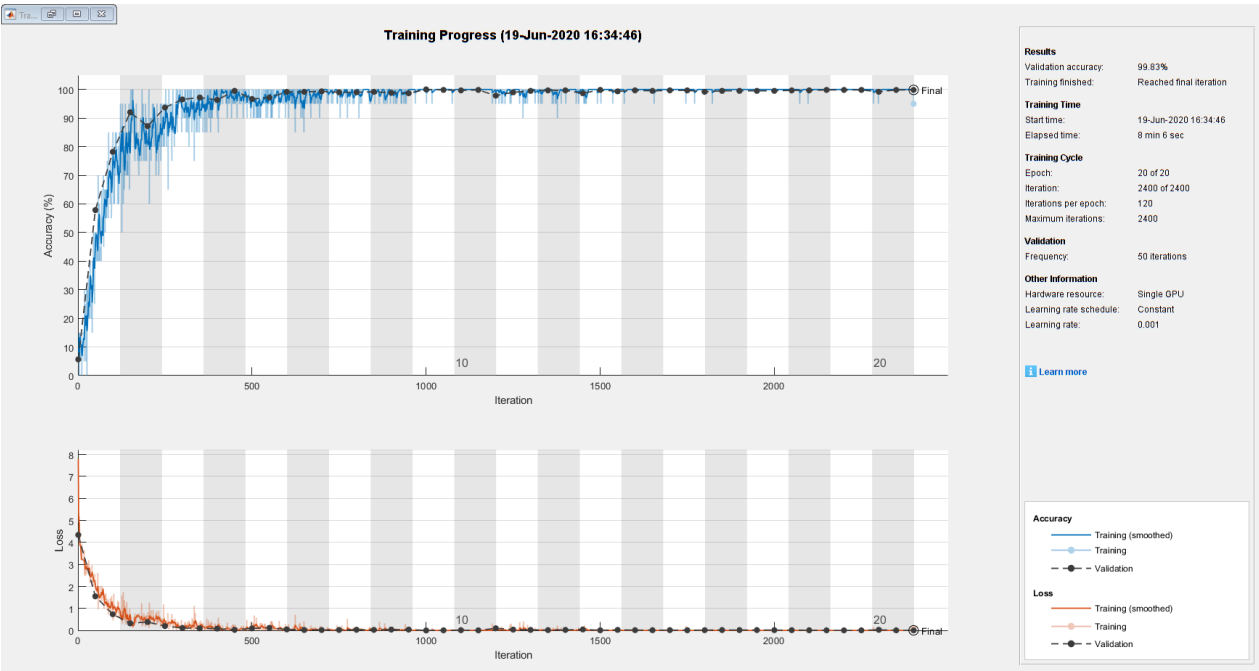
```
[FlowerNet, traininfo] = trainNetwork(augimdsTrain, layers, opts);
```

Training on single GPU.

Initializing input data normalization.

Epoch	Iteration	Time Elapsed (hh:mm:ss)	Mini-batch Accuracy	Validation Accuracy	Mini-batch Loss	Validation Loss	Base Learning Rate
1	1	00:00:02	5.00%	5.67%	7.7968	4.3407	0.001
1	50	00:00:12	45.00%	57.83%	2.0008	1.5510	0.001
1	100	00:00:21	85.00%	78.17%	0.8258	0.7365	0.001
2	150	00:00:31	85.00%	92.00%	0.6224	0.3251	0.001
2	200	00:00:41	80.00%	87.17%	0.5149	0.3850	0.001
3	250	00:00:51	90.00%	93.67%	0.4237	0.1984	0.001
3	300	00:01:01	100.00%	96.50%	0.0884	0.1139	0.001
3	350	00:01:11	100.00%	97.17%	0.0468	0.0960	0.001
4	400	00:01:21	90.00%	96.33%	0.1126	0.0852	0.001
4	450	00:01:31	95.00%	99.50%	0.0847	0.0269	0.001
5	500	00:01:41	100.00%	96.67%	0.0531	0.0953	0.001
5	550	00:01:51	95.00%	97.17%	0.1916	0.1187	0.001
5	600	00:02:01	100.00%	99.17%	0.0028	0.0480	0.001
6	650	00:02:11	95.00%	99.17%	0.1531	0.0219	0.001
6	700	00:02:21	100.00%	99.33%	0.0048	0.0202	0.001
7	750	00:02:31	100.00%	99.00%	0.0224	0.0239	0.001
7	800	00:02:40	100.00%	99.00%	0.0162	0.0321	0.001
8	850	00:02:50	100.00%	99.17%	0.0216	0.0267	0.001
8	900	00:03:00	100.00%	98.83%	0.0160	0.0395	0.001
8	950	00:03:11	100.00%	98.67%	0.0029	0.0405	0.001
9	1000	00:03:21	100.00%	100.00%	4.2282e-05	0.0026	0.001
9	1050	00:03:31	100.00%	99.83%	0.0001	0.0074	0.001
10	1100	00:03:41	100.00%	99.67%	0.0009	0.0133	0.001
10	1150	00:03:51	100.00%	99.83%	0.0005	0.0053	0.001
10	1200	00:04:01	95.00%	97.83%	0.0730	0.0990	0.001
11	1250	00:04:11	100.00%	99.00%	0.0011	0.0389	0.001
11	1300	00:04:21	100.00%	99.50%	0.0083	0.0262	0.001
12	1350	00:04:31	100.00%	99.67%	0.0004	0.0175	0.001
12	1400	00:04:41	100.00%	99.67%	0.0029	0.0248	0.001
13	1450	00:04:51	100.00%	98.67%	0.0001	0.0463	0.001
13	1500	00:05:01	100.00%	99.83%	0.0047	0.0070	0.001
13	1550	00:05:11	100.00%	99.33%	0.0001	0.0274	0.001
14	1600	00:05:23	100.00%	99.67%	0.0007	0.0145	0.001
14	1650	00:05:33	100.00%	99.50%	9.2627e-05	0.0137	0.001
15	1700	00:05:43	100.00%	99.67%	0.0002	0.0157	0.001
15	1750	00:05:54	100.00%	99.67%	0.0002	0.0119	0.001
15	1800	00:06:04	100.00%	99.17%	0.0075	0.0141	0.001

16	1850	00:06:14	100.00%	99.50%	0.0005	0.0197	0.00
16	1900	00:06:24	100.00%	99.50%	1.9082e-05	0.0170	0.00
17	1950	00:06:34	100.00%	99.50%	0.0002	0.0182	0.00
17	2000	00:06:44	100.00%	99.50%	0.0030	0.0154	0.00
18	2050	00:06:53	100.00%	99.67%	3.8897e-05	0.0138	0.00
18	2100	00:07:04	100.00%	99.67%	0.0001	0.0103	0.00
18	2150	00:07:14	100.00%	99.83%	4.6612e-06	0.0075	0.00
19	2200	00:07:24	100.00%	99.83%	2.5499e-05	0.0064	0.00
19	2250	00:07:34	100.00%	99.83%	6.7519e-05	0.0073	0.00
20	2300	00:07:44	100.00%	99.17%	8.0120e-05	0.0296	0.00
20	2350	00:07:54	100.00%	99.83%	0.0003	0.0078	0.00
20	2400	00:08:04	95.00%	99.83%	0.1026	0.0058	0.00



save FlowerNet