Train Sensor Fusion Network
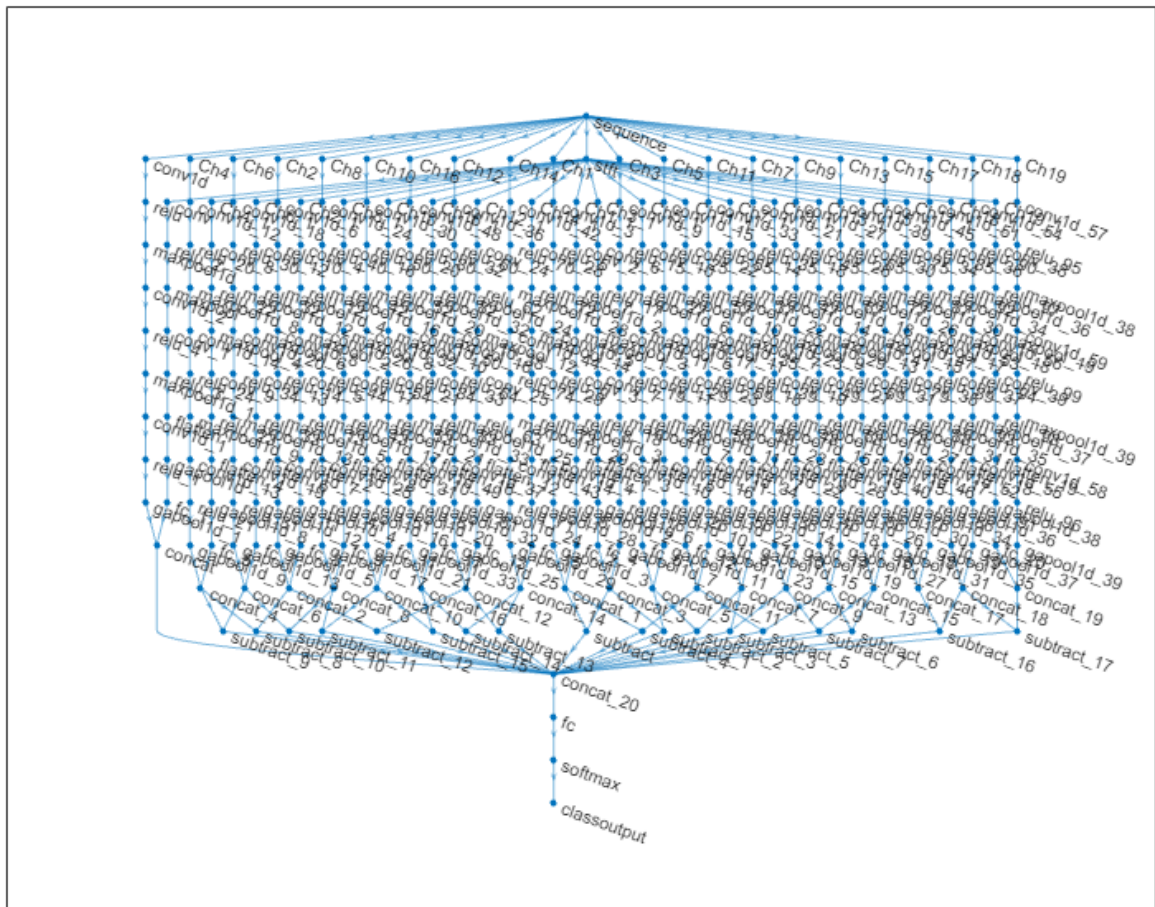
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Live script used to train sensor fusion network

```
load("SFnet.mat","Y_Train","X_Test");
```

Visualize Sensor Fusion Double Banana layers

```
load("SFnet.mat","lgraph_2")
f = figure;
f.Position(4) = f.Position (4) *2;
f.Position(3) = f.Position (3) *2;
plot(lgraph_2)
```


Train Network

Only need to do once

```matlab
% gpuDevice(1);
% reset(Y_Train);
% reset(X_Test);
% miniBatchSize=24;
% Y_Train.MiniBatchSize=miniBatchSize;
% X_Test.MiniBatchSize=miniBatchSize;
% opts=trainingOptions("adam","Plots","training-
progress","ExecutionEnvironment","gpu", ...
% "Shuffle","every-epoch","MiniBatchSize",miniBatchSize,"MaxEpochs",30*3,...
%
"InitialLearnRate",3e-4,"LearnRateSchedule","piecewise","LearnRateDropPeriod",30,...
"L2Regularization",.001,...
% "OutputNetwork","best-validation-
loss","ValidationData",X_Test,"ValidationFrequency",100);
% bnet=trainNetwork(Y_Train,lgraph_2,opts);
```

Epoch	Iteration	Time Elapsed (hh:mm:ss)	Mini-batch Accuracy	Validation Accuracy	Mini-batch Loss	Validation Loss	Base Learning Rate
1	1	00:01:36	29.17%	33.45%	15.0494	145.0047	0.00
1	50	00:08:18	37.50%		4.1385		0.00
1	100	00:16:15	45.83%	45.60%	2.2992	2.0721	0.00
1	150	00:19:20	33.33%		2.3187		0.00
1	200	00:24:13	50.00%	46.64%	2.0761	2.6010	0.00
1	250	00:27:54	41.67%		1.2485		0.00
1	300	00:41:26	70.83%	53.36%	0.7728	1.2220	0.00
2	350	00:48:11	62.50%		1.3491		0.00
2	400	00:55:51	54.17%	54.98%	1.0014	1.1624	0.00
2	450	00:59:12	54.17%		0.8025		0.00
2	500	01:03:56	79.17%	56.13%	0.9126	1.0525	0.00
2	550	01:07:00	50.00%		1.0657		0.00
2	600	01:11:20	29.17%	58.62%	1.2741	0.9780	0.00
3	650	01:14:10	70.83%		0.6247		0.00
3	700	01:18:18	62.50%	58.56%	0.8001	0.9727	0.00
3	750	01:21:07	70.83%		0.7278		0.00
3	800	01:25:12	41.67%	55.03%	1.4583	1.0206	0.00
3	850	01:27:59	45.83%		0.8822		0.00
3	900	01:32:05	54.17%	59.20%	0.9292	0.9895	0.00
4	950	01:34:49	62.50%		0.7898		0.00
4	1000	01:38:55	62.50%	58.10%	0.7584	0.9892	0.00
4	1050	01:41:39	79.17%		0.6270		0.00
4	1100	01:45:45	54.17%	59.09%	0.9021	0.9611	0.00
4	1150	01:49:37	70.83%		0.6439		0.00
4	1200	01:56:15	79.17%	58.91%	0.6009	0.9240	0.00
5	1250	02:09:45	66.67%		0.8336		0.00
5	1300	02:19:24	70.83%	62.15%	0.6389	0.9105	0.00
5	1350	02:31:25	79.17%		0.5937		0.00
5	1400	03:02:11	62.50%	58.22%	0.7513	0.9412	0.00
5	1450	03:05:14	66.67%		0.7749		0.00
5	1500	03:10:24	58.33%	57.70%	1.0417	1.0001	0.00
6	1550	03:16:20	50.00%		0.8347		0.00
6	1600	03:23:13	58.33%	61.23%	0.8994	0.9031	0.00
6	1650	03:26:58	66.67%		0.8084		0.00
6	1700	03:33:25	50.00%	60.36%	0.8234	0.9894	0.00
6	1750	03:37:59	66.67%		0.6833		0.00
6	1800	03:44:37	58.33%	55.67%	0.8521	1.1076	0.00
6	1850	03:58:09	62.50%		0.8608		0.00
7	1900	04:03:31	70.83%	60.59%	0.7331	0.9788	0.00

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7	1950	04:06:15	37.50%		1.2106		0.00
7	2000	04:10:16	66.67%	61.05%	0.6500	0.9726	0.00
7	2050	04:13:00	45.83%		0.9096		0.00
7	2100	04:17:06	79.17%	60.07%	0.6418	0.9677	0.00
7	2150	04:19:50	79.17%		0.6430		0.00
8	2200	04:23:50	75.00%	60.19%	0.6372	1.0027	0.00
8	2250	04:26:34	70.83%		0.6349		0.00
8	2300	04:30:41	79.17%	61.69%	0.5670	0.9561	0.00
8	2350	04:33:23	66.67%		0.7452		0.00
8	2400	04:37:29	70.83%	63.25%	0.7619	0.9376	0.00
8	2450	04:40:13	58.33%		0.7042		0.00
9	2500	04:44:17	54.17%	61.40%	0.8604	0.9897	0.00
9	2550	04:47:01	70.83%		0.6398		0.00
9	2600	04:51:02	70.83%	60.13%	0.6056	0.9514	0.00
9	2650	04:53:45	70.83%		0.6839		0.00
9	2700	04:57:49	75.00%	63.95%	0.7252	0.9745	0.00
9	2750	05:00:34	70.83%		0.6545		0.00
10	2800	05:04:39	58.33%	63.66%	0.7407	0.9726	0.00
10	2850	05:07:23	54.17%		0.9189		0.00
10	2900	05:11:27	79.17%	62.85%	0.5769	0.9870	0.00
10	2950	05:14:11	66.67%		0.6697		0.00
10	3000	05:18:17	62.50%	62.21%	0.7090	0.9453	0.00
10	3050	05:21:00	62.50%		0.7790		0.00
11	3100	05:25:05	62.50%	62.04%	0.5974	1.0288	0.00
11	3150	05:27:48	79.17%		0.6001		0.00
11	3200	05:31:53	62.50%	62.79%	0.7672	1.0024	0.00
11	3250	05:34:36	79.17%		0.5257		0.00
11	3300	05:38:41	75.00%	61.52%	0.7370	0.9865	0.00
11	3350	05:41:26	79.17%		0.5860		0.00
12	3400	05:45:32	70.83%	64.35%	0.5817	0.9214	0.00
12	3450	05:48:14	66.67%		0.6960		0.00
12	3500	05:52:19	70.83%	62.33%	0.6806	1.0126	0.00
12	3550	05:55:03	58.33%		0.8609		0.00
12	3600	05:59:08	75.00%	64.00%	0.7222	0.9300	0.00
12	3650	06:01:52	66.67%		0.6972		0.00
12	3700	06:05:54	75.00%	63.66%	0.7107	0.9716	0.00
13	3750	06:08:38	83.33%		0.6133		0.00
13	3800	06:12:40	91.67%	65.10%	0.3900	0.9788	0.00
13	3850	06:15:23	83.33%		0.4082		0.00
13	3900	06:19:28	62.50%	63.31%	0.8171	0.9651	0.00
13	3950	06:22:11	54.17%		0.7239		0.00
13	4000	06:26:15	83.33%	59.26%	0.5004	1.1425	0.00
14	4050	06:29:00	75.00%		0.6211		0.00
14	4100	06:33:06	66.67%	59.09%	0.6297	0.9812	0.00
14	4150	06:35:49	79.17%		0.5681		0.00
14	4200	06:39:54	75.00%	64.29%	0.4528	0.9293	0.00
14	4250	06:42:37	58.33%		0.9057		0.00
14	4300	06:46:43	66.67%	62.96%	0.9041	1.0237	0.00
15	4350	06:49:27	66.67%		0.8422		0.00
15	4400	06:53:31	70.83%	64.35%	0.6118	1.1140	0.00
15	4450	06:56:15	83.33%		0.5584		0.00
15	4500	07:00:19	79.17%	62.44%	0.4883	0.9911	0.00
15	4550	07:03:02	62.50%		0.7429		0.00
15	4600	07:07:07	75.00%	64.47%	0.5706	1.1027	0.00
16	4650	07:09:53	66.67%		0.7039		0.00
16	4700	07:13:56	87.50%	63.25%	0.3691	1.0038	0.00
16	4750	07:16:40	75.00%		0.6137		0.00
16	4800	07:20:44	75.00%	64.53%	0.6317	0.9519	0.00
16	4850	07:23:28	79.17%		0.6047		0.00
16	4900	07:27:31	75.00%	63.77%	0.6798	1.0251	0.00
17	4950	07:30:15	87.50%		0.4473		0.00
17	5000	07:34:20	54.17%	63.08%	1.1527	1.0629	0.00
17	5050	07:37:02	62.50%		0.8714		0.00
17	5100	07:41:08	58.33%	65.74%	0.8475	0.9730	0.00

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17	5150	07:43:52	62.50%		0.8335		0.00
17	5200	07:47:57	79.17%	66.44%	0.5717	0.9922	0.00
17	5250	07:50:39	62.50%		0.5832		0.00
18	5300	07:54:44	70.83%	62.56%	0.9945	1.0039	0.00
18	5350	07:57:28	62.50%		0.7169		0.00
18	5400	08:01:33	75.00%	64.00%	0.5974	0.9704	0.00
18	5450	08:04:17	79.17%		0.5240		0.00
18	5500	08:08:21	66.67%	64.29%	0.6107	1.0135	0.00
18	5550	08:11:06	91.67%		0.4279		0.00
19	5600	08:15:10	87.50%	63.83%	0.4356	1.0189	0.00
19	5650	08:17:54	62.50%		0.6173		0.00
19	5700	08:21:59	83.33%	65.57%	0.4208	1.0194	0.00
19	5750	08:24:42	54.17%		0.7556		0.00
19	5800	08:28:46	79.17%	64.81%	0.5037	1.0217	0.00
19	5850	08:31:29	70.83%		0.5358		0.00
20	5900	08:35:35	87.50%	64.47%	0.5498	1.0143	0.00
20	5950	08:38:19	83.33%		0.5062		0.00
20	6000	08:42:25	83.33%	63.66%	0.5006	1.2533	0.00
20	6050	08:45:09	83.33%		0.5351		0.00
20	6100	08:49:14	87.50%	65.51%	0.4277	1.0769	0.00
20	6150	08:51:57	87.50%		0.3426		0.00
21	6200	08:56:02	75.00%	63.95%	0.4930	1.0810	0.00
21	6250	08:58:46	87.50%		0.3633		0.00
21	6300	09:02:52	79.17%	65.28%	0.3826	1.1179	0.00
21	6350	09:05:34	75.00%		0.4850		0.00
21	6400	09:09:40	70.83%	63.02%	0.5355	1.1715	0.00
21	6450	09:12:23	66.67%		0.6933		0.00
22	6500	09:16:26	70.83%	65.34%	0.7062	1.2025	0.00
22	6550	09:19:09	70.83%		0.6015		0.00
22	6600	09:23:14	79.17%	65.22%	0.6664	1.0731	0.00
22	6650	09:25:58	70.83%		0.6158		0.00
22	6700	09:30:02	66.67%	63.43%	0.7444	1.1705	0.00
22	6750	09:32:46	83.33%		0.3382		0.00
23	6800	09:36:53	95.83%	63.89%	0.2926	1.1278	0.00
23	6850	09:39:36	91.67%		0.4083		0.00
23	6900	09:43:39	91.67%	65.28%	0.2630	1.1122	0.00
23	6950	09:46:24	75.00%		0.4349		0.00
23	7000	09:50:30	75.00%	63.95%	0.5741	1.1682	0.00
23	7050	09:53:14	83.33%		0.4797		0.00
23	7100	09:57:19	79.17%	63.66%	0.5000	1.2240	0.00
24	7150	10:00:04	83.33%		0.4508		0.00
24	7200	10:04:09	83.33%	64.12%	0.3831	1.2169	0.00
24	7250	10:06:51	75.00%		0.4495		0.00
24	7300	10:10:57	87.50%	63.43%	0.3166	1.2262	0.00
24	7350	10:13:41	58.33%		1.5760		0.00
24	7400	10:17:46	75.00%	64.53%	0.6414	1.3917	0.00
25	7450	10:20:31	87.50%		0.5241		0.00
25	7500	10:24:37	87.50%	65.34%	0.3719	1.1023	0.00
25	7550	10:27:20	87.50%		0.4020		0.00
25	7600	10:31:25	75.00%	65.16%	0.6729	1.2282	0.00
25	7650	10:34:08	79.17%		0.4400		0.00
25	7700	10:38:15	79.17%	65.62%	0.6174	1.0597	0.00
26	7750	10:40:58	79.17%		0.3730		0.00
26	7800	10:45:03	70.83%	64.35%	0.4574	1.1804	0.00
26	7850	10:47:45	87.50%		0.3812		0.00
26	7900	10:51:51	79.17%	64.47%	0.4065	1.1954	0.00
26	7950	10:54:34	70.83%		0.7120		0.00
26	8000	10:58:38	83.33%	65.28%	0.4111	1.2328	0.00
27	8050	11:01:23	75.00%		0.5431		0.00
27	8100	11:05:28	79.17%	65.86%	0.3544	1.1730	0.00
27	8150	11:08:10	79.17%		0.4348		0.00
27	8200	11:12:16	100.00%	65.22%	0.1543	1.2195	0.00
27	8250	11:15:00	87.50%		0.4162		0.00
27	8300	11:19:04	75.00%	65.91%	0.6000	1.1980	0.00

28	8350	11:21:48	83.33%		0.4400		0.00
28	8400	11:25:52	83.33%	63.60%	0.3811	1.3001	0.00
28	8450	11:28:35	79.17%		0.3850		0.00
28	8500	11:32:39	95.83%	65.57%	0.1480	1.4947	0.00
28	8550	11:35:22	95.83%		0.1813		0.00
28	8600	11:39:27	91.67%	64.58%	0.3476	1.3363	0.00
28	8650	11:42:11	87.50%		0.3089		0.00
29	8700	11:46:15	95.83%	66.15%	0.1704	1.3751	0.00
29	8750	11:48:59	91.67%		0.2593		0.00
29	8800	11:53:04	87.50%	65.57%	0.3220	1.5700	0.00
29	8850	11:55:47	83.33%		0.7732		0.00
29	8900	11:59:52	70.83%	65.34%	0.5129	1.4834	0.00
29	8950	12:02:35	91.67%		0.1873		0.00
30	9000	12:06:41	91.67%	65.28%	0.2739	1.3908	0.00
30	9050	12:09:24	87.50%		0.2750		0.00
30	9100	12:13:30	91.67%	65.86%	0.2286	1.4011	0.00
30	9150	12:16:14	87.50%		0.3007		0.00
30	9200	12:20:19	83.33%	66.38%	0.3615	1.3206	0.00
30	9250	12:23:02	91.67%		0.2205		0.00
31	9300	12:27:07	100.00%	66.67%	0.1353	1.3347	3.0000e-
31	9350	12:29:51	87.50%		0.2832		3.0000e-
31	9400	12:33:56	83.33%	66.38%	0.3481	1.3485	3.0000e-
31	9450	12:36:38	91.67%		0.2274		3.0000e-
31	9500	12:40:43	87.50%	65.91%	0.3101	1.3581	3.0000e-
31	9550	12:43:28	91.67%		0.2053		3.0000e-
32	9600	12:47:34	95.83%	67.01%	0.1729	1.4037	3.0000e-
32	9650	12:50:17	91.67%		0.1937		3.0000e-
32	9700	12:54:23	95.83%	67.13%	0.2103	1.3877	3.0000e-
32	9750	12:57:06	91.67%		0.2990		3.0000e-
32	9800	13:01:11	100.00%	67.13%	0.1075	1.4040	3.0000e-
32	9850	13:03:55	100.00%		0.0636		3.0000e-
33	9900	13:08:00	100.00%	67.94%	0.0833	1.4188	3.0000e-
33	9950	13:10:44	87.50%		0.2390		3.0000e-
33	10000	13:14:49	95.83%	67.36%	0.2348	1.4407	3.0000e-
33	10050	13:17:33	87.50%		0.2717		3.0000e-
33	10100	13:21:38	83.33%	67.71%	0.3238	1.4478	3.0000e-
33	10150	13:24:21	95.83%		0.2195		3.0000e-
34	10200	13:28:27	95.83%	67.36%	0.1527	1.4541	3.0000e-
34	10250	13:31:12	95.83%		0.1624		3.0000e-
34	10300	13:35:17	87.50%	67.13%	0.2567	1.4798	3.0000e-
34	10350	13:38:00	91.67%		0.1823		3.0000e-
34	10400	13:42:05	95.83%	67.25%	0.1374	1.4731	3.0000e-
34	10450	13:44:49	100.00%		0.1291		3.0000e-
34	10500	13:48:53	87.50%	67.25%	0.2535	1.4776	3.0000e-
35	10550	13:51:37	91.67%		0.2016		3.0000e-
35	10600	13:55:42	100.00%	67.36%	0.0737	1.5198	3.0000e-
35	10650	13:58:25	91.67%		0.2285		3.0000e-
35	10700	14:02:29	95.83%	67.01%	0.1728	1.4924	3.0000e-
35	10750	14:05:13	100.00%		0.1041		3.0000e-
35	10800	14:09:19	100.00%	67.65%	0.0743	1.5023	3.0000e-
36	10850	14:12:02	83.33%		0.2266		3.0000e-
36	10900	14:16:07	95.83%	67.82%	0.2022	1.5280	3.0000e-
36	10950	14:18:50	95.83%		0.1783		3.0000e-
36	11000	14:22:55	100.00%	66.67%	0.1142	1.5769	3.0000e-
36	11050	14:25:38	91.67%		0.2180		3.0000e-
36	11100	14:29:44	95.83%	67.36%	0.2911	1.5218	3.0000e-
37	11150	14:32:28	91.67%		0.2232		3.0000e-
37	11200	14:36:33	91.67%	67.25%	0.2484	1.5701	3.0000e-
37	11250	14:39:16	95.83%		0.2078		3.0000e-
37	11300	14:43:20	95.83%	67.19%	0.1191	1.6069	3.0000e-
37	11350	14:46:04	100.00%		0.1315		3.0000e-
37	11400	14:50:07	100.00%	67.25%	0.1098	1.6078	3.0000e-
38	11450	14:52:51	95.83%		0.1467		3.0000e-
38	11500	14:56:57	95.83%	67.77%	0.1342	1.5929	3.0000e-

| 38 | 11550 | 14:59:41 | 91.67% | | 0.2294 | | 3.0000e-
| 38 | 11600 | 15:03:46 | 95.83% | 67.53% | 0.1973 | 1.6311 | 3.0000e-
| 38 | 11650 | 15:06:29 | 95.83% | | 0.0846 | | 3.0000e-
| 38 | 11700 | 15:10:34 | 95.83% | 67.36% | 0.1608 | 1.6819 | 3.0000e-
| 39 | 11750 | 15:13:18 | 100.00% | | 0.1029 | | 3.0000e-
| 39 | 11800 | 15:17:22 | 91.67% | 67.42% | 0.2657 | 1.6299 | 3.0000e-
| 39 | 11850 | 15:20:06 | 79.17% | | 0.3629 | | 3.0000e-
| 39 | 11900 | 15:24:11 | 95.83% | 67.30% | 0.0970 | 1.6414 | 3.0000e-
| 39 | 11950 | 15:26:53 | 91.67% | | 0.2403 | | 3.0000e-
| 39 | 12000 | 15:30:59 | 95.83% | 67.19% | 0.0952 | 1.6594 | 3.0000e-
| 39 | 12050 | 15:33:41 | 100.00% | | 0.0979 | | 3.0000e-
| 40 | 12100 | 15:37:48 | 95.83% | 67.82% | 0.1696 | 1.6622 | 3.0000e-
| 40 | 12150 | 15:40:30 | 95.83% | | 0.1522 | | 3.0000e-
| 40 | 12200 | 15:44:35 | 95.83% | 67.94% | 0.1663 | 1.7045 | 3.0000e-
| 40 | 12250 | 15:47:19 | 95.83% | | 0.2174 | | 3.0000e-
| 40 | 12300 | 15:51:24 | 95.83% | 67.48% | 0.1409 | 1.6900 | 3.0000e-
| 40 | 12350 | 15:54:08 | 100.00% | | 0.0999 | | 3.0000e-
| 41 | 12400 | 15:58:12 | 91.67% | 67.71% | 0.2583 | 1.7031 | 3.0000e-
| 41 | 12450 | 16:00:55 | 87.50% | | 0.2358 | | 3.0000e-
| 41 | 12500 | 16:05:00 | 100.00% | 67.01% | 0.1392 | 1.7372 | 3.0000e-
| 41 | 12550 | 16:07:43 | 100.00% | | 0.1085 | | 3.0000e-
| 41 | 12600 | 16:11:48 | 95.83% | 67.25% | 0.1140 | 1.7756 | 3.0000e-
| 41 | 12650 | 16:14:32 | 91.67% | | 0.1609 | | 3.0000e-
| 42 | 12700 | 16:18:36 | 91.67% | 67.13% | 0.2103 | 1.8130 | 3.0000e-
| 42 | 12750 | 16:21:19 | 95.83% | | 0.1366 | | 3.0000e-
| 42 | 12800 | 16:25:25 | 100.00% | 67.42% | 0.0196 | 1.8484 | 3.0000e-
| 42 | 12850 | 16:28:09 | 100.00% | | 0.0729 | | 3.0000e-
| 42 | 12900 | 16:32:14 | 95.83% | 67.30% | 0.0868 | 1.8544 | 3.0000e-
| 42 | 12950 | 16:34:57 | 100.00% | | 0.0859 | | 3.0000e-
| 43 | 13000 | 16:39:02 | 100.00% | 67.59% | 0.0808 | 1.8270 | 3.0000e-
| 43 | 13050 | 16:41:45 | 100.00% | | 0.0484 | | 3.0000e-
| 43 | 13100 | 16:45:51 | 91.67% | 68.17% | 0.2417 | 1.8383 | 3.0000e-
| 43 | 13150 | 16:48:35 | 100.00% | | 0.0767 | | 3.0000e-
| 43 | 13200 | 16:52:40 | 100.00% | 66.96% | 0.0636 | 1.8962 | 3.0000e-
| 43 | 13250 | 16:55:23 | 100.00% | | 0.1255 | | 3.0000e-
| 44 | 13300 | 16:59:28 | 100.00% | 67.42% | 0.0652 | 1.9591 | 3.0000e-
| 44 | 13350 | 17:02:12 | 100.00% | | 0.0695 | | 3.0000e-
| 44 | 13400 | 17:06:17 | 100.00% | 67.36% | 0.0584 | 1.9136 | 3.0000e-
| 44 | 13450 | 17:09:01 | 95.83% | | 0.0993 | | 3.0000e-
| 44 | 13500 | 17:13:07 | 95.83% | 67.01% | 0.1141 | 1.8581 | 3.0000e-
| 44 | 13550 | 17:15:50 | 100.00% | | 0.0784 | | 3.0000e-
| 45 | 13600 | 17:19:56 | 100.00% | 68.06% | 0.0745 | 1.9250 | 3.0000e-
| 45 | 13650 | 17:22:40 | 87.50% | | 0.1981 | | 3.0000e-
| 45 | 13700 | 17:26:45 | 95.83% | 67.77% | 0.1007 | 1.9608 | 3.0000e-
| 45 | 13750 | 17:29:28 | 100.00% | | 0.0389 | | 3.0000e-
| 45 | 13800 | 17:33:32 | 95.83% | 67.48% | 0.1259 | 2.0004 | 3.0000e-
| 45 | 13850 | 17:36:16 | 95.83% | | 0.1247 | | 3.0000e-
| 45 | 13900 | 17:40:21 | 95.83% | 66.61% | 0.1172 | 2.0488 | 3.0000e-
| 46 | 13950 | 17:43:05 | 95.83% | | 0.0918 | | 3.0000e-
| 46 | 14000 | 17:47:10 | 100.00% | 67.07% | 0.0729 | 1.9902 | 3.0000e-
| 46 | 14050 | 17:49:55 | 100.00% | | 0.0606 | | 3.0000e-
| 46 | 14100 | 17:54:00 | 100.00% | 66.49% | 0.0863 | 2.0962 | 3.0000e-
| 46 | 14150 | 17:56:43 | 100.00% | | 0.0436 | | 3.0000e-
| 46 | 14200 | 18:00:49 | 100.00% | 66.84% | 0.1042 | 2.1132 | 3.0000e-
| 47 | 14250 | 18:03:34 | 100.00% | | 0.0492 | | 3.0000e-
| 47 | 14300 | 18:07:37 | 87.50% | 67.07% | 0.2326 | 2.1570 | 3.0000e-
| 47 | 14350 | 18:10:20 | 100.00% | | 0.0364 | | 3.0000e-
| 47 | 14400 | 18:14:26 | 100.00% | 66.96% | 0.0692 | 2.0616 | 3.0000e-
| 47 | 14450 | 18:17:10 | 91.67% | | 0.1468 | | 3.0000e-
| 47 | 14500 | 18:21:15 | 100.00% | 67.07% | 0.0588 | 2.2122 | 3.0000e-
| 48 | 14550 | 18:24:00 | 91.67% | | 0.1598 | | 3.0000e-
| 48 | 14600 | 18:28:05 | 91.67% | 67.36% | 0.1510 | 2.1688 | 3.0000e-
| 48 | 14650 | 18:30:49 | 95.83% | | 0.0623 | | 3.0000e-
| 48 | 14700 | 18:34:53 | 100.00% | 67.36% | 0.0672 | 2.1950 | 3.0000e-

48	14750	18:37:36	100.00%		0.1038		3.0000e-
48	14800	18:41:42	100.00%	66.96%	0.0589	2.1725	3.0000e-
49	14850	18:44:25	100.00%		0.0599		3.0000e-
49	14900	18:48:29	100.00%	67.19%	0.0682	2.1835	3.0000e-
49	14950	18:51:13	100.00%		0.0560		3.0000e-
49	15000	18:55:19	95.83%	67.01%	0.0841	2.2182	3.0000e-
49	15050	18:58:02	95.83%		0.0679		3.0000e-
49	15100	19:02:08	100.00%	67.59%	0.0260	2.1926	3.0000e-
50	15150	19:04:53	100.00%		0.0211		3.0000e-
50	15200	19:08:57	100.00%	67.65%	0.0403	2.2917	3.0000e-
50	15250	19:11:40	95.83%		0.1261		3.0000e-
50	15300	19:15:45	100.00%	67.59%	0.0804	2.3241	3.0000e-
50	15350	19:18:29	95.83%		0.0928		3.0000e-
50	15400	19:22:34	95.83%	67.36%	0.1125	2.1957	3.0000e-
50	15450	19:25:16	100.00%		0.0351		3.0000e-
51	15500	19:29:24	100.00%	67.13%	0.0471	2.3907	3.0000e-
51	15550	19:32:07	95.83%		0.0832		3.0000e-
51	15600	19:36:12	100.00%	67.94%	0.0555	2.3174	3.0000e-
51	15650	19:38:52	100.00%		0.0187		3.0000e-
51	15700	19:42:58	100.00%	66.26%	0.0364	2.3927	3.0000e-
51	15750	19:45:41	100.00%		0.0959		3.0000e-
52	15800	19:49:46	100.00%	66.55%	0.0385	2.4018	3.0000e-
52	15850	19:52:29	100.00%		0.0396		3.0000e-
52	15900	19:56:34	100.00%	67.48%	0.0672	2.3495	3.0000e-
52	15950	19:59:18	100.00%		0.0340		3.0000e-
52	16000	20:03:23	100.00%	66.90%	0.0819	2.4447	3.0000e-
52	16050	20:06:07	100.00%		0.0182		3.0000e-
53	16100	20:10:13	100.00%	67.88%	0.0404	2.3838	3.0000e-
53	16150	20:12:56	100.00%		0.0999		3.0000e-
53	16200	20:17:01	100.00%	67.01%	0.0750	2.4329	3.0000e-
53	16250	20:19:45	100.00%		0.0724		3.0000e-
53	16300	20:23:50	100.00%	66.96%	0.0574	2.4979	3.0000e-
53	16350	20:26:35	100.00%		0.0703		3.0000e-
54	16400	20:30:41	100.00%	68.17%	0.0751	2.3979	3.0000e-
54	16450	20:33:25	100.00%		0.0337		3.0000e-
54	16500	20:37:30	95.83%	68.11%	0.0593	2.4614	3.0000e-
54	16550	20:40:14	100.00%		0.0519		3.0000e-
54	16600	20:44:20	100.00%	67.71%	0.0261	2.4459	3.0000e-
54	16650	20:47:03	100.00%		0.0203		3.0000e-
55	16700	20:51:09	100.00%	67.36%	0.0818	2.5929	3.0000e-
55	16750	20:53:53	100.00%		0.0199		3.0000e-
55	16800	20:57:59	100.00%	66.96%	0.0398	2.4947	3.0000e-
55	16850	21:00:42	100.00%		0.0098		3.0000e-
55	16900	21:04:48	100.00%	68.11%	0.0453	2.5726	3.0000e-
55	16950	21:07:31	100.00%		0.0352		3.0000e-
56	17000	21:11:37	100.00%	67.36%	0.0224	2.5363	3.0000e-
56	17050	21:14:20	100.00%		0.0430		3.0000e-
56	17100	21:18:25	100.00%	67.71%	0.0202	2.5568	3.0000e-
56	17150	21:21:10	100.00%		0.0638		3.0000e-
56	17200	21:25:15	100.00%	67.82%	0.0832	2.5078	3.0000e-
56	17250	21:27:58	100.00%		0.0611		3.0000e-
56	17300	21:32:03	100.00%	68.00%	0.0281	2.5249	3.0000e-
57	17350	21:34:48	100.00%		0.0181		3.0000e-
57	17400	21:38:53	100.00%	67.88%	0.0490	2.4671	3.0000e-
57	17450	21:41:39	95.83%		0.0805		3.0000e-
57	17500	21:45:48	100.00%	66.96%	0.0162	2.6162	3.0000e-
57	17550	21:48:33	95.83%		0.0863		3.0000e-
57	17600	21:52:39	100.00%	66.03%	0.0646	2.5116	3.0000e-
58	17650	21:55:24	100.00%		0.0808		3.0000e-
58	17700	22:00:10	100.00%	67.65%	0.0506	2.5685	3.0000e-
58	17750	22:03:11	100.00%		0.0911		3.0000e-
58	17800	22:07:32	100.00%	68.23%	0.0176	2.4596	3.0000e-
58	17850	22:10:35	100.00%		0.0155		3.0000e-
58	17900	22:15:01	100.00%	68.00%	0.0206	2.4921	3.0000e-

59	17950	22:17:58	100.00%		0.0367		3.0000e-
59	18000	22:22:09	100.00%	67.82%	0.0511	2.4608	3.0000e-
59	18050	22:25:01	95.83%		0.0906		3.0000e-
59	18100	22:29:07	100.00%	68.00%	0.0284	2.4950	3.0000e-
59	18150	22:31:53	100.00%		0.0335		3.0000e-
59	18200	22:36:00	100.00%	67.65%	0.0422	2.8059	3.0000e-
60	18250	22:38:45	100.00%		0.0575		3.0000e-
60	18300	22:42:49	100.00%	67.48%	0.0143	2.5714	3.0000e-
60	18350	22:45:33	100.00%		0.0557		3.0000e-
60	18400	22:49:38	100.00%	67.42%	0.0499	2.6684	3.0000e-
60	18450	22:52:23	100.00%		0.0194		3.0000e-
60	18500	22:56:28	100.00%	67.88%	0.0107	2.5834	3.0000e-
61	18550	22:59:13	100.00%		0.0582		3.0000e-
61	18600	23:03:18	100.00%	67.71%	0.0586	2.6368	3.0000e-
61	18650	23:06:01	100.00%		0.0821		3.0000e-
61	18700	23:10:06	100.00%	68.00%	0.0658	2.6426	3.0000e-
61	18750	23:12:50	100.00%		0.0235		3.0000e-
61	18800	23:16:56	100.00%	67.88%	0.0123	2.6364	3.0000e-
62	18850	23:19:40	100.00%		0.0353		3.0000e-
62	18900	23:23:44	100.00%	68.00%	0.0260	2.6531	3.0000e-
62	18950	23:26:27	100.00%		0.0453		3.0000e-
62	19000	23:30:33	100.00%	68.00%	0.0390	2.6460	3.0000e-
62	19050	23:33:15	100.00%		0.0190		3.0000e-
62	19100	23:37:20	100.00%	68.11%	0.0154	2.6408	3.0000e-
62	19150	23:40:05	100.00%		0.0136		3.0000e-
63	19200	23:44:11	100.00%	67.82%	0.0233	2.6570	3.0000e-
63	19250	23:46:56	100.00%		0.0064		3.0000e-
63	19300	23:51:01	100.00%	68.11%	0.0305	2.6288	3.0000e-
63	19350	23:53:45	100.00%		0.0298		3.0000e-
63	19400	23:57:50	100.00%	68.23%	0.0486	2.6408	3.0000e-
63	19450	24:00:35	95.83%		0.0700		3.0000e-
64	19500	24:04:41	100.00%	68.06%	0.0145	2.6726	3.0000e-
64	19550	24:07:26	100.00%		0.0166		3.0000e-
64	19600	24:11:30	100.00%	67.82%	0.0208	2.6581	3.0000e-
64	19650	24:14:14	100.00%		0.0072		3.0000e-
64	19700	24:18:20	100.00%	68.40%	0.0099	2.6635	3.0000e-
64	19750	24:21:04	100.00%		0.0086		3.0000e-
65	19800	24:25:09	100.00%	68.23%	0.0275	2.6927	3.0000e-
65	19850	24:27:53	95.83%		0.0880		3.0000e-
65	19900	24:31:59	100.00%	68.11%	0.0300	2.6725	3.0000e-
65	19950	24:34:42	100.00%		0.0409		3.0000e-
65	20000	24:38:48	100.00%	67.88%	0.0235	2.6966	3.0000e-
65	20050	24:41:32	100.00%		0.0211		3.0000e-
66	20100	24:45:39	100.00%	67.94%	0.0140	2.6595	3.0000e-
66	20150	24:48:23	100.00%		0.0246		3.0000e-
66	20200	24:52:28	100.00%	68.00%	0.0220	2.7180	3.0000e-
66	20250	24:55:14	100.00%		0.0205		3.0000e-
66	20300	24:59:19	95.83%	67.48%	0.0770	2.7186	3.0000e-
66	20350	25:02:04	100.00%		0.0110		3.0000e-
67	20400	25:06:11	100.00%	68.17%	0.0024	2.6978	3.0000e-
67	20450	25:08:54	100.00%		0.0372		3.0000e-
67	20500	25:12:59	100.00%	68.34%	0.0130	2.7142	3.0000e-
67	20550	25:15:43	95.83%		0.0795		3.0000e-
67	20600	25:19:49	100.00%	68.23%	0.0191	2.7097	3.0000e-
67	20650	25:22:32	100.00%		0.0309		3.0000e-
67	20700	25:26:39	100.00%	68.11%	0.0416	2.7203	3.0000e-
68	20750	25:29:24	100.00%		0.0250		3.0000e-
68	20800	25:33:31	100.00%	67.53%	0.0141	2.7148	3.0000e-
68	20850	25:36:15	100.00%		0.0254		3.0000e-
68	20900	25:40:21	100.00%	67.94%	0.0137	2.7566	3.0000e-
68	20950	25:43:05	100.00%		0.0169		3.0000e-
68	21000	25:47:11	100.00%	68.46%	0.0306	2.7479	3.0000e-
69	21050	25:49:56	100.00%		0.0233		3.0000e-
69	21100	25:54:01	100.00%	68.11%	0.0387	2.7470	3.0000e-

69	21150	25:56:46	100.00%			0.0137		3.0000e-
69	21200	26:00:52	100.00%	68.23%		0.0280	2.7346	3.0000e-
69	21250	26:03:36	100.00%			0.0354		3.0000e-
69	21300	26:07:43	100.00%	68.40%		0.0250	2.7368	3.0000e-
70	21350	26:10:27	100.00%			0.0330		3.0000e-
70	21400	26:14:33	100.00%	68.17%		0.0078	2.7421	3.0000e-
70	21450	26:17:17	95.83%			0.0838		3.0000e-
70	21500	26:21:22	100.00%	67.71%		0.0215	2.7851	3.0000e-
70	21550	26:24:06	100.00%			0.0294		3.0000e-
70	21600	26:28:12	100.00%	68.34%		0.0208	2.7520	3.0000e-
71	21650	26:30:56	100.00%			0.0160		3.0000e-
71	21700	26:35:03	100.00%	67.94%		0.0148	2.7430	3.0000e-
71	21750	26:37:47	100.00%			0.0147		3.0000e-
71	21800	26:41:51	100.00%	68.29%		0.0413	2.7599	3.0000e-
71	21850	26:44:36	100.00%			0.0340		3.0000e-
71	21900	26:48:41	100.00%	68.06%		0.0143	2.7755	3.0000e-
72	21950	26:51:26	100.00%			0.0106		3.0000e-
72	22000	26:55:31	100.00%	68.17%		0.0064	2.8006	3.0000e-
72	22050	26:58:16	100.00%			0.0136		3.0000e-
72	22100	27:02:22	100.00%	68.29%		0.0078	2.7776	3.0000e-
72	22150	27:05:06	100.00%			0.0467		3.0000e-
72	22200	27:09:10	100.00%	68.52%		0.0454	2.7996	3.0000e-
73	22250	27:11:55	100.00%			0.0130		3.0000e-
73	22300	27:16:00	100.00%	68.11%		0.0279	2.8066	3.0000e-
73	22350	27:18:44	95.83%			0.0457		3.0000e-
73	22400	27:22:50	100.00%	68.11%		0.0087	2.8052	3.0000e-
73	22450	27:25:34	100.00%			0.0085		3.0000e-
73	22500	27:29:40	100.00%	68.34%		0.0040	2.8254	3.0000e-
73	22550	27:32:24	100.00%			0.0226		3.0000e-
74	22600	27:36:30	100.00%	68.87%		0.0212	2.7808	3.0000e-
74	22650	27:39:14	95.83%			0.0881		3.0000e-
74	22700	27:43:19	100.00%	68.00%		0.0059	2.8159	3.0000e-
74	22750	27:46:03	100.00%			0.0364		3.0000e-
74	22800	27:50:07	100.00%	68.11%		0.0260	2.7891	3.0000e-
74	22850	27:52:51	100.00%			0.0358		3.0000e-
75	22900	27:56:57	100.00%	68.40%		0.0149	2.8473	3.0000e-
75	22950	27:59:41	100.00%			0.0181		3.0000e-
75	23000	28:03:48	100.00%	68.52%		0.0329	2.8385	3.0000e-
75	23050	28:06:31	100.00%			0.0342		3.0000e-
75	23100	28:10:38	100.00%	67.94%		0.0252	2.8435	3.0000e-
75	23150	28:13:22	100.00%			0.0091		3.0000e-
76	23200	28:17:27	100.00%	68.40%		0.0136	2.8527	3.0000e-
76	23250	28:20:13	100.00%			0.0175		3.0000e-
76	23300	28:24:19	100.00%	68.29%		0.0181	2.8559	3.0000e-
76	23350	28:27:03	100.00%			0.0302		3.0000e-
76	23400	28:31:08	95.83%	68.52%		0.0913	2.8310	3.0000e-
76	23450	28:33:52	100.00%			0.0171		3.0000e-
77	23500	28:37:58	100.00%	68.11%		0.0117	2.8382	3.0000e-
77	23550	28:40:43	100.00%			0.0307		3.0000e-
77	23600	28:44:48	100.00%	68.34%		0.0149	2.8880	3.0000e-
77	23650	28:47:33	95.83%			0.0640		3.0000e-
77	23700	28:51:39	100.00%	68.29%		0.0239	2.8777	3.0000e-
77	23750	28:54:24	100.00%			0.0169		3.0000e-
78	23800	28:58:31	100.00%	67.88%		0.0180	2.8538	3.0000e-
78	23850	29:01:16	100.00%			0.0179		3.0000e-
78	23900	29:05:22	100.00%	68.46%		0.0139	2.8880	3.0000e-
78	23950	29:08:05	100.00%			0.0047		3.0000e-
78	24000	29:12:10	100.00%	68.11%		0.0178	2.9160	3.0000e-
78	24050	29:14:55	100.00%			0.0388		3.0000e-
78	24100	29:19:00	100.00%	68.11%		0.0109	2.9040	3.0000e-
79	24150	29:21:45	100.00%			0.0162		3.0000e-
79	24200	29:25:51	100.00%	68.23%		0.0349	2.8860	3.0000e-
79	24250	29:28:34	100.00%			0.0060		3.0000e-
79	24300	29:32:42	100.00%	68.40%		0.0142	2.9045	3.0000e-

```
| 79 |    24350 |  29:35:26 |  100.00% |         |  0.0506 |        |  3.0000e-
| 79 |    24400 |  29:39:33 |  100.00% |  68.29% |  0.0142 |  2.8587 |  3.0000e-
| 80 |    24450 |  29:42:18 |  100.00% |         |  0.0108 |        |  3.0000e-
| 80 |    24500 |  29:46:23 |  100.00% |  68.46% |  0.0137 |  2.8809 |  3.0000e-
| 80 |    24550 |  29:49:09 |  100.00% |         |  0.0245 |        |  ...
```
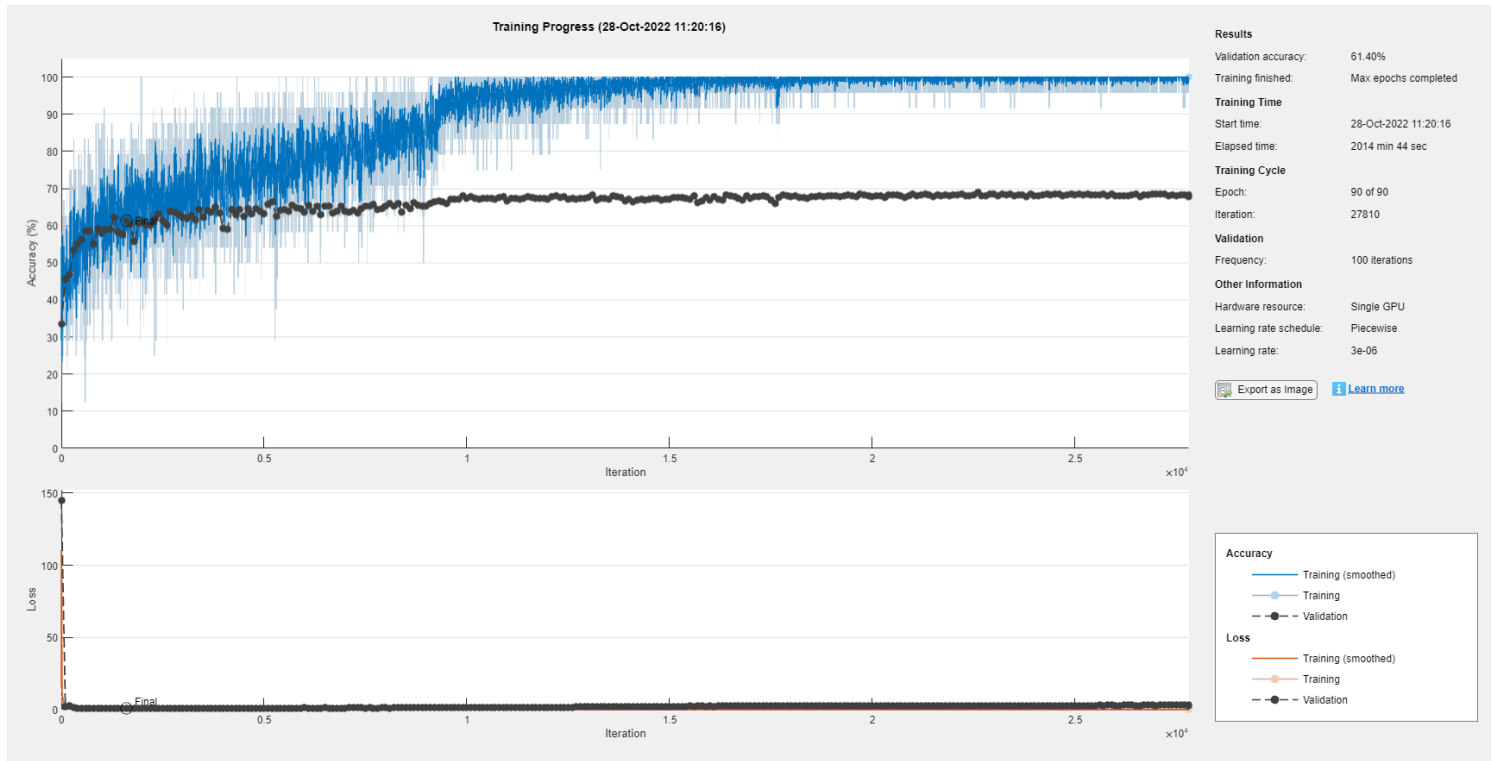


```
load("SFnet.mat","bnet2");
Snet = MdlResults(bnet2,X_Test,X_Test.Labels);
classify(Snet);
```
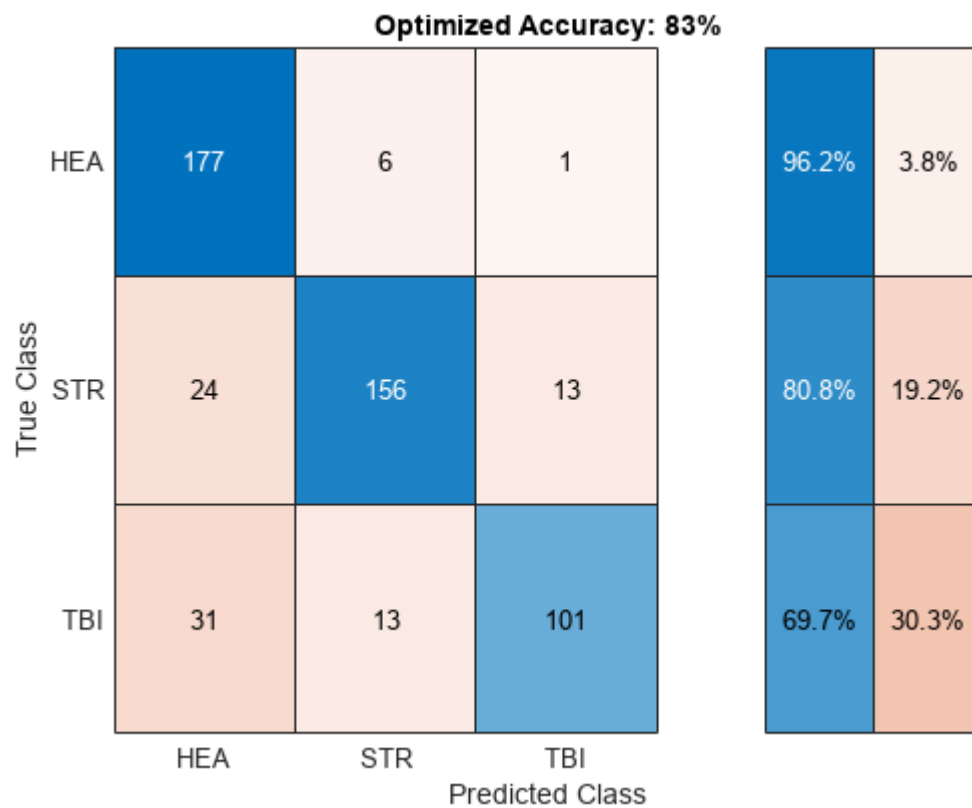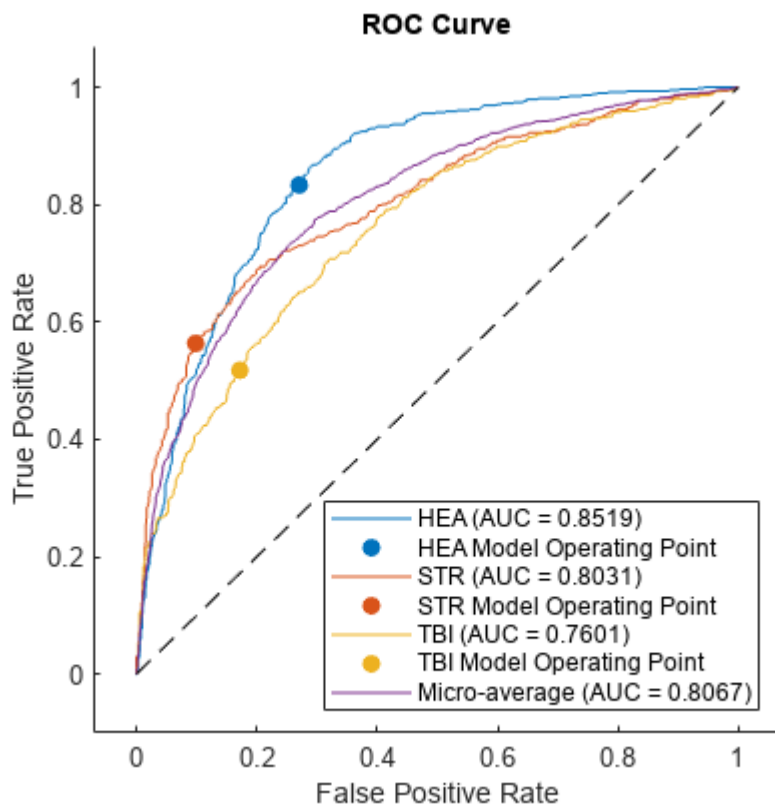
Accuracy: 64%

	HEA	STR	TBI		
HEA	485	26	71	83.3%	16.7%
STR	125	328	129	56.4%	43.6%
TBI	185	87	292	51.8%	48.2%

```
metrics(Snet);
```


Score Histogram

Model Performance

Data Remaining: 0.30208

Optimized Accuracy: 83%

ROC Curve

Legend:
- HEA (AUC = 0.8519)
- HEA Model Operating Point
- STR (AUC = 0.8031)
- STR Model Operating Point
- TBI (AUC = 0.7601)
- TBI Model Operating Point
- Micro-average (AUC = 0.8067)

X-axis: False Positive Rate
Y-axis: True Positive Rate
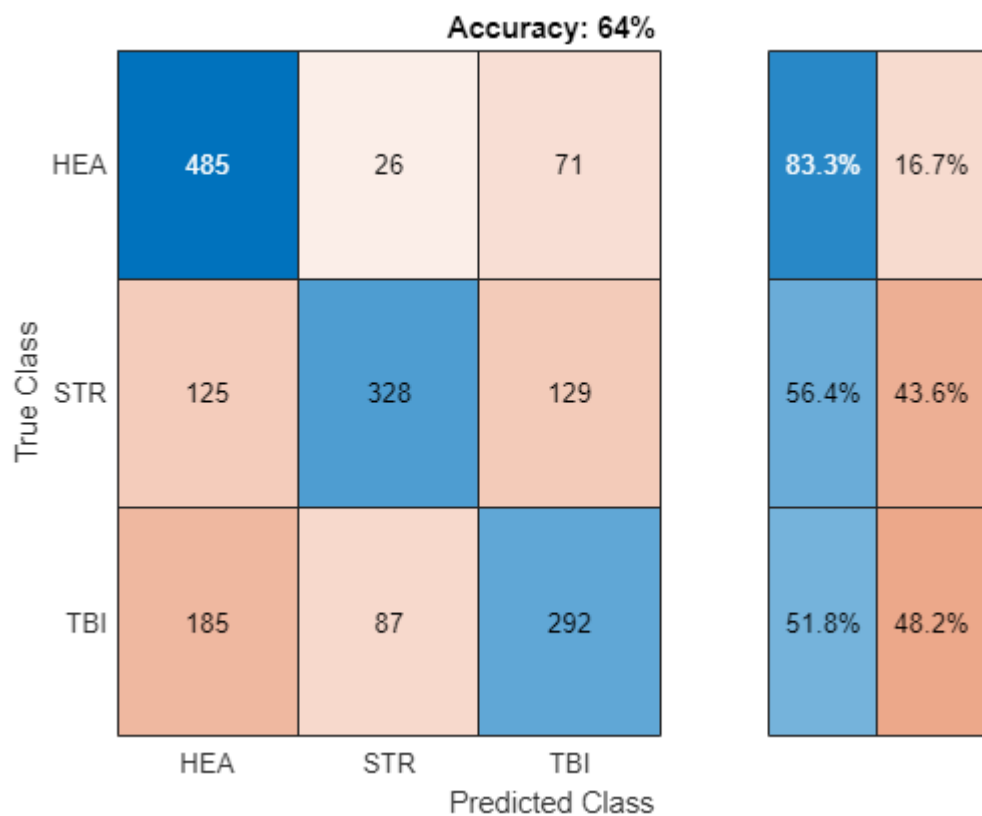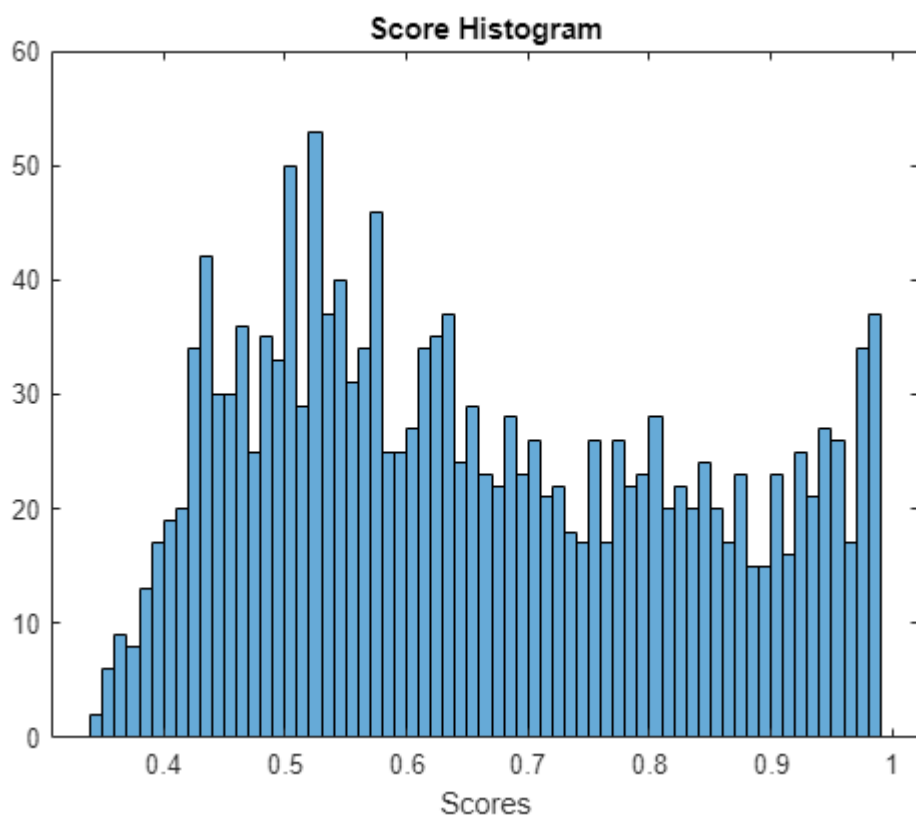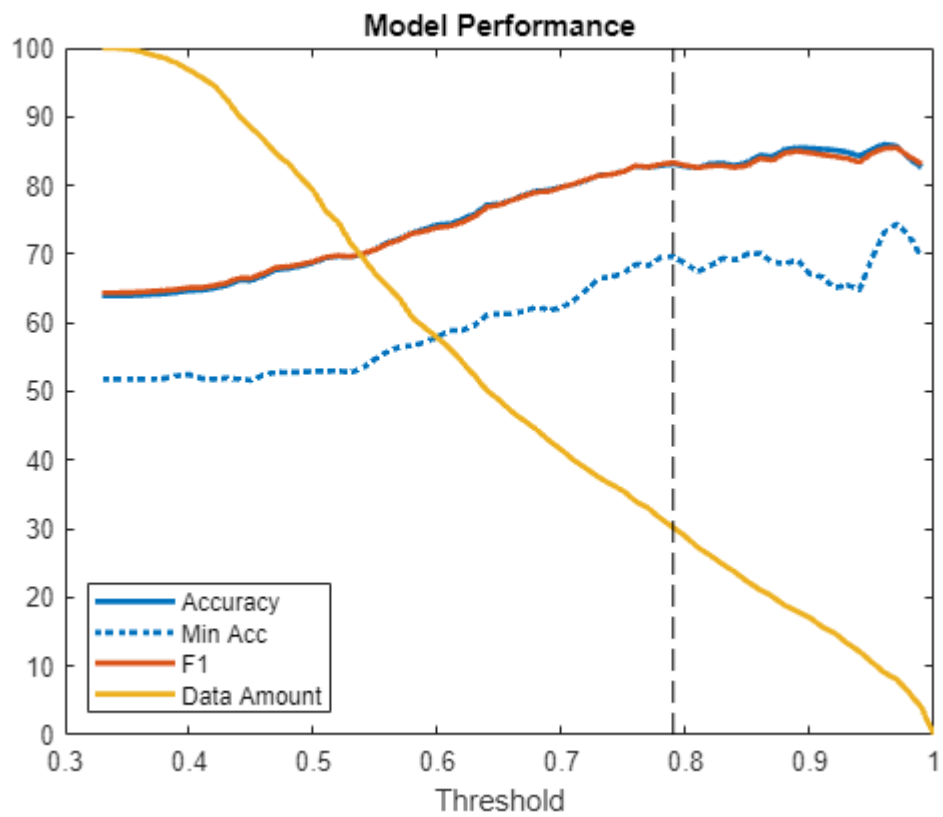
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