options =

[**TrainingOptionsSGDM**](matlab:helpPopup%20nnet.cnn.TrainingOptionsSGDM) with properties:

Momentum: 0.1000

InitialLearnRate: 1.0000e-03

LearnRateSchedule: 'none'

LearnRateDropFactor: 0.1000

LearnRateDropPeriod: 5

L2Regularization: 1.0000e-04

GradientThresholdMethod: 'l2norm'

GradientThreshold: Inf

MaxEpochs: 6

MiniBatchSize: 4

Verbose: 1

VerboseFrequency: 50

ValidationData: [1×1 augmentedImageDatastore]

ValidationFrequency: 4000

ValidationPatience: Inf

Shuffle: 'every-epoch'

CheckpointPath: ''

ExecutionEnvironment: 'gpu'

WorkerLoad: []

OutputFcn: []

Plots: 'training-progress'

SequenceLength: 'longest'

SequencePaddingValue: 0

SequencePaddingDirection: 'right'

DispatchInBackground: 0

ResetInputNormalization: 1

Initializing input data normalization.

|======================================================================================================================|

| Epoch | Iteration | Time Elapsed | Mini-batch | Validation | Mini-batch | Validation | Base Learning |

| | | (hh:mm:ss) | Accuracy | Accuracy | Loss | Loss | Rate |

|======================================================================================================================|

| 1 | 1 | 00:00:49 | 0.00% | 1.14% | 4.3510 | 4.1731 | 0.0010 |

| 1 | 50 | 00:01:01 | 0.00% | | 3.5566 | | 0.0010 |

| 1 | 100 | 00:01:09 | 0.00% | | 3.5077 | | 0.0010 |

| 1 | 150 | 00:01:22 | 25.00% | | 3.9794 | | 0.0010 |

| 1 | 200 | 00:01:34 | 0.00% | | 3.6746 | | 0.0010 |

| 1 | 250 | 00:01:42 | 25.00% | | 3.5194 | | 0.0010 |

| 1 | 300 | 00:01:53 | 0.00% | | 4.4785 | | 0.0010 |

| 1 | 350 | 00:02:06 | 25.00% | | 3.3374 | | 0.0010 |

| 1 | 400 | 00:02:15 | 25.00% | | 2.6631 | | 0.0010 |

| 1 | 450 | 00:02:25 | 25.00% | | 3.8957 | | 0.0010 |

| 1 | 500 | 00:02:38 | 0.00% | | 3.4210 | | 0.0010 |

| 1 | 550 | 00:02:47 | 0.00% | | 3.9051 | | 0.0010 |

| 1 | 600 | 00:02:58 | 0.00% | | 3.6442 | | 0.0010 |

| 1 | 650 | 00:03:11 | 0.00% | | 3.9558 | | 0.0010 |

| 1 | 700 | 00:03:20 | 0.00% | | 3.7039 | | 0.0010 |

| 1 | 750 | 00:03:30 | 25.00% | | 2.8729 | | 0.0010 |

| 1 | 800 | 00:03:43 | 0.00% | | 3.7392 | | 0.0010 |

| 1 | 850 | 00:03:51 | 0.00% | | 3.5662 | | 0.0010 |

| 1 | 900 | 00:04:03 | 0.00% | | 4.0979 | | 0.0010 |

| 1 | 950 | 00:04:16 | 50.00% | | 2.8181 | | 0.0010 |

| 1 | 1000 | 00:04:25 | 0.00% | | 3.1410 | | 0.0010 |

| 1 | 1050 | 00:04:36 | 25.00% | | 2.9533 | | 0.0010 |

| 1 | 1100 | 00:04:49 | 25.00% | | 3.6263 | | 0.0010 |

| 1 | 1150 | 00:04:59 | 0.00% | | 3.9326 | | 0.0010 |

| 1 | 1200 | 00:05:09 | 50.00% | | 2.5241 | | 0.0010 |

| 1 | 1250 | 00:05:22 | 25.00% | | 2.8692 | | 0.0010 |

| 1 | 1300 | 00:05:31 | 25.00% | | 3.3961 | | 0.0010 |

| 1 | 1350 | 00:05:42 | 0.00% | | 4.1340 | | 0.0010 |

| 1 | 1400 | 00:05:55 | 0.00% | | 3.7523 | | 0.0010 |

| 1 | 1450 | 00:06:05 | 25.00% | | 3.3018 | | 0.0010 |

| 1 | 1500 | 00:06:14 | 50.00% | | 2.9834 | | 0.0010 |

| 2 | 1550 | 00:06:27 | 0.00% | | 4.3817 | | 0.0010 |

| 2 | 1600 | 00:06:37 | 50.00% | | 2.8009 | | 0.0010 |

| 2 | 1650 | 00:06:47 | 50.00% | | 3.0456 | | 0.0010 |

| 2 | 1700 | 00:07:00 | 25.00% | | 3.8678 | | 0.0010 |

| 2 | 1750 | 00:07:11 | 0.00% | | 3.6788 | | 0.0010 |

| 2 | 1800 | 00:07:20 | 0.00% | | 3.4730 | | 0.0010 |

| 2 | 1850 | 00:07:33 | 25.00% | | 3.7265 | | 0.0010 |

| 2 | 1900 | 00:07:43 | 25.00% | | 2.4632 | | 0.0010 |

| 2 | 1950 | 00:07:53 | 25.00% | | 3.6049 | | 0.0010 |

| 2 | 2000 | 00:08:06 | 25.00% | | 2.4455 | | 0.0010 |

| 2 | 2050 | 00:08:15 | 0.00% | | 4.1849 | | 0.0010 |

| 2 | 2100 | 00:08:27 | 25.00% | | 2.5009 | | 0.0010 |

| 2 | 2150 | 00:08:40 | 0.00% | | 4.2448 | | 0.0010 |

| 2 | 2200 | 00:08:49 | 0.00% | | 3.4565 | | 0.0010 |

| 2 | 2250 | 00:09:00 | 25.00% | | 3.4008 | | 0.0010 |

| 2 | 2300 | 00:09:13 | 25.00% | | 4.1368 | | 0.0010 |

| 2 | 2350 | 00:09:23 | 0.00% | | 4.0144 | | 0.0010 |

| 2 | 2400 | 00:09:33 | 0.00% | | 3.1353 | | 0.0010 |

| 2 | 2450 | 00:09:46 | 25.00% | | 3.1558 | | 0.0010 |

| 2 | 2500 | 00:09:55 | 50.00% | | 3.3090 | | 0.0010 |

| 2 | 2550 | 00:10:07 | 0.00% | | 4.4578 | | 0.0010 |

| 2 | 2600 | 00:10:20 | 25.00% | | 3.4184 | | 0.0010 |

| 2 | 2650 | 00:10:29 | 75.00% | | 2.4912 | | 0.0010 |

| 2 | 2700 | 00:10:40 | 25.00% | | 2.5310 | | 0.0010 |

| 2 | 2750 | 00:10:53 | 25.00% | | 2.9235 | | 0.0010 |

| 2 | 2800 | 00:11:01 | 25.00% | | 3.1416 | | 0.0010 |

| 2 | 2850 | 00:11:14 | 0.00% | | 2.9178 | | 0.0010 |

| 2 | 2900 | 00:11:26 | 0.00% | | 2.8632 | | 0.0010 |

| 2 | 2950 | 00:11:34 | 25.00% | | 3.1046 | | 0.0010 |

| 2 | 3000 | 00:11:47 | 25.00% | | 2.6434 | | 0.0010 |

| 2 | 3050 | 00:11:59 | 0.00% | | 4.0900 | | 0.0010 |

| 3 | 3100 | 00:12:07 | 0.00% | | 4.6716 | | 0.0010 |

| 3 | 3150 | 00:12:20 | 0.00% | | 2.5399 | | 0.0010 |

| 3 | 3200 | 00:12:32 | 0.00% | | 4.3663 | | 0.0010 |

| 3 | 3250 | 00:12:41 | 0.00% | | 3.4893 | | 0.0010 |

| 3 | 3300 | 00:12:53 | 25.00% | | 3.8395 | | 0.0010 |

| 3 | 3350 | 00:13:05 | 0.00% | | 3.5180 | | 0.0010 |

| 3 | 3400 | 00:13:14 | 0.00% | | 3.3199 | | 0.0010 |

| 3 | 3450 | 00:13:27 | 0.00% | | 3.9187 | | 0.0010 |

| 3 | 3500 | 00:13:37 | 25.00% | | 3.5384 | | 0.0010 |

| 3 | 3550 | 00:13:47 | 25.00% | | 3.2714 | | 0.0010 |

| 3 | 3600 | 00:14:01 | 0.00% | | 3.2510 | | 0.0010 |

| 3 | 3650 | 00:14:11 | 25.00% | | 3.2496 | | 0.0010 |

| 3 | 3700 | 00:14:21 | 50.00% | | 2.9133 | | 0.0010 |

| 3 | 3750 | 00:14:34 | 0.00% | | 3.9104 | | 0.0010 |

| 3 | 3800 | 00:14:43 | 25.00% | | 2.3610 | | 0.0010 |

| 3 | 3850 | 00:14:54 | 50.00% | | 2.1258 | | 0.0010 |

| 3 | 3900 | 00:15:07 | 25.00% | | 2.7995 | | 0.0010 |

| 3 | 3950 | 00:15:16 | 0.00% | | 2.9616 | | 0.0010 |

| 3 | 4000 | 00:16:12 | 25.00% | 20.34% | 3.5337 | 3.0746 | 0.0010 |

| 3 | 4050 | 00:16:25 | 0.00% | | 2.9606 | | 0.0010 |

| 3 | 4100 | 00:16:38 | 0.00% | | 3.3005 | | 0.0010 |

| 3 | 4150 | 00:16:47 | 0.00% | | 2.6579 | | 0.0010 |

| 3 | 4200 | 00:17:00 | 0.00% | | 3.5353 | | 0.0010 |

| 3 | 4250 | 00:17:12 | 0.00% | | 4.3976 | | 0.0010 |

| 3 | 4300 | 00:17:21 | 50.00% | | 2.2157 | | 0.0010 |

| 3 | 4350 | 00:17:33 | 0.00% | | 2.3677 | | 0.0010 |

| 3 | 4400 | 00:17:44 | 75.00% | | 2.5556 | | 0.0010 |

| 3 | 4450 | 00:17:54 | 50.00% | | 3.0952 | | 0.0010 |

| 3 | 4500 | 00:18:08 | 50.00% | | 2.4407 | | 0.0010 |

| 3 | 4550 | 00:18:19 | 0.00% | | 3.3672 | | 0.0010 |

| 3 | 4600 | 00:18:28 | 25.00% | | 2.8641 | | 0.0010 |

| 4 | 4650 | 00:18:42 | 25.00% | | 3.1111 | | 0.0010 |

| 4 | 4700 | 00:18:53 | 0.00% | | 2.9598 | | 0.0010 |

| 4 | 4750 | 00:19:01 | 0.00% | | 3.1385 | | 0.0010 |

| 4 | 4800 | 00:19:14 | 75.00% | | 1.5996 | | 0.0010 |

| 4 | 4850 | 00:19:27 | 25.00% | | 3.9754 | | 0.0010 |

| 4 | 4900 | 00:19:36 | 0.00% | | 3.8158 | | 0.0010 |

| 4 | 4950 | 00:19:48 | 25.00% | | 4.2724 | | 0.0010 |

| 4 | 5000 | 00:20:02 | 25.00% | | 3.2955 | | 0.0010 |

| 4 | 5050 | 00:20:10 | 50.00% | | 2.1744 | | 0.0010 |

| 4 | 5100 | 00:20:21 | 25.00% | | 2.6708 | | 0.0010 |

| 4 | 5150 | 00:20:35 | 25.00% | | 2.0471 | | 0.0010 |

| 4 | 5200 | 00:20:44 | 25.00% | | 2.9904 | | 0.0010 |

| 4 | 5250 | 00:20:55 | 25.00% | | 4.0096 | | 0.0010 |

| 4 | 5300 | 00:21:08 | 25.00% | | 2.4152 | | 0.0010 |

| 4 | 5350 | 00:21:19 | 0.00% | | 3.5694 | | 0.0010 |

| 4 | 5400 | 00:21:29 | 0.00% | | 2.3344 | | 0.0010 |

| 4 | 5450 | 00:21:42 | 25.00% | | 3.5086 | | 0.0010 |

| 4 | 5500 | 00:21:54 | 0.00% | | 3.2801 | | 0.0010 |

| 4 | 5550 | 00:22:02 | 25.00% | | 2.2489 | | 0.0010 |

| 4 | 5600 | 00:22:15 | 25.00% | | 3.7534 | | 0.0010 |

| 4 | 5650 | 00:22:29 | 25.00% | | 2.3930 | | 0.0010 |

| 4 | 5700 | 00:22:38 | 0.00% | | 2.3726 | | 0.0010 |

| 4 | 5750 | 00:22:49 | 25.00% | | 2.8514 | | 0.0010 |

| 4 | 5800 | 00:23:03 | 0.00% | | 2.9965 | | 0.0010 |

| 4 | 5850 | 00:23:12 | 0.00% | | 3.3701 | | 0.0010 |

| 4 | 5900 | 00:23:23 | 25.00% | | 3.2457 | | 0.0010 |

| 4 | 5950 | 00:23:36 | 25.00% | | 3.0552 | | 0.0010 |

| 4 | 6000 | 00:23:49 | 50.00% | | 1.9853 | | 0.0010 |

| 4 | 6050 | 00:23:58 | 25.00% | | 3.9650 | | 0.0010 |

| 4 | 6100 | 00:24:10 | 25.00% | | 3.4924 | | 0.0010 |

| 5 | 6150 | 00:24:24 | 75.00% | | 2.2372 | | 0.0010 |

| 5 | 6200 | 00:24:32 | 25.00% | | 2.7427 | | 0.0010 |

| 5 | 6250 | 00:24:44 | 25.00% | | 3.0250 | | 0.0010 |

| 5 | 6300 | 00:24:57 | 0.00% | | 3.3773 | | 0.0010 |

| 5 | 6350 | 00:25:07 | 25.00% | | 2.6228 | | 0.0010 |

| 5 | 6400 | 00:25:18 | 75.00% | | 1.5611 | | 0.0010 |

| 5 | 6450 | 00:25:31 | 50.00% | | 2.5263 | | 0.0010 |

| 5 | 6500 | 00:25:42 | 0.00% | | 3.3829 | | 0.0010 |

| 5 | 6550 | 00:25:52 | 25.00% | | 2.7307 | | 0.0010 |

| 5 | 6600 | 00:26:05 | 0.00% | | 3.0362 | | 0.0010 |

| 5 | 6650 | 00:26:16 | 0.00% | | 2.2506 | | 0.0010 |

| 5 | 6700 | 00:26:26 | 25.00% | | 3.2624 | | 0.0010 |

| 5 | 6750 | 00:26:39 | 25.00% | | 2.9997 | | 0.0010 |

| 5 | 6800 | 00:26:52 | 50.00% | | 2.6723 | | 0.0010 |

| 5 | 6850 | 00:27:01 | 0.00% | | 3.8387 | | 0.0010 |

| 5 | 6900 | 00:27:13 | 50.00% | | 2.1605 | | 0.0010 |

| 5 | 6950 | 00:27:26 | 0.00% | | 4.5408 | | 0.0010 |

| 5 | 7000 | 00:27:35 | 25.00% | | 3.1805 | | 0.0010 |

| 5 | 7050 | 00:27:48 | 50.00% | | 2.6658 | | 0.0010 |

| 5 | 7100 | 00:28:02 | 0.00% | | 3.2876 | | 0.0010 |

| 5 | 7150 | 00:28:11 | 0.00% | | 3.0002 | | 0.0010 |

| 5 | 7200 | 00:28:22 | 25.00% | | 2.9534 | | 0.0010 |

| 5 | 7250 | 00:28:36 | 0.00% | | 3.8112 | | 0.0010 |

| 5 | 7300 | 00:28:47 | 50.00% | | 2.1126 | | 0.0010 |

| 5 | 7350 | 00:28:56 | 0.00% | | 3.1499 | | 0.0010 |

| 5 | 7400 | 00:29:10 | 25.00% | | 3.3746 | | 0.0010 |

| 5 | 7450 | 00:29:19 | 25.00% | | 2.8593 | | 0.0010 |

| 5 | 7500 | 00:29:30 | 25.00% | | 3.3957 | | 0.0010 |

| 5 | 7550 | 00:29:44 | 0.00% | | 2.3530 | | 0.0010 |

| 5 | 7600 | 00:29:56 | 25.00% | | 2.6780 | | 0.0010 |

| 5 | 7650 | 00:30:04 | 0.00% | | 3.0567 | | 0.0010 |

| 6 | 7700 | 00:30:17 | 0.00% | | 3.7251 | | 0.0010 |

| 6 | 7750 | 00:30:30 | 0.00% | | 3.5635 | | 0.0010 |

| 6 | 7800 | 00:30:38 | 25.00% | | 3.4004 | | 0.0010 |

| 6 | 7850 | 00:30:51 | 50.00% | | 2.3384 | | 0.0010 |

| 6 | 7900 | 00:31:03 | 0.00% | | 2.9298 | | 0.0010 |

| 6 | 7950 | 00:31:12 | 25.00% | | 2.8357 | | 0.0010 |

| 6 | 8000 | 00:32:10 | 0.00% | 23.31% | 4.1935 | 2.8456 | 0.0010 |

| 6 | 8050 | 00:32:24 | 25.00% | | 2.4017 | | 0.0010 |

| 6 | 8100 | 00:32:35 | 50.00% | | 2.1173 | | 0.0010 |

| 6 | 8150 | 00:32:45 | 25.00% | | 2.2298 | | 0.0010 |

| 6 | 8200 | 00:32:58 | 25.00% | | 2.3849 | | 0.0010 |

| 6 | 8250 | 00:33:08 | 0.00% | | 3.7347 | | 0.0010 |

| 6 | 8300 | 00:33:18 | 25.00% | | 3.6252 | | 0.0010 |

| 6 | 8350 | 00:33:32 | 0.00% | | 3.2309 | | 0.0010 |

| 6 | 8400 | 00:33:46 | 50.00% | | 1.8007 | | 0.0010 |

| 6 | 8450 | 00:33:57 | 25.00% | | 1.9002 | | 0.0010 |

| 6 | 8500 | 00:34:10 | 25.00% | | 2.3052 | | 0.0010 |

| 6 | 8550 | 00:34:24 | 0.00% | | 3.5101 | | 0.0010 |

| 6 | 8600 | 00:34:38 | 50.00% | | 2.4001 | | 0.0010 |

| 6 | 8650 | 00:34:52 | 25.00% | | 3.0635 | | 0.0010 |

| 6 | 8700 | 00:35:06 | 75.00% | | 1.3134 | | 0.0010 |

| 6 | 8750 | 00:35:17 | 0.00% | | 3.7418 | | 0.0010 |

| 6 | 8800 | 00:35:30 | 0.00% | | 3.7257 | | 0.0010 |

| 6 | 8850 | 00:35:44 | 0.00% | | 2.8643 | | 0.0010 |

| 6 | 8900 | 00:35:58 | 25.00% | | 2.1374 | | 0.0010 |

| 6 | 8950 | 00:36:12 | 25.00% | | 2.5675 | | 0.0010 |

| 6 | 9000 | 00:36:26 | 0.00% | | 3.1501 | | 0.0010 |

| 6 | 9050 | 00:36:40 | 0.00% | | 3.3006 | | 0.0010 |

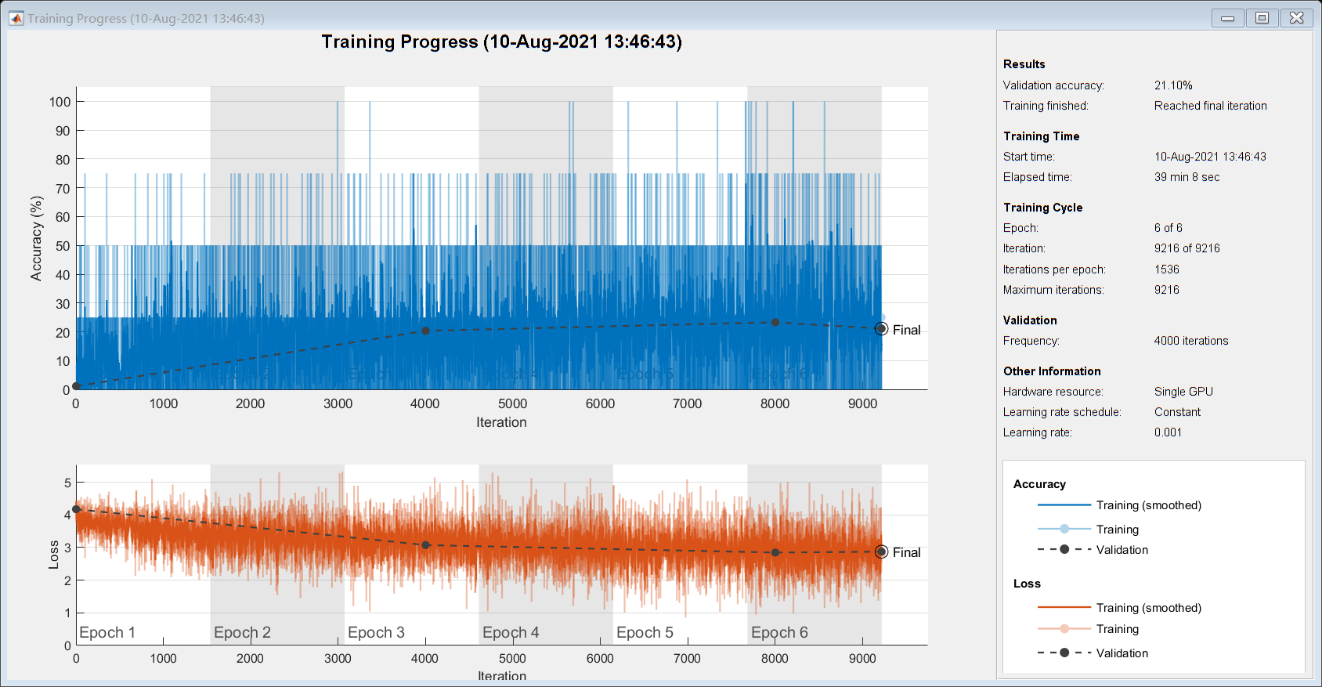
| 6 | 9100 | 00:36:54 | 25.00% | | 2.4199 | | 0.0010 |

| 6 | 9150 | 00:37:08 | 0.00% | | 3.7928 | | 0.0010 |

| 6 | 9200 | 00:37:22 | 50.00% | | 3.1451 | | 0.0010 |

| 6 | 9216 | 00:38:19 | 25.00% | 21.10% | 2.7900 | 2.8724 | 0.0010 |

|======================================================================================================================|



net =

[**DAGNetwork**](matlab:helpPopup%20DAGNetwork) with properties:

Layers: [144×1 nnet.cnn.layer.Layer]

Connections: [170×2 table]

InputNames: {'data'}

OutputNames: {'output'}

traininfo = struct with fields:

TrainingLoss: [1×9216 double]

TrainingAccuracy: [1×9216 double]

ValidationLoss: [1×9216 double]

ValidationAccuracy: [1×9216 double]

BaseLearnRate: [1×9216 double]

FinalValidationLoss: 2.8724

FinalValidationAccuracy: 21.1027

Error using [**nnet.internal.cnn.util.validateLayersForLayerGraph>iAssertUniqueAndNonEmptyLayerNames**](matlab:matlab.internal.language.introspective.errorDocCallback('nnet.internal.cnn.util.validateLayersForLayerGraph%3eiAssertUniqueAndNonEmptyLayerNames',%20'C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+internal\+cnn\+util\validateLayersForLayerGraph.m',%2056)) ([line 56](matlab:%20opentoline('C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+internal\+cnn\+util\validateLayersForLayerGraph.m',56,0)))  
Layer names in layer array must be different from the names of layers in layer graph.

Error in [**nnet.internal.cnn.util.validateLayersForLayerGraph**](matlab:matlab.internal.language.introspective.errorDocCallback('nnet.internal.cnn.util.validateLayersForLayerGraph',%20'C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+internal\+cnn\+util\validateLayersForLayerGraph.m',%2033)) ([line 33](matlab:%20opentoline('C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+internal\+cnn\+util\validateLayersForLayerGraph.m',33,0)))  
iAssertUniqueAndNonEmptyLayerNames(larray, existingLayers);  
  
Error in [**nnet.cnn.LayerGraph>iValidateLayers**](matlab:matlab.internal.language.introspective.errorDocCallback('nnet.cnn.LayerGraph%3eiValidateLayers',%20'C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+cnn\LayerGraph.m',%20556)) ([line 556](matlab:%20opentoline('C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+cnn\LayerGraph.m',556,0)))  
larray = nnet.internal.cnn.util.validateLayersForLayerGraph(larray, existingLayers);  
  
Error in [**nnet.cnn.LayerGraph/addLayers**](matlab:matlab.internal.language.introspective.errorDocCallback('nnet.cnn.LayerGraph/addLayers',%20'C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+cnn\LayerGraph.m',%20190)) ([line 190](matlab:%20opentoline('C:\Program%20Files\Polyspace\R2020a\toolbox\nnet\cnn\+nnet\+cnn\LayerGraph.m',190,0)))  
larray = iValidateLayers(larray, existingLayers);