

Mini Project

ໂຄຍ

65010101 ດາວກໍາ ຄູນຮຽນສົດສ

65010902 ຮ່າ ຕັ້ງຕະຫຼອດ

65010869 ກູວກໍທຣ ຈັຍສິນ

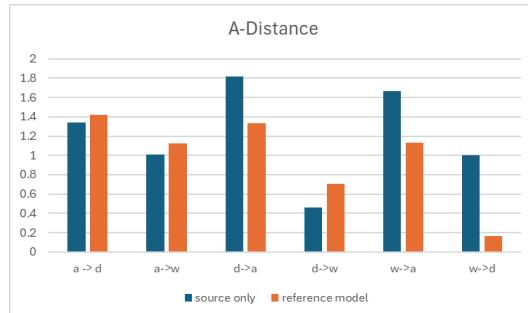
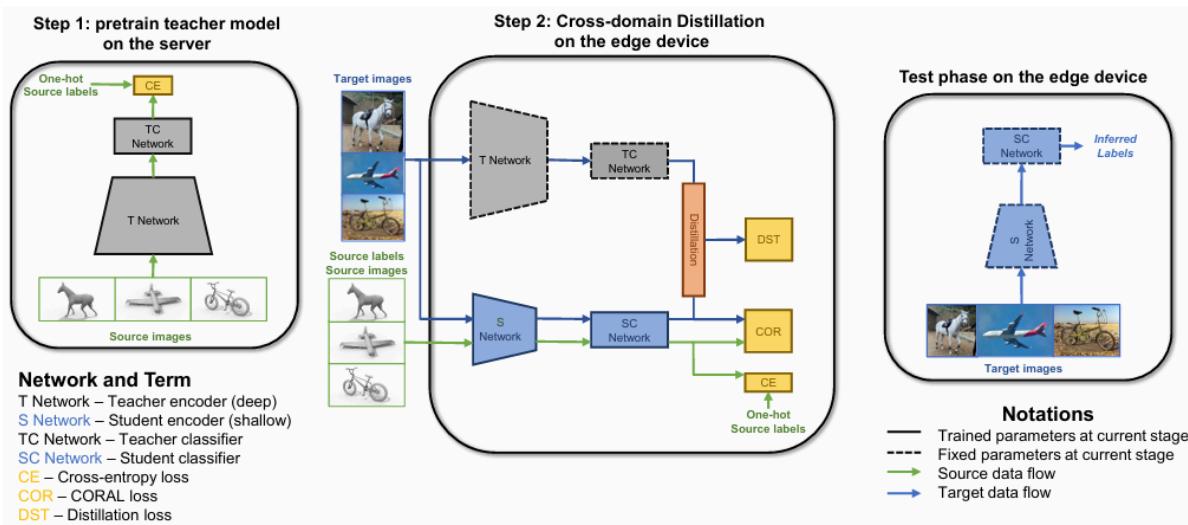
ເສັນອ

គ. ຈີරາຍຸ ເພີ່ມແນນ

ໄປຮັບຮັດກຳນົດກຳນົດ

ປຶກການສຶກສາ 1/2567

ขั้นตอนเทคนิคมาจากการ method MobileDA



	a -> d	a->w	d->a	d->w	w->a	w->d	Avg
Source Only	52.00%	49.06%	34.75%	84.28%	40.43%	91.00%	58.59%
Reference	66.00%	61.01%	43.44%	86.79%	43.62%	97.00%	66.31%
baseline	95.54%	97.09%	85.13%	97.09%	85.13%	95.54%	92.58%

	precision	recall	f beta	nmi	ri
a -d	0.72	0.56	0.587	0.755	0.296
a-w	0.69	0.61	0.613	0.755	0.47
d-a	0.46	0.434	0.421	0.533	0.239
d-w	0.91	0.867	0.871	0.903	0.724
w-a	0.462	0.436	0.417	0.544	0.243
w-d	0.465	0.416	0.406	0.534	0.224

Student model

num parameter 1,549,631

flops (MFLOPS) 87.27 MFLOPS

onnx (acceleration)

not optimized

```
Non-optimizing FP32 bench testing...
PyTorch FPS: 54.06
```

```
ONNXRuntime [FP32] Output length: 1
ONNXRuntime [FP32] Sample output: tensor([[ 0.1848, -0.1373, -0.5260, -0.2943, -0.1708, -0.0078,  0.2685, -0.1476,
    -1.1159, -0.8513, -0.1908, -0.0750, -1.1218,  0.0646, -0.4402, -0.5535,
    -0.1139, -0.2215,  1.6075,  0.3878, -0.7753, -0.9128, -0.4736,  2.0460,
    0.5537,  1.6544,  1.8379,  0.1406, -0.3420, -0.7071,  0.1444]],

device='cuda:0', grad_fn=<AddmmBackward0>)
ONNXRuntime [FP32] Sample output type: torch.float32
```

optimized FP32

```
Optimized model FP32 bench testing...
***** EP Error *****
EP Error /onnxruntime_src/onnxruntime/python/onnxruntime_pybind_state.cc:490 void onnxruntime::python::RegisterTensorrtExecutionProvider()
when using ['TensorrtExecutionProvider', 'CUDAExecutionProvider', 'CPUExecutionProvider']
Falling back to ['CUDAExecutionProvider', 'CPUExecutionProvider'] and retrying.
*****
start inferencing...FP32
Tensor FPS [FP32]: 303.39
Speedup: 4.97x
```

```
ONNXRuntime [FP32] Output length: 1
ONNXRuntime [FP32] Sample output: [[ 0.28205708 -0.12034966 -0.4634714  -0.3286803  -0.11172116 -0.38233197
    0.26170397  0.44066855 -1.0477519  -0.27273166 -0.6568503  -0.10655535
    -0.46334922 -0.48434927 -0.2857525  -0.05018425 -0.11455899 -0.45145398
    2.0548217   0.11790843 -0.68774976 -1.2432163  -0.8301675   1.5726347
    0.12868254  1.306679   1.4181204   0.17880589 -0.16210826 -0.32256067
    0.7159667 ]]

ONNXRuntime [FP32] Sample output type: float32
```

optimized FP16

```
Optimized model FP16 bench testing...
***** EP Error *****
EP Error /onnxruntime_src/onnxruntime/python/onnxruntime_pybind_state.cc:490 void onnxruntime::python::RegisterTensorrtExecutionProvider()
when using ['TensorrtExecutionProvider', 'CUDAExecutionProvider', 'CPUExecutionProvider']
Falling back to ['CUDAExecutionProvider', 'CPUExecutionProvider'] and retrying.
*****
start inferencing...FP16
Tensor FPS [FP16]: 339.05
Speedup: 6.27x
```

```
ONNXRuntime [FP16] Output length: 1
ONNXRuntime [FP16] Sample output: [[ 0.1836  -0.1383  -0.5244  -0.2957  -0.1704  -0.01099  0.2686  -0.1503
    -1.108  -0.8516  -0.1881  -0.0746  -1.118   0.0686  -0.441   -0.5547
    -0.1136  -0.2223  1.598   0.392   -0.768   -0.915  -0.4712  2.035
    0.5527  1.656   1.835   0.1461  -0.341   -0.712   0.1436 ]]

ONNXRuntime [FP16] Sample output type: float32
```

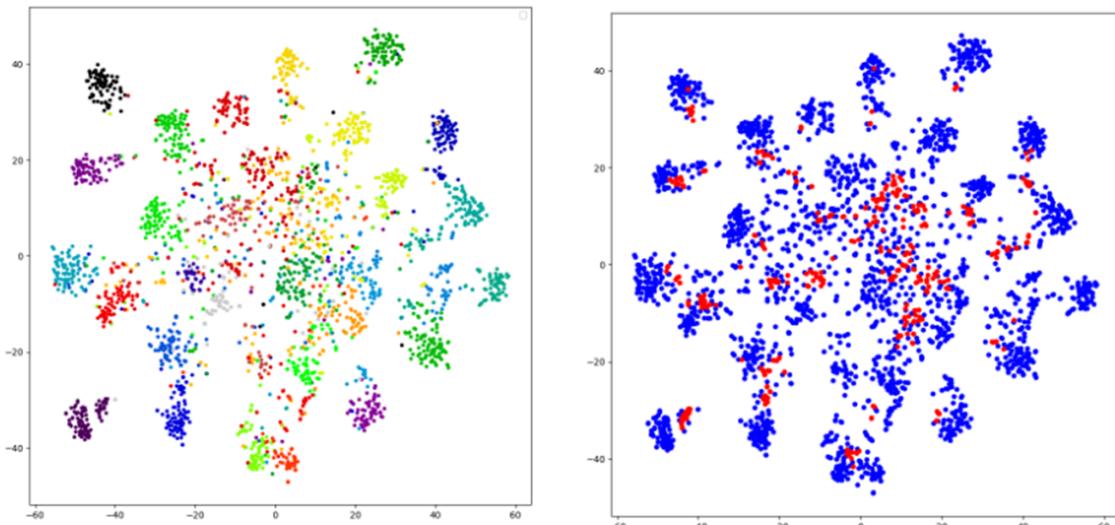
optimized INT8

Tensor FPS [INT8]: 85.86
Speedup: 5.74x

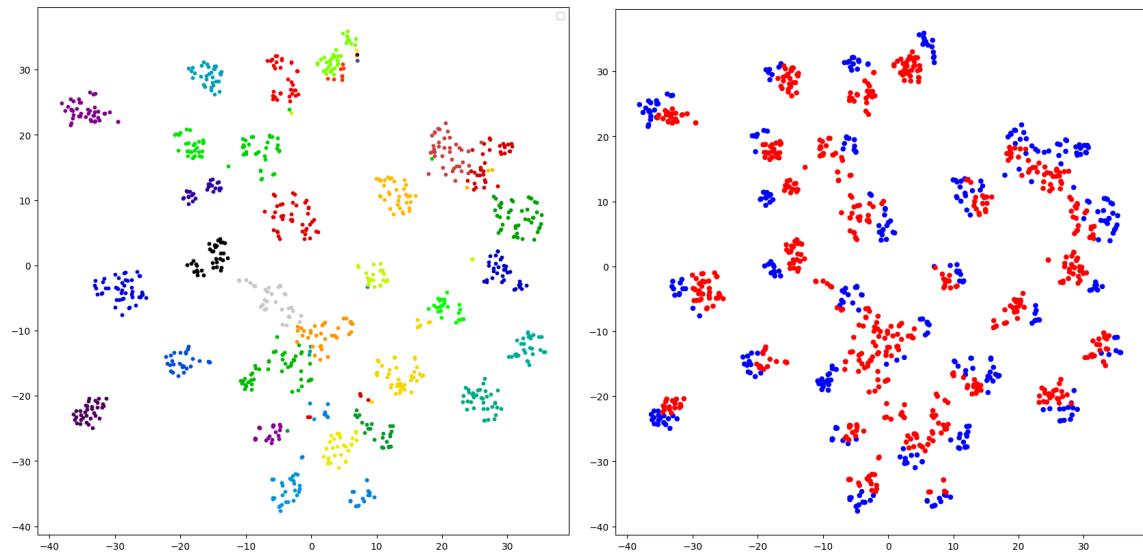
```
ONNXRuntime [INT8] Output length: 1
ONNXRuntime [INT8] Sample output: [[ 0.07147942  0.0748832   0.10551723 -0.1293437  -0.05786429 -0.01021134
-0.10892101 -0.09530589 -0.02042269  0.10551723  0.05105672 -0.14636262
0.0374416   0.03063403  0.01361513  0.21103446 -0.03403782 -0.08169076
0.06807563 -0.10551723 -0.10211345  0.01361513 -0.00340378 -0.05786429
-0.01021134 -0.08509454  0.02723025  0.17699665  0.0374416   0.01361513
0.10892101]]
ONNXRuntime [INT8] Sample output type: float32
```

t-SNE

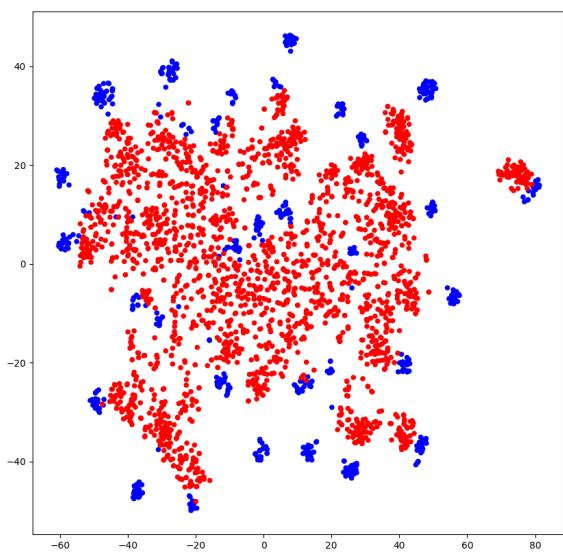
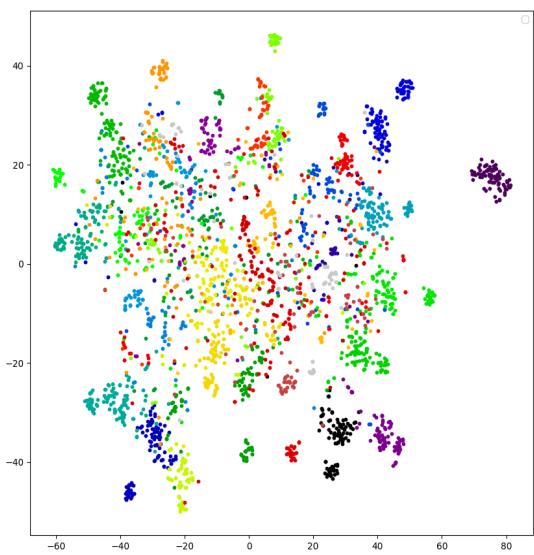
A>D



D>W



W->A



Hyperparameter

```
optimizer = torch.optim.SGD(  
[dict(params= student_model.features.parameters(), lr=base_lr/10.0), # best at 1e-4  
 dict(params= student_model.classifier.parameters()),  
 ],
lr=base_lr, # learning rate for all layers if none of any setting individual  
momentum=0.9,weight_decay=5e-4  
optimeizer:  
)
```

teacher epoch: 30

syudent epoch: 50

Batch Size : 32

CORAL : 0.8

KD temp : 2.0

KD threshold : 0.6

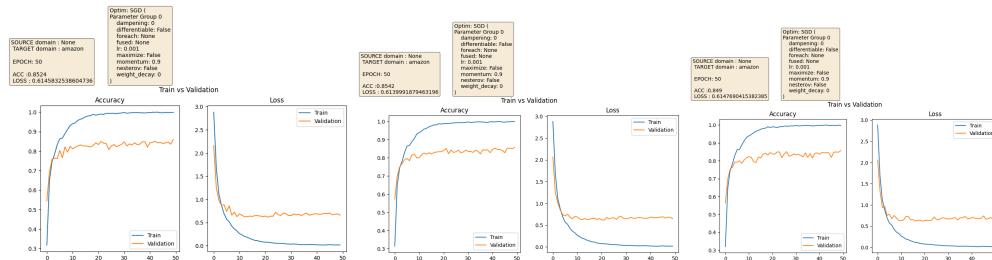
KD_weight : 0.9

Baseline

เฉลี่ย(3 ครั้ง)

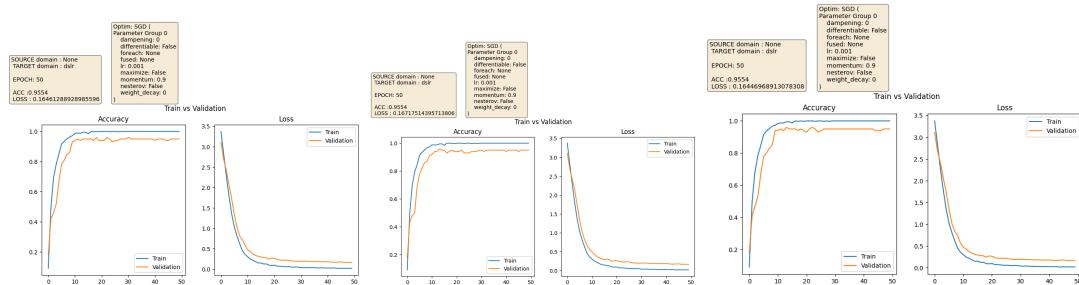
EPOCH 50

Amazon



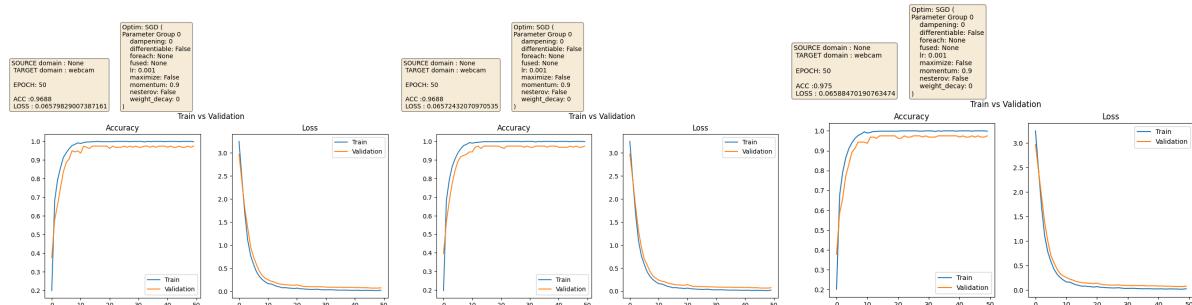
ACC = 0.8512666

DSLR



ACC = 0.9554

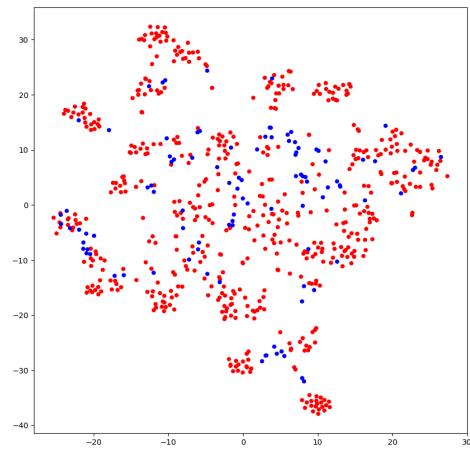
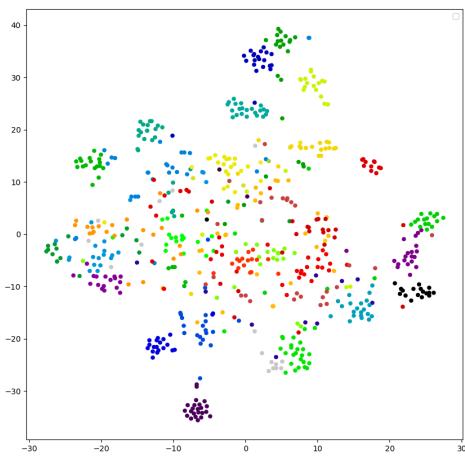
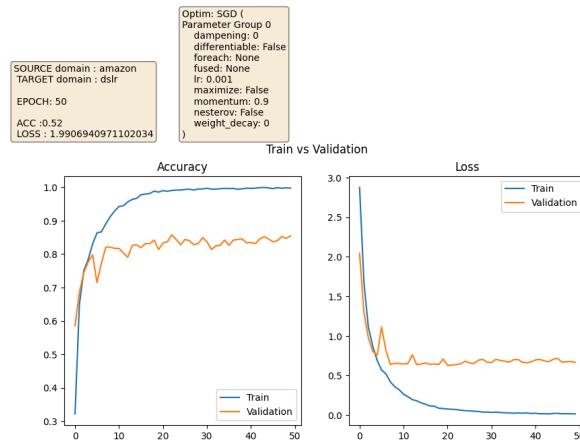
WEBCAM

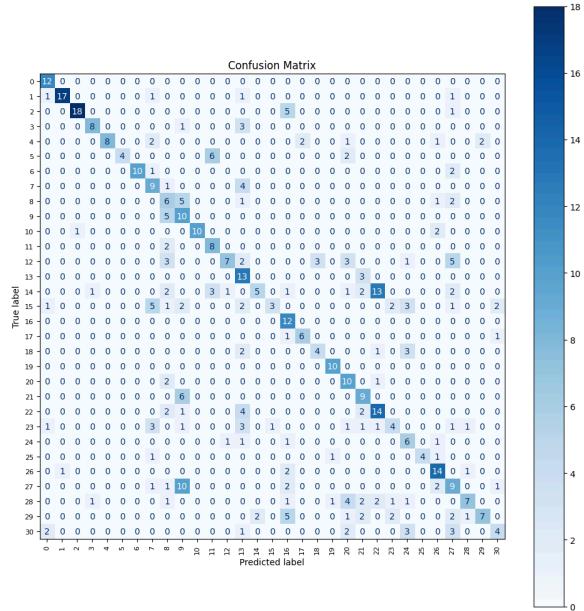


Acc = 0.97086

Source Only Model

A -> D



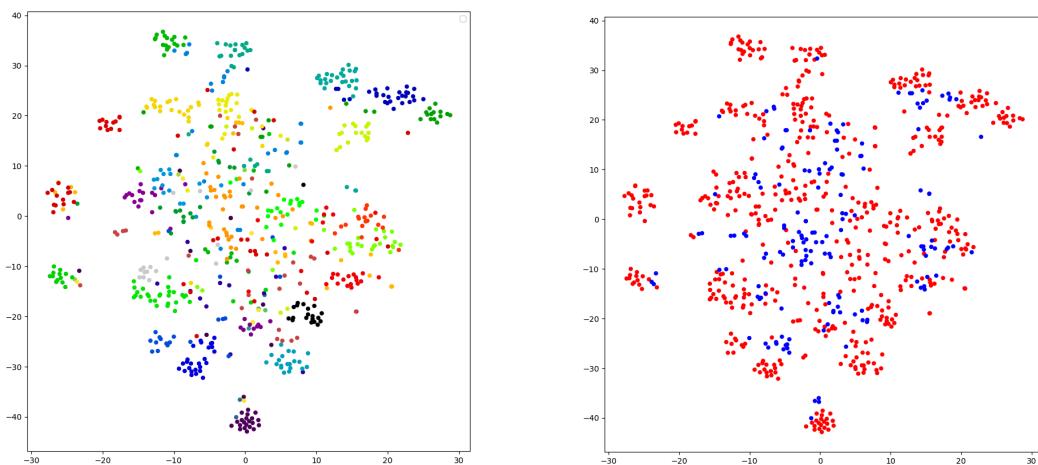
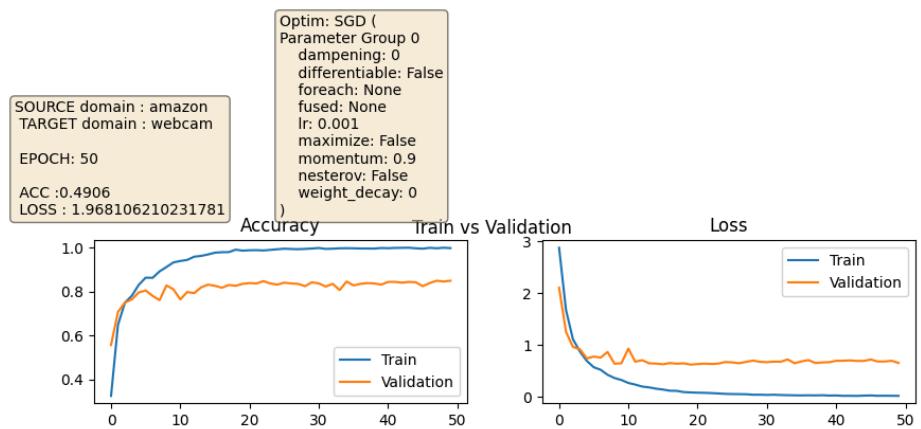


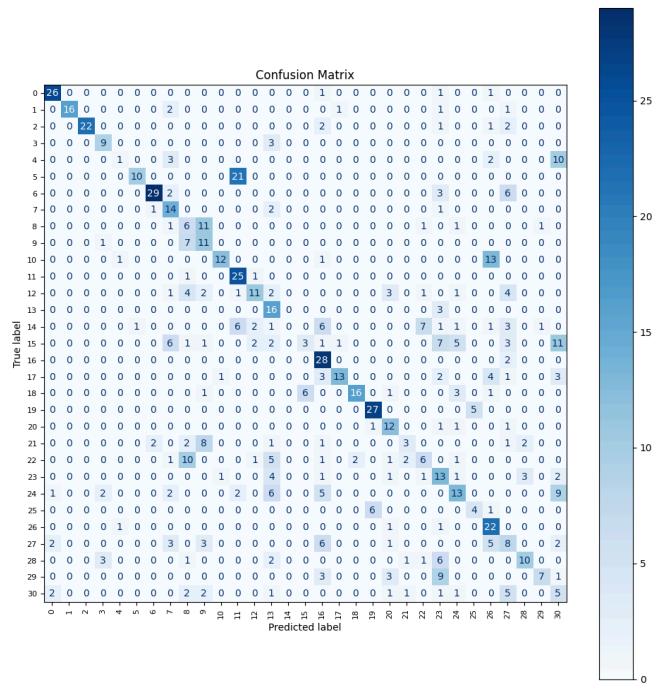
Precision/Recall/F-beta score: (0.5999166666666667, 0.52, 0.4976157731157731, None)

NMI score: 0.7460352704541032, RI score: 0.27663267948839293

A-distance = tensor(1.3383, device='cuda:0')

A -> W





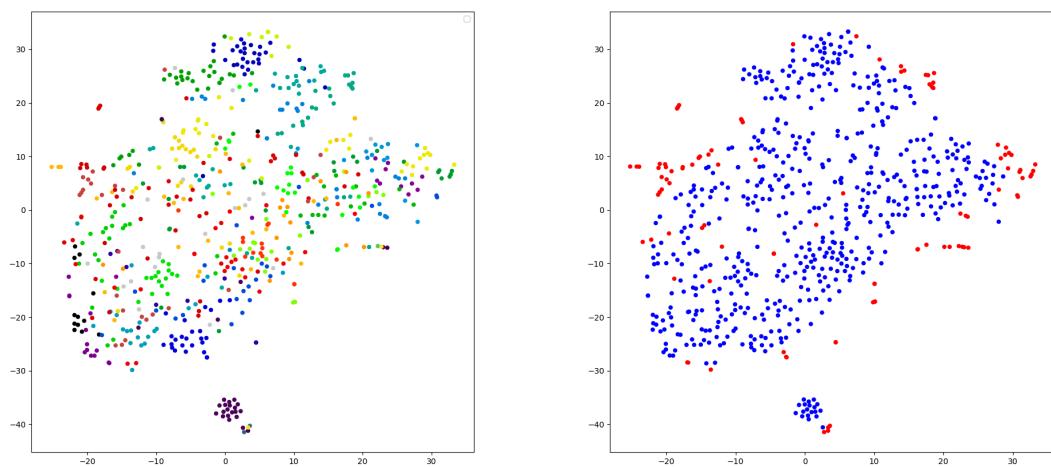
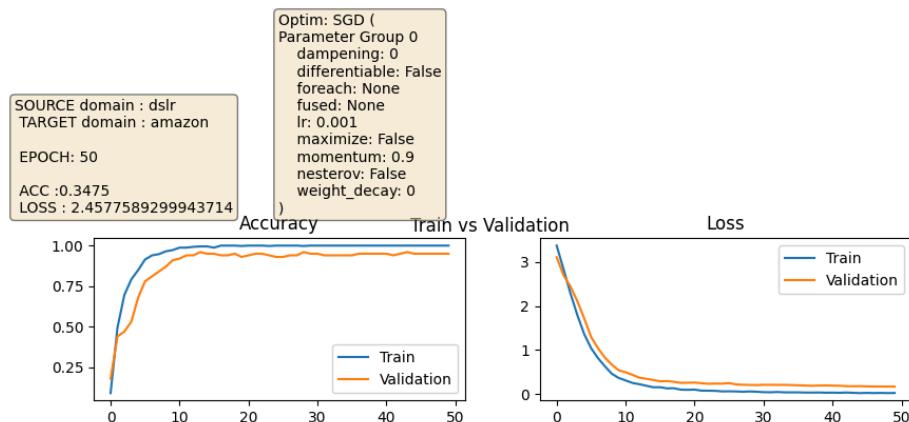
A-distance = tensor(1.0069, device='cuda:0')

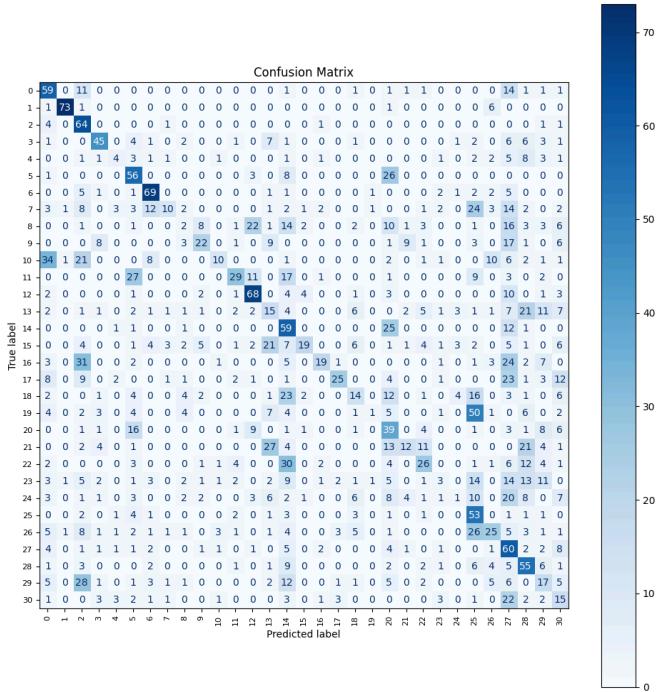
Precision/Recall/F-beta score: (0.5541692758673892, 0.49056603773584906,

0.4808802226671262, None)

NMI score: 0.7099778951881403, RI score: 0.2923106888636341

D->A





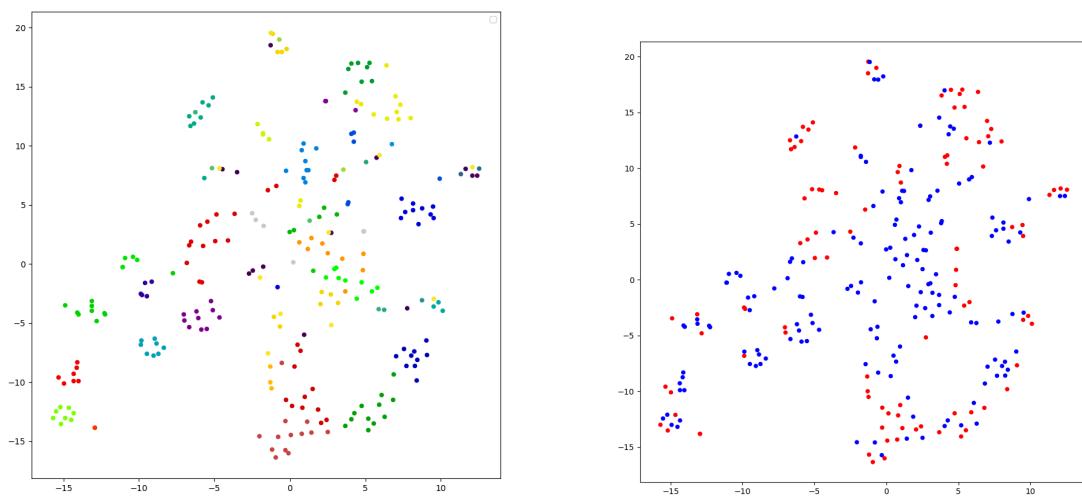
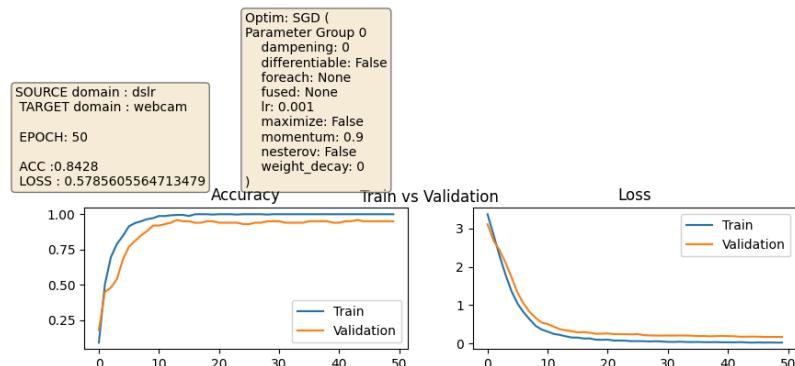
Precision/Recall/F-beta score: (0.38704690972866546, 0.3475177304964539,

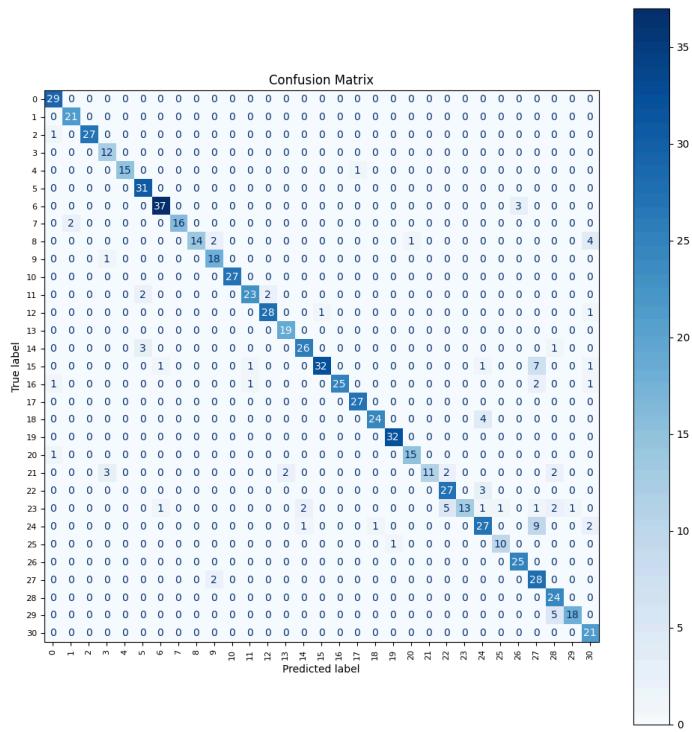
0.32081747617371303, None)

NMI score: 0.46304489516068337, RI score: 0.16321107573456992

A-distance = tensor(1.8195, device='cuda:0')

D->W





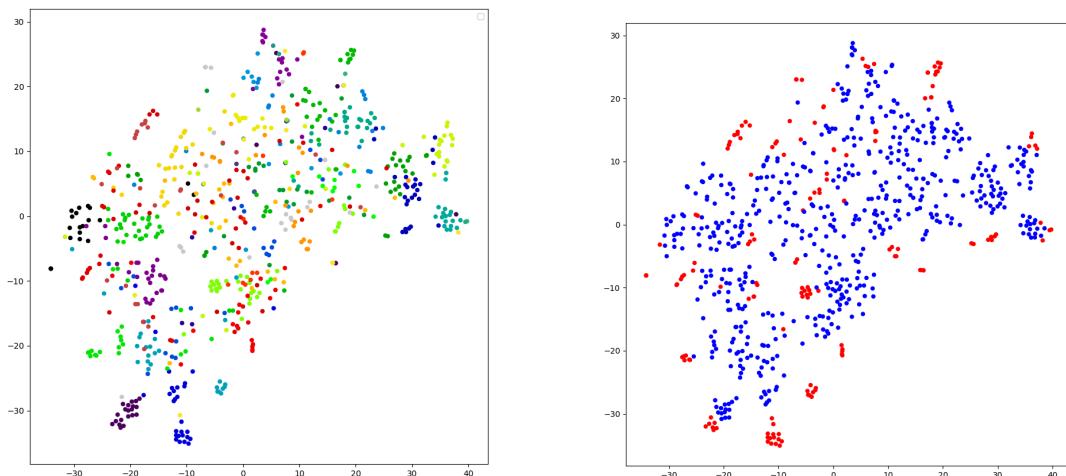
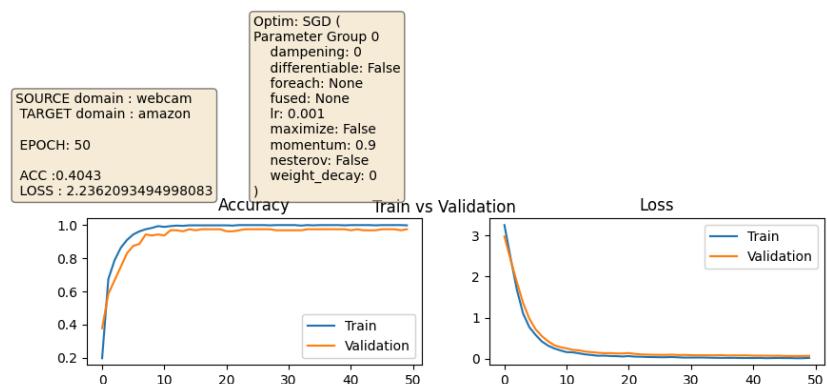
Precision/Recall/F-beta score: (0.882744334631127, 0.8427672955974843,

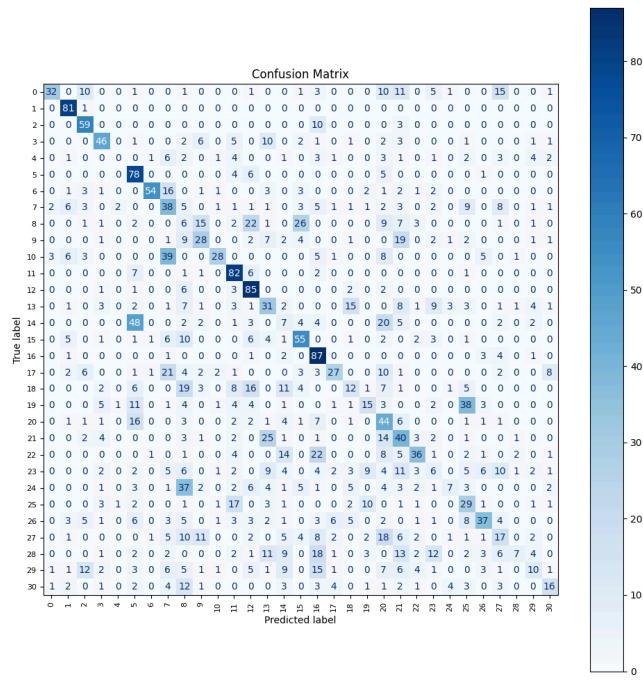
0.8331274390097919, None)

NMI score: 0.8968155612537992, RI score: 0.7066957065217084

A-distance = tensor(0.4615, device='cuda:0')

W->A





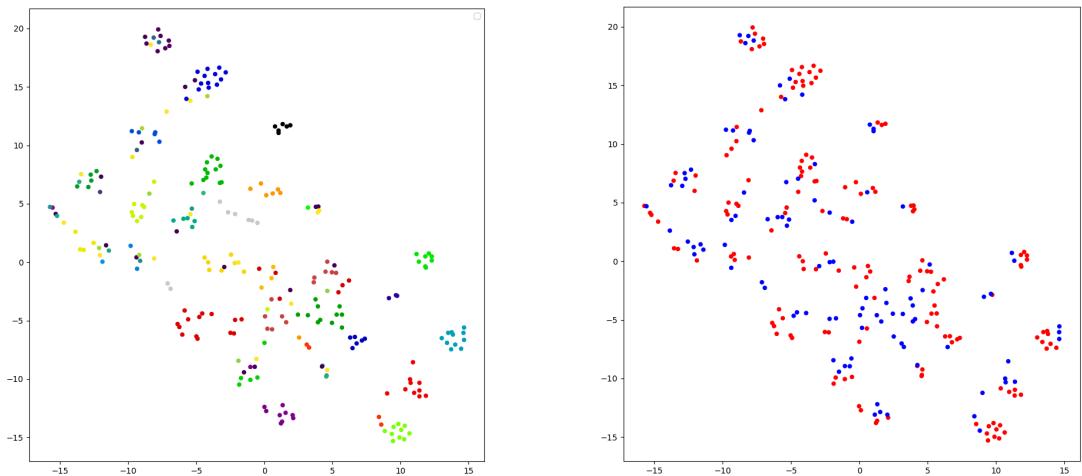
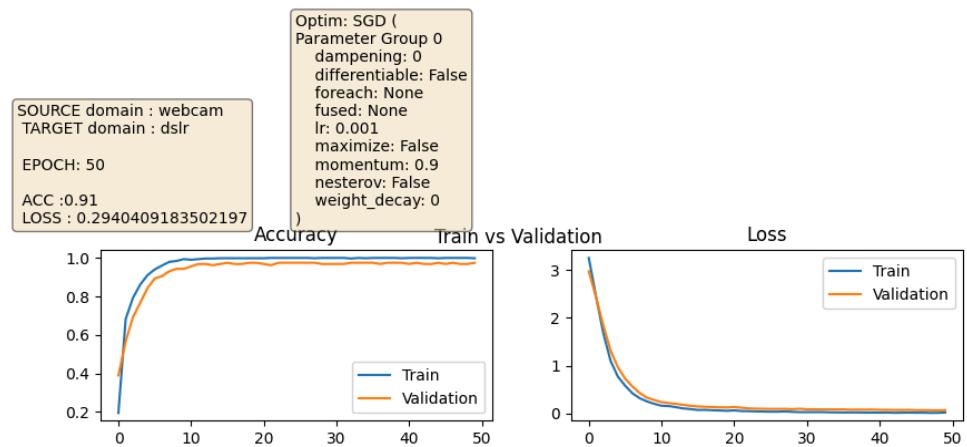
Precision/Recall/F-beta score: (0.42083121317654765, 0.40425531914893614,

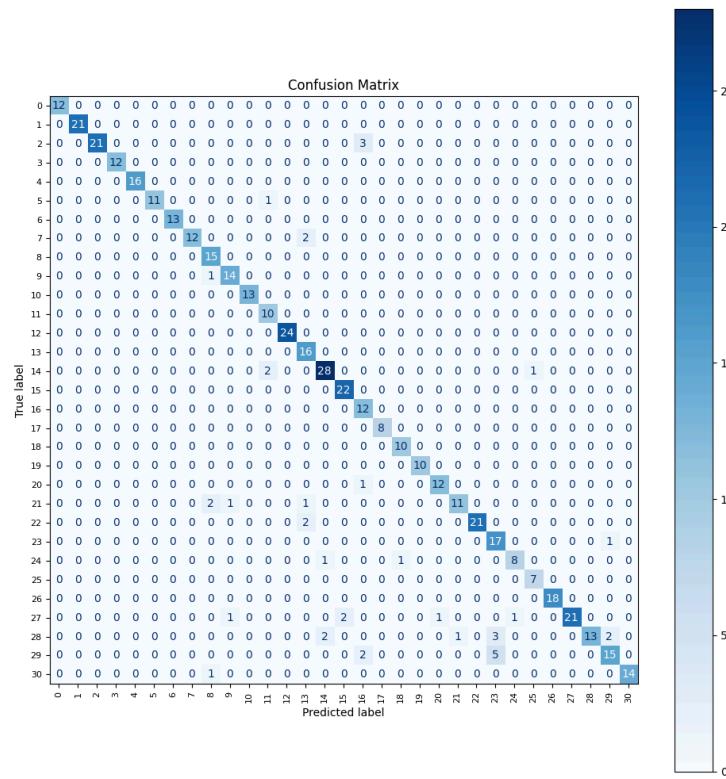
0.37483801706862496, None)

NMI score: 0.5092990453565536, RI score: 0.23829293879700175

A-distance = tensor(1.6690, device='cuda:0')

W->D





Precision/Recall/F-beta score: (0.9404523809523809, 0.91, 0.9115491175491175, None)

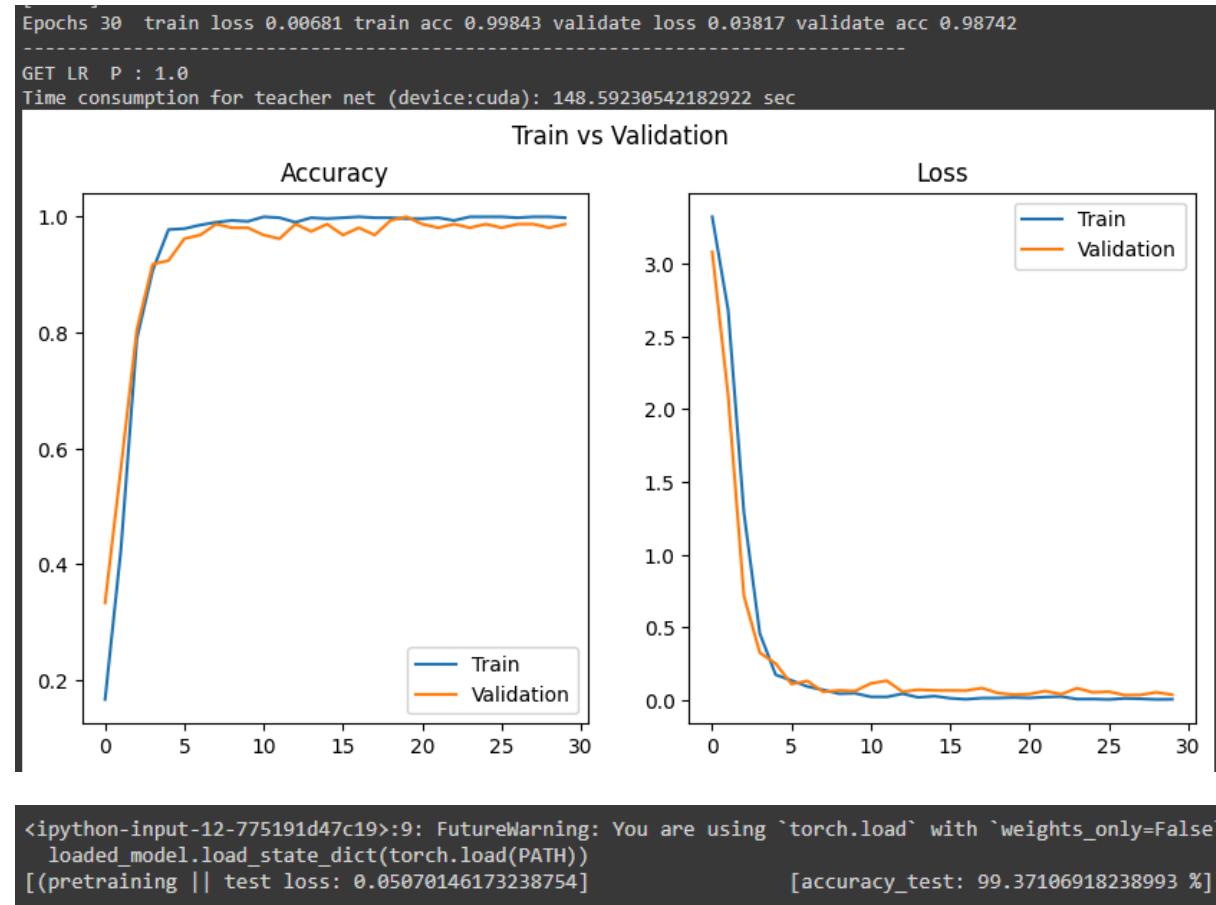
NMI score: 0.9418696993425849, RI score: 0.8119534052329138

A-distance = tensor(1., device='cuda:0')

Model Reference

W->D

Teacher



```
<ipython-input-12-775191d47c19>:9: FutureWarning: You are using `torch.load` with `weights_only=False`  
loaded_model.load_state_dict(torch.load(PATH))  
[(pretraining || test loss: 0.05070146173238754] [accuracy_test: 99.37106918238993 %]
```

Student

```
Total params: 2,542,856  
Trainable params: 2,542,856  
Non-trainable params: 0
-----
Input size (MB): 0.57  
Forward/backward pass size (MB): 34.61  
Params size (MB): 9.70  
Estimated Total Size (MB): 44.88
-----
Number of FLOPs: 0.116322 GFLOPs (116.32 MFLOPs)  
tensor(1.1632e+08, device='cuda:0')
```

```

Sparsity in r_allpruned[0][0].weight: 14.35%
Sparsity in f_allpruned[1].block[0][0].weight: 9.72%
Sparsity in f_allpruned[1].block[2][0].weight: 19.14%
Sparsity in f_allpruned[2].block[0][0].weight: 21.27%
Sparsity in f_allpruned[2].block[1][0].weight: 15.43%
Sparsity in f_allpruned[2].block[2][0].weight: 23.55%
Sparsity in f_allpruned[3].block[0][0].weight: 36.36%
Sparsity in f_allpruned[3].block[1][0].weight: 33.96%
Sparsity in f_allpruned[3].block[2][0].weight: 30.63%
Sparsity in f_allpruned[4].block[0][0].weight: 18.71%
Sparsity in f_allpruned[4].block[1][0].weight: 33.38%
Sparsity in f_allpruned[4].block[3][0].weight: 11.54%
Sparsity in f_allpruned[5].block[0][0].weight: 19.54%
Sparsity in f_allpruned[5].block[1][0].weight: 62.06%
Sparsity in f_allpruned[5].block[3][0].weight: 21.93%
Sparsity in f_allpruned[6].block[0][0].weight: 19.61%
Sparsity in f_allpruned[6].block[1][0].weight: 52.47%
Sparsity in f_allpruned[6].block[3][0].weight: 18.29%
Sparsity in f_allpruned[7].block[0][0].weight: 15.17%
Sparsity in f_allpruned[7].block[1][0].weight: 56.57%
Sparsity in f_allpruned[7].block[3][0].weight: 14.86%
Sparsity in f_allpruned[8].block[0][0].weight: 18.21%
Sparsity in f_allpruned[8].block[1][0].weight: 48.00%
Sparsity in f_allpruned[8].block[3][0].weight: 20.23%
Sparsity in f_allpruned[9].block[0][0].weight: 16.35%
Sparsity in f_allpruned[9].block[1][0].weight: 35.19%
Sparsity in f_allpruned[9].block[3][0].weight: 18.53%
Sparsity in f_allpruned[10].block[0][0].weight: 26.43%
Sparsity in f_allpruned[10].block[1][0].weight: 54.33%
Sparsity in f_allpruned[10].block[3][0].weight: 27.53%
Sparsity in f_allpruned[11].block[0][0].weight: 25.16%
Sparsity in f_allpruned[11].block[1][0].weight: 53.66%
Sparsity in f_allpruned[11].block[3][0].weight: 25.84%
Sparsity in f_allpruned[12][0].weight: 21.16%
Sparsity in f_allpruned[1].block[1].fc1.weight: 100.00%
Sparsity in f_allpruned[1].block[1].fc2.weight: 100.00%
Sparsity in f_allpruned[4].block[2].fc1.weight: 96.48%
Sparsity in f_allpruned[4].block[2].fc2.weight: 95.96%
Sparsity in f_allpruned[5].block[2].fc1.weight: 31.89%
Sparsity in f_allpruned[5].block[2].fc2.weight: 28.76%
Sparsity in f_allpruned[6].block[2].fc1.weight: 31.38%
Sparsity in f_allpruned[6].block[2].fc2.weight: 29.43%
Sparsity in f_allpruned[7].block[2].fc1.weight: 81.93%
Sparsity in f_allpruned[7].block[2].fc2.weight: 84.92%
Sparsity in f_allpruned[8].block[2].fc1.weight: 24.95%
Sparsity in f_allpruned[8].block[2].fc2.weight: 21.34%
Sparsity in f_allpruned[9].block[2].fc1.weight: 29.24%
Sparsity in f_allpruned[9].block[2].fc2.weight: 29.96%

```

Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)

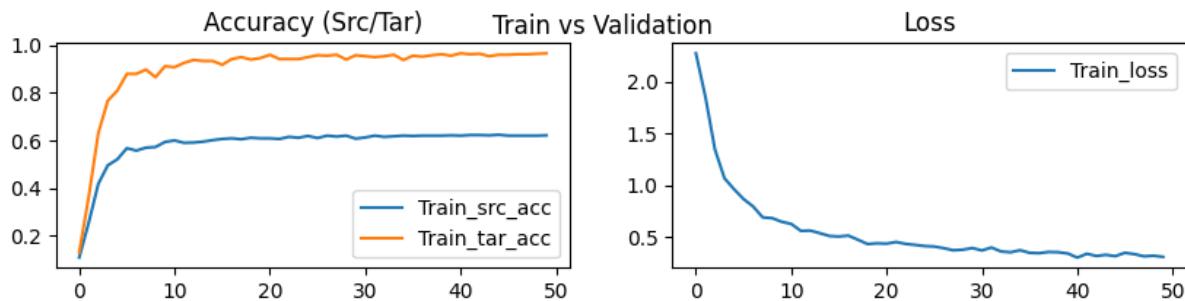
GET_LB = 0.1, 0.2

```

=====
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0

Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09

```



```

=====
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0

Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09

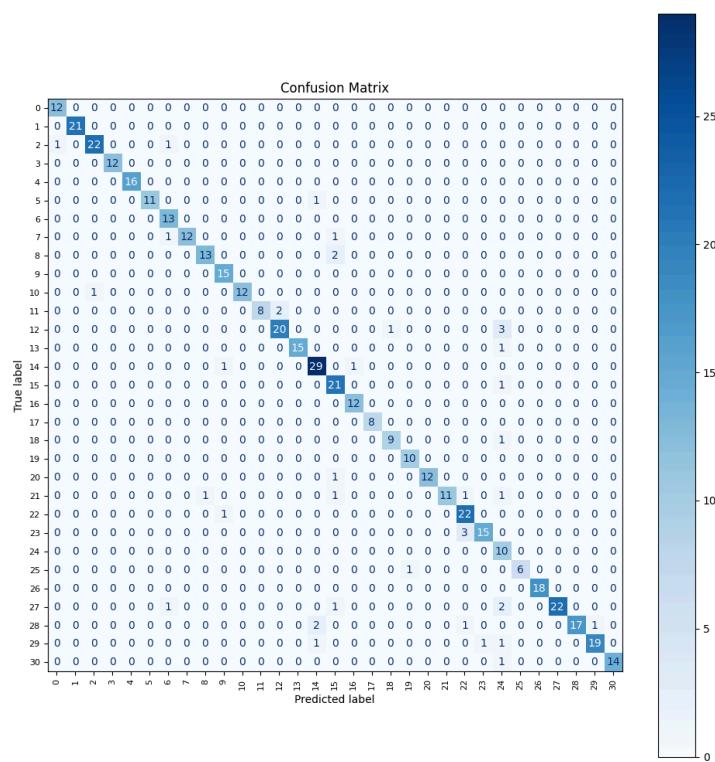
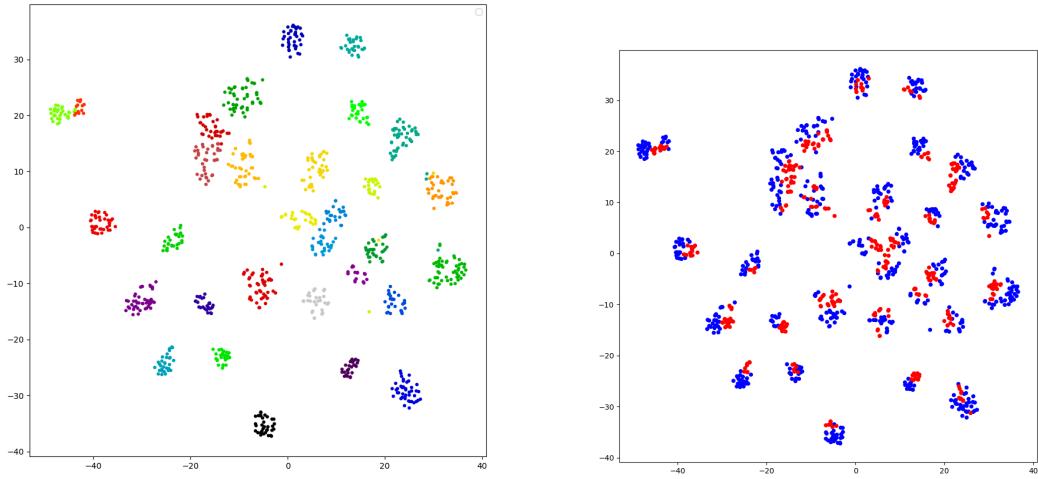
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)
<ipython-input-62-64f0b4ffcd4>:8: FutureWarning: You are using `torch.load` with
    loaded_model.load_state_dict(torch.load(PATH))
[(pretraining || test loss: 1.0291666984558105] [accuracy_test: 97.0 %]

```

```

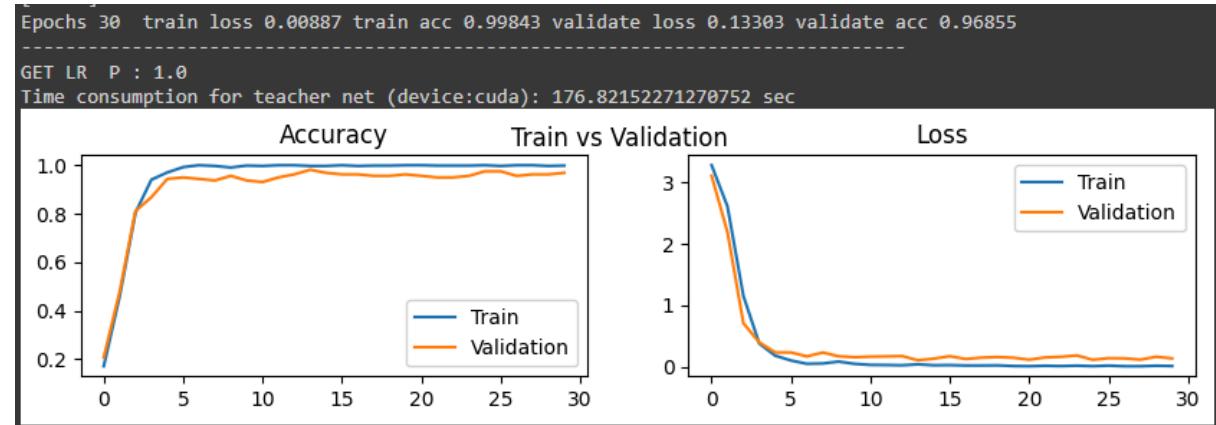
Precision/Recall/F-beta score: (0.4658130324861245, 0.4166666666666667, 0.4062974422186133, None)
NMI score: 0.534312731412937, RI score: 0.2246021842028528
100%|██████████| 20/20 [00:01<00:00, 10.71it/s]
100%|██████████| 71/71 [00:03<00:00, 19.89it/s]
epoch 0 accuracy: 76.9896240234375 A-dist: 1.0795848369598389
epoch 1 accuracy: 78.0276870727539 A-dist: 1.1211073398590088
epoch 2 accuracy: 78.54671478271484 A-dist: 1.1418685913085938
epoch 3 accuracy: 79.23875427246094 A-dist: 1.1695501804351807
epoch 4 accuracy: 79.93080139160156 A-dist: 1.1972320079803467
epoch 5 accuracy: 80.27681732177734 A-dist: 1.2110726833343506
epoch 6 accuracy: 79.23875427246094 A-dist: 1.1695501804351807
epoch 7 accuracy: 79.93080139160156 A-dist: 1.1972320079803467
epoch 8 accuracy: 79.23875427246094 A-dist: 1.1695501804351807
epoch 9 accuracy: 79.7577896118164 A-dist: 1.1903114318847656
A-distance = tensor(1.1903, device='cuda:0')

```



W->A

Teacher



```
<ipython-input-38-775191d47c19>:9: FutureWarning: You are using `torch.load` with `weights_only=False`
loaded_model.load_state_dict(torch.load(PATH))
[(pretraining || test loss: 0.12311780576904614] [accuracy_test: 94.9685534591195 %]
```

Student

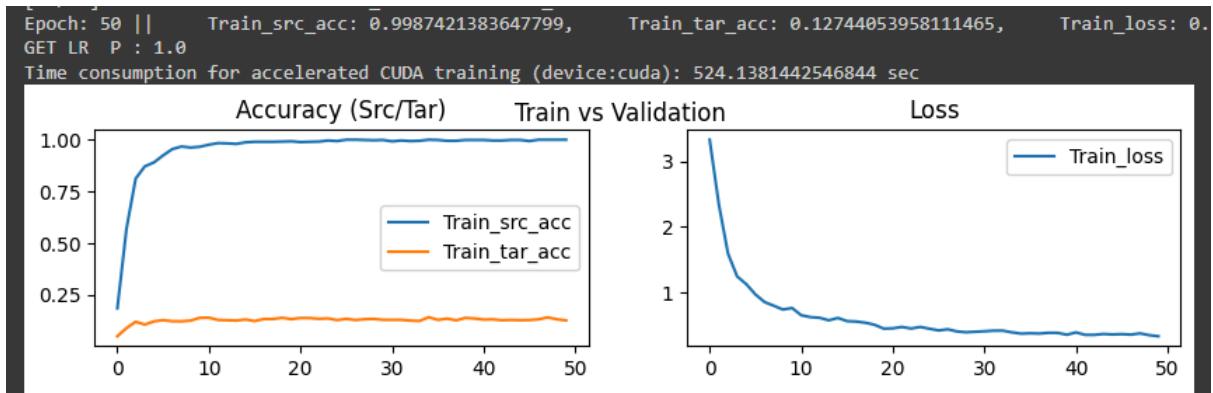
```
=====
Total params: 2,542,856
Trainable params: 2,542,856
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.61
Params size (MB): 9.70
Estimated Total Size (MB): 44.88
-----
Number of FLOPs: 0.116322 GFLOPs (116.32 MFLOPs)
tensor(1.1632e+08, device='cuda:0')
```

```

Sparsity in f_allpruned[1].block[0][0].weight: 9.72%
Sparsity in f_allpruned[1].block[2][0].weight: 19.14%
Sparsity in f_allpruned[2].block[0][0].weight: 21.27%
Sparsity in f_allpruned[2].block[1][0].weight: 15.43%
Sparsity in f_allpruned[2].block[2][0].weight: 23.55%
Sparsity in f_allpruned[3].block[0][0].weight: 36.36%
Sparsity in f_allpruned[3].block[1][0].weight: 33.96%
Sparsity in f_allpruned[3].block[2][0].weight: 30.63%
Sparsity in f_allpruned[4].block[0][0].weight: 18.71%
Sparsity in f_allpruned[4].block[1][0].weight: 33.38%
Sparsity in f_allpruned[4].block[3][0].weight: 11.54%
Sparsity in f_allpruned[5].block[0][0].weight: 19.54%
Sparsity in f_allpruned[5].block[1][0].weight: 62.00%
Sparsity in f_allpruned[5].block[3][0].weight: 21.93%
Sparsity in f_allpruned[6].block[0][0].weight: 19.61%
Sparsity in f_allpruned[6].block[1][0].weight: 52.47%
Sparsity in f_allpruned[6].block[3][0].weight: 18.29%
Sparsity in f_allpruned[7].block[0][0].weight: 15.17%
Sparsity in f_allpruned[7].block[1][0].weight: 56.57%
Sparsity in f_allpruned[7].block[3][0].weight: 14.86%
Sparsity in f_allpruned[8].block[0][0].weight: 18.21%
Sparsity in f_allpruned[8].block[1][0].weight: 48.00%
Sparsity in f_allpruned[8].block[3][0].weight: 20.23%
Sparsity in f_allpruned[9].block[0][0].weight: 16.35%
Sparsity in f_allpruned[9].block[1][0].weight: 35.19%
Sparsity in f_allpruned[9].block[3][0].weight: 18.53%
Sparsity in f_allpruned[10].block[0][0].weight: 26.43%
Sparsity in f_allpruned[10].block[1][0].weight: 54.33%
Sparsity in f_allpruned[10].block[3][0].weight: 27.53%
Sparsity in f_allpruned[11].block[0][0].weight: 25.10%
Sparsity in f_allpruned[11].block[1][0].weight: 53.60%
Sparsity in f_allpruned[11].block[3][0].weight: 25.84%
Sparsity in f_allpruned[12][0].weight: 21.10%
Sparsity in f_allpruned[1].block[1].fc1.weight: 100.00%
Sparsity in f_allpruned[1].block[1].fc2.weight: 100.00%
Sparsity in f_allpruned[4].block[2].fc1.weight: 96.48%
Sparsity in f_allpruned[4].block[2].fc2.weight: 95.96%
Sparsity in f_allpruned[5].block[2].fc1.weight: 31.89%
Sparsity in f_allpruned[5].block[2].fc2.weight: 28.76%
Sparsity in f_allpruned[6].block[2].fc1.weight: 31.38%
Sparsity in f_allpruned[6].block[2].fc2.weight: 29.43%
Sparsity in f_allpruned[7].block[2].fc1.weight: 81.93%
Sparsity in f_allpruned[7].block[2].fc2.weight: 84.92%
Sparsity in f_allpruned[8].block[2].fc1.weight: 24.95%
Sparsity in f_allpruned[8].block[2].fc2.weight: 21.34%
Sparsity in f_allpruned[9].block[2].fc1.weight: 29.24%
Sparsity in f_allpruned[9].block[2].fc2.weight: 29.98%
Sparsity in f_allpruned[1].block[1].fc1.weight: 31.50%
=====

Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09
-----
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)

```



```

NUMBER OF FLOPS: 0.087275 GFLOPS (87.27 MFLOPs)
<ipython-input-43-ea23060d7a90>:8: FutureWarning: You are using `torch.load`  

loaded_model.load_state_dict(torch.load(PATH))  

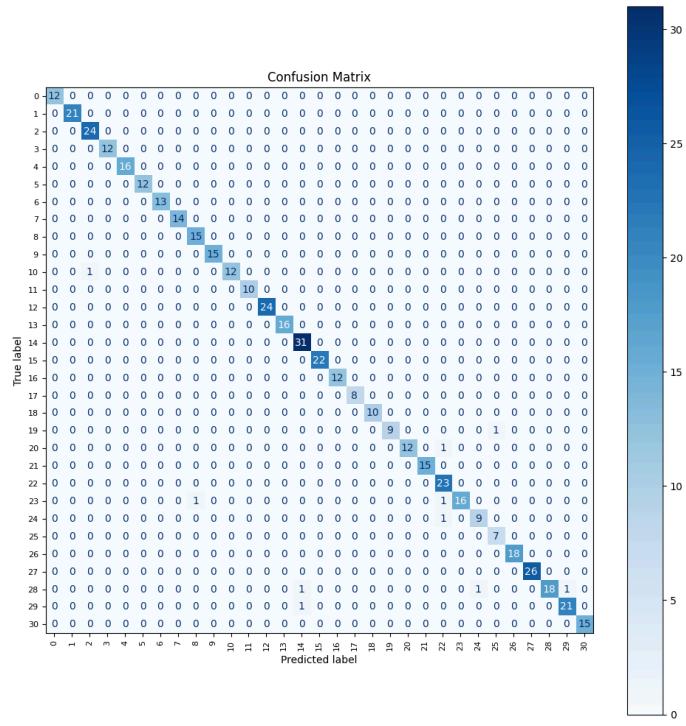
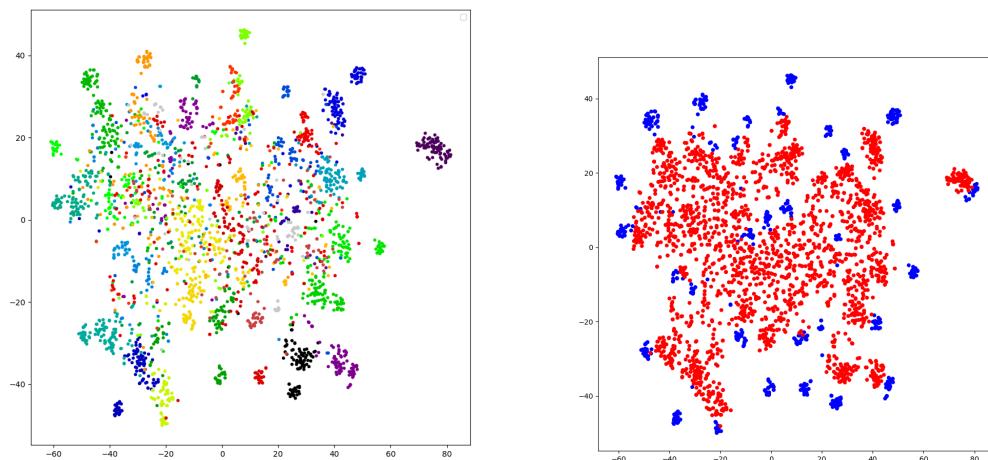
[(pretraining || test loss: 2.432459831237793] [accuracy_test: 43.62 %]

```

```

Precision/Recall/F-beta score: (0.4629829206799966, 0.43617021276595747, 0.41779763435708595, None)
NMI score: 0.5440785047524843, RI score: 0.24377573630088978
100% |██████████| 20/20 [00:03<00:00, 5.99it/s]
100% |██████████| 71/71 [00:14<00:00, 5.07it/s]
epoch 0 accuracy: 76.81661224365234 A-dist: 1.072664499282837
epoch 1 accuracy: 77.50865173339844 A-dist: 1.1003460884094238
epoch 2 accuracy: 77.6816635131836 A-dist: 1.1072664260864258
epoch 3 accuracy: 77.50865173339844 A-dist: 1.1003460884094238
epoch 4 accuracy: 78.0276870727539 A-dist: 1.1211073398590088
epoch 5 accuracy: 79.06575012207031 A-dist: 1.1626298427581787
epoch 6 accuracy: 78.20069122314453 A-dist: 1.1280276775360107
epoch 7 accuracy: 77.85467529296875 A-dist: 1.1141870021820068
epoch 8 accuracy: 77.85467529296875 A-dist: 1.1141870021820068
epoch 9 accuracy: 78.20069122314453 A-dist: 1.1280276775360107
A-distance = tensor(1.1280, device='cuda:0')

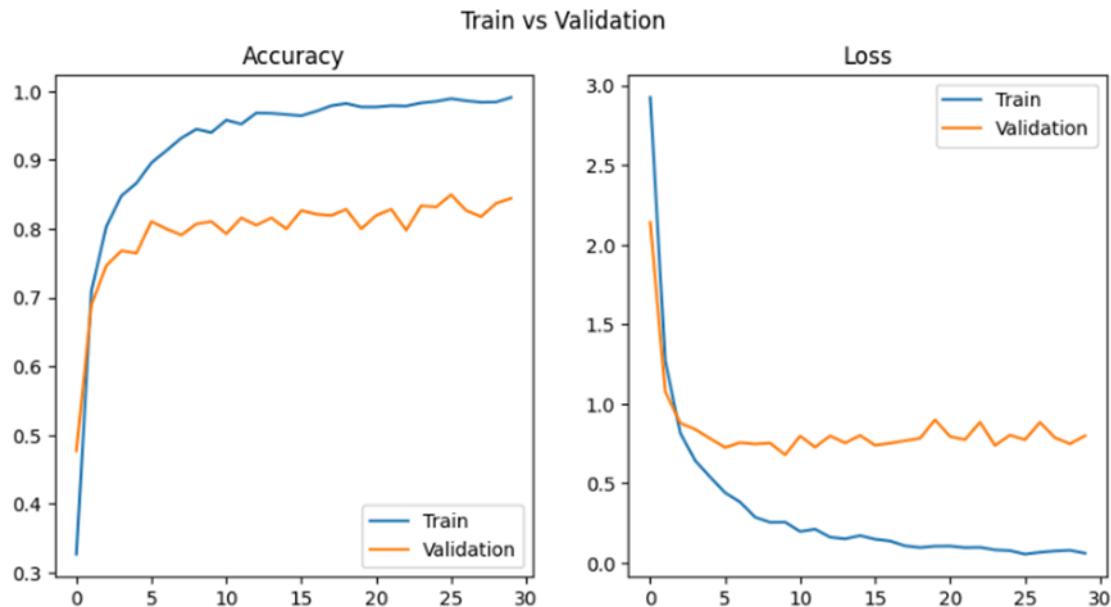
```



A->D

Teacher

```
Epochs 30  train loss 0.06095 train acc 0.99068 validate loss 0.79898 validate acc 0.84397
-----
GET LR P : 1.0
Time consumption for teacher net (device:cuda): 159.64831161499023 sec
```



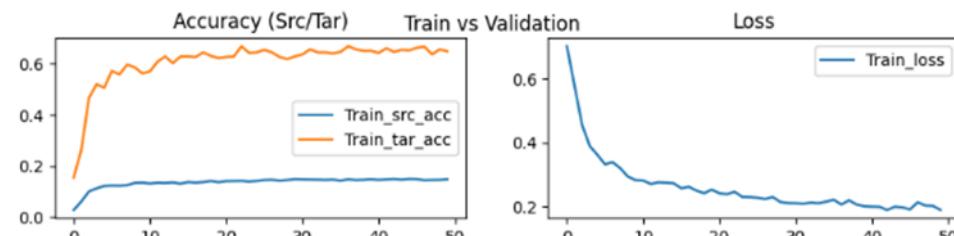
```
Total params: 4,241,743  
Trainable params: 4,241,743  
Non-trainable params: 0  
-----  
Input size (MB): 0.57  
Forward/backward pass size  
Params size (MB): 16.18  
Estimated Total Size (MB):
```

```
<ipython-input-21-775191d47c19>:9: FutureWarning: You are using `torch.load` with `weights_only=False`  
    loaded_model.load_state_dict(torch.load(PATH))  
[(pretraining || test loss: 0.8253935178120931] [accuracy_test: 82.446805106383 %]
```

Student

```
Sparsity in f_allpruned[0][0].weight: 14.35%
Sparsity in f_allpruned[1].block[0][0].weight: 9.72%
Sparsity in f_allpruned[1].block[2][0].weight: 19.14%
Sparsity in f_allpruned[2].block[0][0].weight: 21.27%
Sparsity in f_allpruned[2].block[1][0].weight: 15.43%
Sparsity in f_allpruned[2].block[2][0].weight: 23.55%
Sparsity in f_allpruned[3].block[0][0].weight: 36.36%
Sparsity in f_allpruned[3].block[1][0].weight: 33.96%
Sparsity in f_allpruned[3].block[2][0].weight: 30.63%
Sparsity in f_allpruned[4].block[0][0].weight: 18.71%
Sparsity in f_allpruned[4].block[1][0].weight: 33.38%
Sparsity in f_allpruned[4].block[3][0].weight: 11.54%
Sparsity in f_allpruned[5].block[0][0].weight: 19.54%
Sparsity in f_allpruned[5].block[1][0].weight: 62.00%
Sparsity in f_allpruned[5].block[3][0].weight: 21.93%
Sparsity in f_allpruned[6].block[0][0].weight: 19.61%
Sparsity in f_allpruned[6].block[1][0].weight: 52.47%
Sparsity in f_allpruned[6].block[3][0].weight: 18.29%
Sparsity in f_allpruned[7].block[0][0].weight: 15.17%
Sparsity in f_allpruned[7].block[1][0].weight: 56.57%
Sparsity in f_allpruned[7].block[3][0].weight: 14.86%
Sparsity in f_allpruned[8].block[0][0].weight: 18.21%
Sparsity in f_allpruned[8].block[1][0].weight: 48.00%
Sparsity in f_allpruned[8].block[3][0].weight: 20.23%
Sparsity in f_allpruned[9].block[0][0].weight: 16.35%
Sparsity in f_allpruned[9].block[1][0].weight: 35.19%
Sparsity in f_allpruned[9].block[3][0].weight: 18.53%
Sparsity in f_allpruned[10].block[0][0].weight: 26.43%
Sparsity in f_allpruned[10].block[1][0].weight: 54.33%
Sparsity in f_allpruned[10].block[3][0].weight: 27.53%
Sparsity in f_allpruned[11].block[0][0].weight: 25.10%
Sparsity in f_allpruned[11].block[1][0].weight: 53.60%
Sparsity in f_allpruned[11].block[3][0].weight: 25.84%
Sparsity in f_allpruned[12][0].weight: 21.10%
Sparsity in f_allpruned[1].block[1].fc1.weight: 100.00%
Sparsity in f_allpruned[1].block[1].fc2.weight: 100.00%
Sparsity in f_allpruned[4].block[2].fc1.weight: 96.48%
Sparsity in f_allpruned[4].block[2].fc2.weight: 95.96%
Sparsity in f_allpruned[5].block[2].fc1.weight: 31.89%
Sparsity in f_allpruned[5].block[2].fc2.weight: 28.76%
Sparsity in f_allpruned[6].block[2].fc1.weight: 31.38%
Sparsity in f_allpruned[6].block[2].fc2.weight: 29.43%
Sparsity in f_allpruned[7].block[2].fc1.weight: 81.93%
Sparsity in f_allpruned[7].block[2].fc2.weight: 84.92%
Sparsity in f_allpruned[8].block[2].fc1.weight: 24.95%
Sparsity in f_allpruned[8].block[2].fc2.weight: 21.34%
Sparsity in f_allpruned[9].block[2].fc1.weight: 29.24%
Sparsity in f_allpruned[9].block[2].fc2.weight: 29.90%
Sparsity in f_allpruned[10].block[2].fc1.weight: 34.59%
Sparsity in f_allpruned[10].block[2].fc2.weight: 33.25%
Sparsity in f_allpruned[11].block[2].fc1.weight: 31.85%
Sparsity in f_allpruned[11].block[2].fc2.weight: 29.79%
```

```
[16/16] class loss: 0.5481 CORAL_loss: 0.3435 KD_loss: 0.0000
Epoch: 50 || Train_src_acc: 0.14838480653177138, Train_tar_acc: 0.6485943775100401, Train_loss: 0.18917429112316517
GET LR P : 1.0
Time consumption for accelerated CUDA training (device:cuda): 180.84268856048584 sec
```

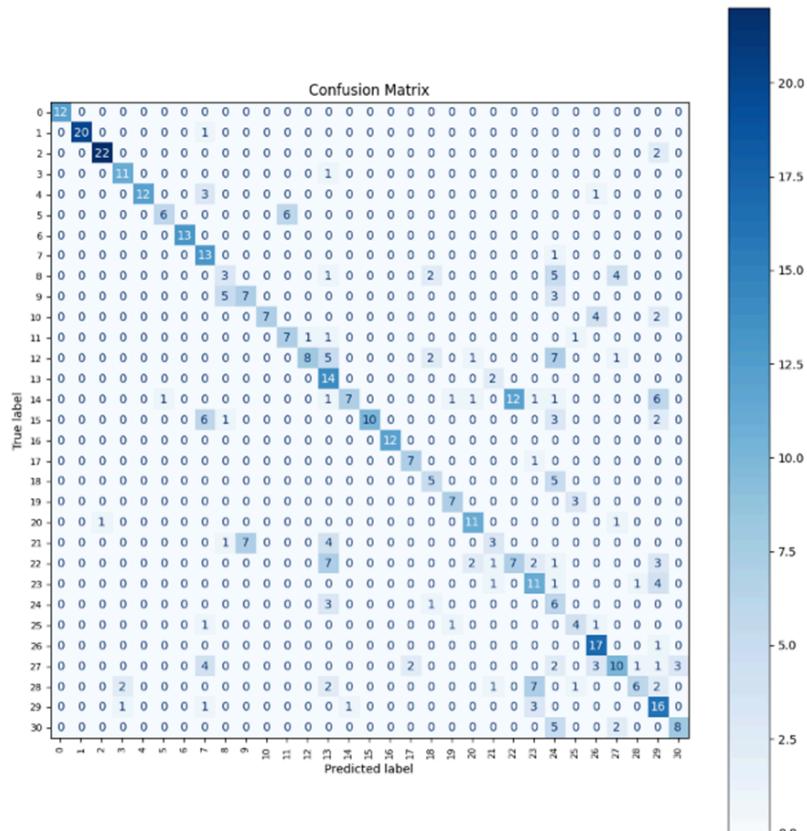
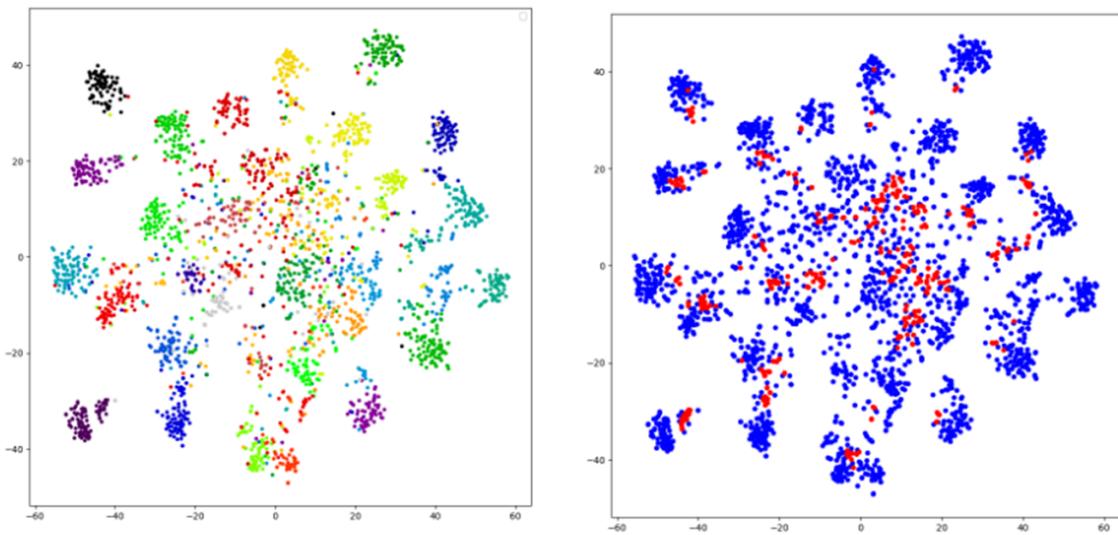


```
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0
```

```
-----  
Input size (MB): 0.57  
Forward/backward pass size (MB): 34.60  
Params size (MB): 5.91  
Estimated Total Size (MB): 41.09
```

```
-----  
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)  
<ipython-input-53-ea23060d7a90>:8: FutureWarning: You are using `torch.load`!  
loaded_model.load_state_dict(torch.load(PATH))  
[(pretraining || test loss: 1.7508724927902222] [accuracy_test: 66.0 %]
```

```
Precision/Recall/F-beta score: (0.7204999999999999, 0.56, 0.5876741591741592, None)
NMI score: 0.7553603385741408, RI score: 0.29689152040600547
100%|██████████| 71/71 [00:04<00:00, 16.09it/s]
100%|██████████| 13/13 [00:02<00:00, 4.87it/s]
epoch 0 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 1 accuracy: 85.49905395507812 A-dist: 1.4199621677398682
epoch 2 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 3 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 4 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 5 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 6 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 7 accuracy: 85.6873779296875 A-dist: 1.427495002746582
epoch 8 accuracy: 85.49905395507812 A-dist: 1.4199621677398682
epoch 9 accuracy: 85.49905395507812 A-dist: 1.4199621677398682
A-distance = tensor(1.4200, device='cuda:0')
<ipython-input-47-6ae620c5f277>:221: UserWarning: *c* argument looks like a single numeric
    plt.scatter(X_tsne[mask, 0], X_tsne[mask, 1], c=cmap_s(label), s=10,
WARNING:matplotlib.legend:No artists with labels found to put in legend. Note that artist:
saving t-SNE to ./output/W5-3_tsNE.png
```



```
Optimized model FP32 bench testing...
***** EP Error *****
EP Error /onnxruntime_src/onnxruntime/python/onnxruntime_pybind_state.cc:490 void onnxruntime::python::RegisterTensorProvider()
when using ['TensorrtExecutionProvider', 'CUDAExecutionProvider', 'CPUExecutionProvider']
Falling back to ['CUDAExecutionProvider', 'CPUExecutionProvider'] and retrying.
*****
start inferencing...FP32
Tensor FPS [FP32]: 303.39
Speedup: 4.97x
```

```
ONNXRuntime [FP32] Output length: 1
ONNXRuntime [FP32] Sample output: [[ 0.28205708 -0.12034966 -0.4634714 -0.3286803 -0.11172116 -0.38233197
  0.26170397 0.44066855 -1.0477519 -0.27273166 -0.6568503 -0.10655535
 -0.46334922 -0.40434927 -0.2857525 -0.05018425 -0.11455899 -0.45145398
 2.0548217 0.11790843 -0.60774976 -1.2432163 -0.8301675 1.5726347
 0.12868254 1.306679 1.4181204 0.17880589 -0.16210826 -0.32256067
 0.7159667 ]]

ONNXRuntime [FP32] Sample output type: float32
```

```
Optimized model FP16 bench testing...
***** EP Error *****
EP Error /onnxruntime_src/onnxruntime/python/onnxruntime_pybind_state.cc:490 void onnxruntime::python::RegisterTensorProvider()
when using ['TensorrtExecutionProvider', 'CUDAExecutionProvider', 'CPUExecutionProvider']
Falling back to ['CUDAExecutionProvider', 'CPUExecutionProvider'] and retrying.
*****
start inferencing...FP16
Tensor FPS [FP16]: 339.05
Speedup: 6.27x
```

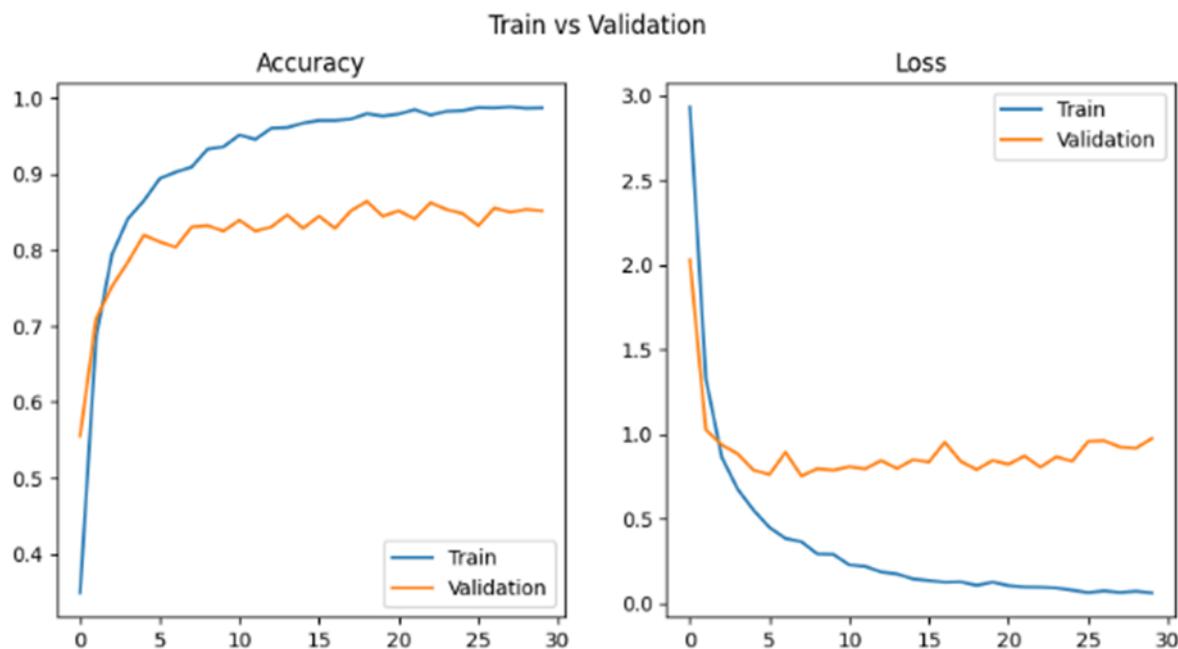
```
ONNXRuntime [FP16] Output length: 1
ONNXRuntime [FP16] Sample output: [[ 0.1836 -0.1383 -0.5244 -0.2957 -0.1704 -0.01099 0.2686 -0.1503
 -1.108 -0.8516 -0.1881 -0.0746 -1.118 0.0686 -0.441 -0.5547
 -0.1136 -0.2223 1.598 0.392 -0.768 -0.915 -0.4712 2.035
 0.5527 1.656 1.835 0.1461 -0.341 -0.712 0.1436 ]]

ONNXRuntime [FP16] Sample output type: float16
```

A>W

Teacher

```
Epochs 30  train loss 0.06122 train acc 0.98624 validate loss 0.97334 validate acc 0.85106
-----
GET LR P : 1.0
Time consumption for teacher net (device:cuda): 167.5718641281128 sec
```

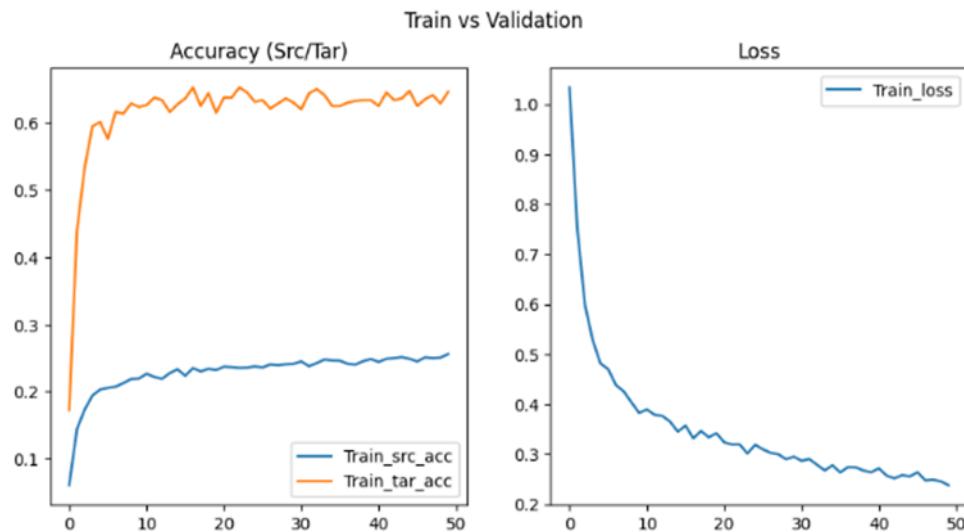


```
<ipython-input-12-775191d47c19>:9: FutureWarning: You are using `torch.load` with `weights_only=False` (the
loaded_model.load_state_dict(torch.load(PATH))
[(pretraining || test loss: 0.9993710517883301] [accuracy_test: 83.15602836879432 %]
```

Student

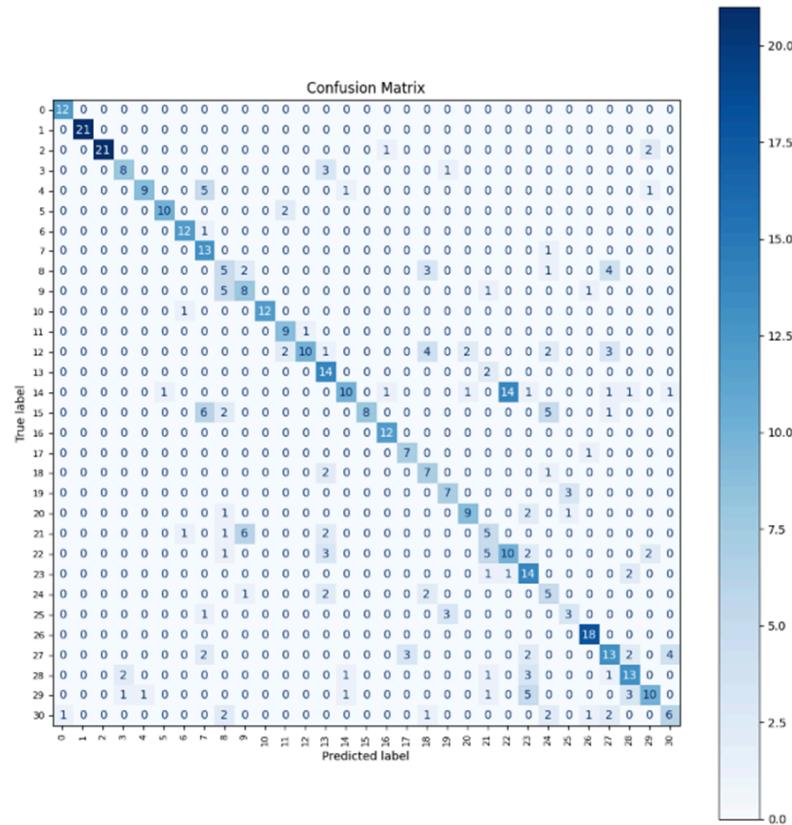
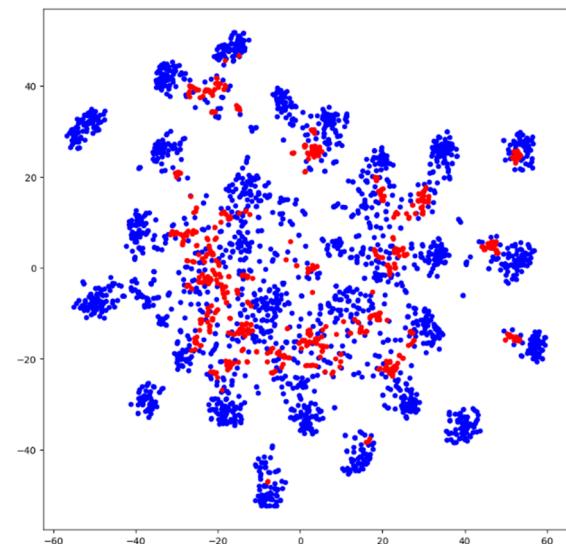
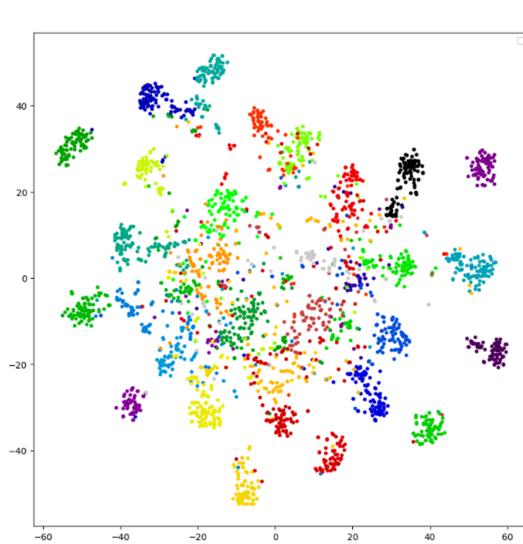
```
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09
-----
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)
```

```
Epoch: 50 || Train_src_acc: 0.2559460418885339, Train_tar_acc: 0.6465408805031446, Train_loss: 0.23827643809693583  
GET LR P : 1.0  
Time consumption for accelerated CUDA training (device:cuda): 202.74786758422852 sec
```



```
<ipython-input-18-ea23060d7a90>:8: FutureWarning: You are using `torch.load`  
loaded_model.load_state_dict(torch.load(PATH))  
[(pretraining || test loss: 1.9013595581054688] [accuracy_test: 61.01 %]
```

```
Precision/Recall/F-beta score: (0.6906479439498306, 0.610062893081761, 0.6134584667603534, None)  
NMI score: 0.755870369871111, RI score: 0.4707664108976056  
100%|██████████| 71/71 [00:04<00:00, 16.75it/s]  
100%|██████████| 20/20 [00:01<00:00, 11.38it/s]  
epoch 0 accuracy: 78.7197265625 A-dist: 1.1487889289855957  
epoch 1 accuracy: 78.20069122314453 A-dist: 1.1280276775360107  
epoch 2 accuracy: 78.37370300292969 A-dist: 1.1349480152130127  
epoch 3 accuracy: 76.81661224365234 A-dist: 1.072664499282837  
epoch 4 accuracy: 78.37370300292969 A-dist: 1.1349480152130127  
epoch 5 accuracy: 76.64360046386719 A-dist: 1.0657439231872559  
epoch 6 accuracy: 78.20069122314453 A-dist: 1.1280276775360107  
epoch 7 accuracy: 76.47058868408203 A-dist: 1.058823585510254  
epoch 8 accuracy: 78.54671478271484 A-dist: 1.1418685913085938  
epoch 9 accuracy: 78.0276870727539 A-dist: 1.1211073398590088  
A-distance = tensor(1.1211, device='cuda:0')  
<ipython-input-19-6ae620c5f277>:221: UserWarning: *c* argument looks like a single numeric RGB or R  
plt.scatter(X_tsne[mask, 0], X_tsne[mask, 1], c=cmap_s(label), s=10,  
WARNING:matplotlib.legend:No artists with labels found to put in legend. Note that artists whose l:  
Saving t-SNE to ./output/W5-3_tsNE.png
```



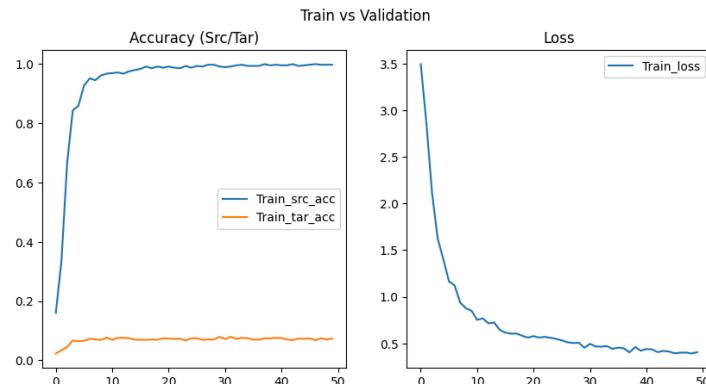
D->A

Student

```
Linear-161           [-1, 1000]      1,025,000
=====
Total params: 2,542,856
Trainable params: 2,542,856
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.61
Params size (MB): 9.70
Estimated Total Size (MB): 44.88
-----
Number of FLOPs: 0.116322 GFLOPs (116.32 MFLOPs)
tensor(1.1632e+08, device='cuda:0')
```

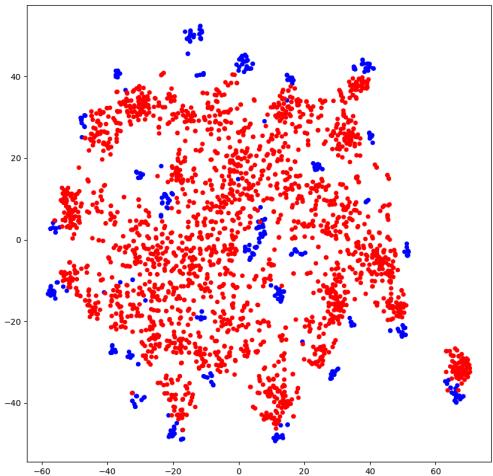
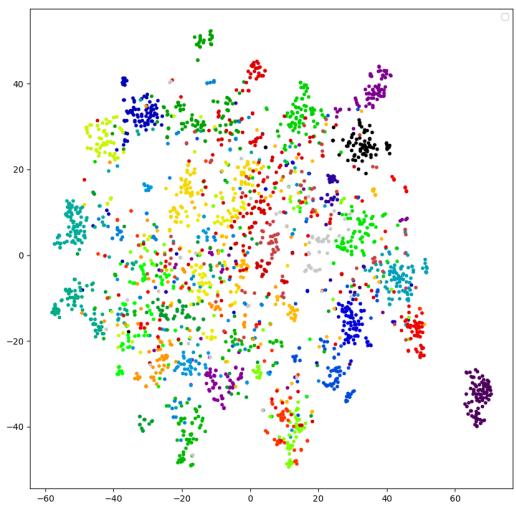
```
[16/16] class loss: 0.2306 CORAL_loss: 0.3092 KD_loss: 0.0000
Epoch: 50 || Train_src_acc: 0.997991967814859, Train_tar_acc: 0.07383741569045084, Train_loss: 0.405526464805007
GET LR P : 1.0
Time consumption for accelerated CUDA training (device:cuda): 481.3158938884735 sec
```

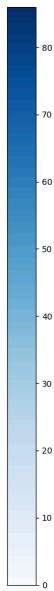
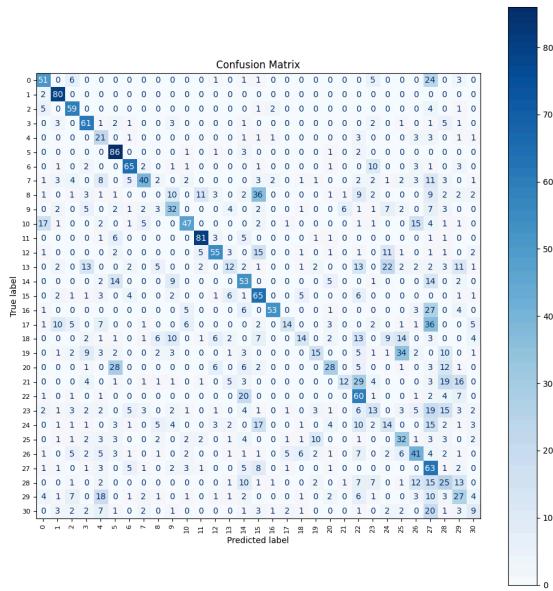
Train vs Validation



```
Dropout-159          [-1, 1024]      0
Dropout-160          [-1, 1024]      0
Linear-161           [-1, 31]        31,775
=====
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09
-----
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)
<ipython-input-25-ea23866d7a90>:8: FutureWarning: You are using `torch.load` with `weights_only=False` (the current default value), which uses the default pickle module implicitly.
loaded_model.load_state_dict(torch.load(PATH))
[pretraining || test loss: 2.560088872909546] [accuracy_test: 43.44 %]
```

```
Precision/Recall/F-beta score: (0.46083066290671076, 0.43439716312056736, 0.4215577917147631, None)
NMI score: 0.5335643026998155, RI score: 0.23991749346550065
100% |██████████| 13/13 [00:04<00:00, 2.83it/s]
100% |██████████| 71/71 [00:09<00:00, 7.16it/s]
epoch 0 accuracy: 83.427490234375 A-dist: 1.337099552154541
```



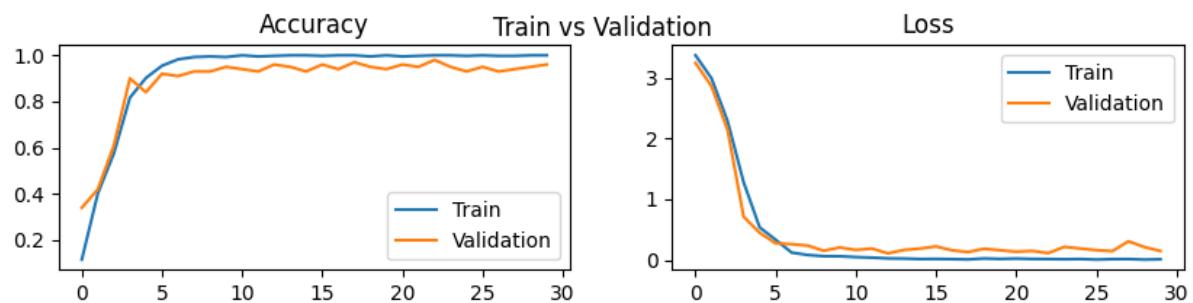


D->W

Teacher

```
Dropout-190           [-1, 1280]          0
Linear-191            [-1, 31]           39,711
=====
Total params: 4,241,743
Trainable params: 4,241,743
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 105.41
Params size (MB): 16.18
Estimated Total Size (MB): 122.16
-----
GET LR P : 0.0
epochs 0001 / 0030
=====
```

```
[13/13] teacher class loss: 0.0040
Epochs 30  train loss 0.01049 train acc 1.00000 validate loss 0.14734 validate acc 0.96000
-----
GET LR P : 1.0
Time consumption for teacher net (device:cuda): 234.44129133224487 sec
```

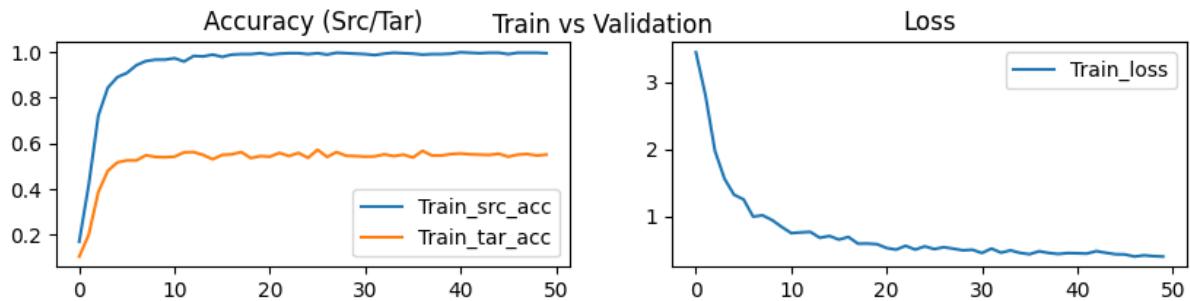


```
44
ipython-input-42-775191d47c19:9: FutureWarning: You are using `torch.load` with `weights_only=False` (the current de-
loaded_model.load_state_dict(torch.load(PATH))
[(pretraining || test loss: 0.21885517984628677] [accuracy_test: 94.0 %]
```

student

```
    Linear-158           [-1, 1024]      590,848
    Hardswish-159         [-1, 1024]          0
    Dropout-160           [-1, 1024]          0
    Linear-161           [-1, 1000]     1,025,000
=====
Total params: 2,542,856
Trainable params: 2,542,856
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.61
Params size (MB): 9.70
Estimated Total Size (MB): 44.88
-----
Number of FLOPs: 0.116322 GFLOPs (116.32 MFLOPs)
tensor(1.1632e+08, device='cuda:0')
```

```
[15/16] class loss: 0.1886 CORAL_loss: 0.1939 KD_loss: 0.0000
[16/16] class loss: 0.1800 CORAL_loss: 0.2512 KD_loss: 0.1307
Epoch: 50 || Train_src_acc: 0.9939759036144579, Train_tar_acc: 0.5509433962264151, Train_loss: 0.39826835319399834
GET LR P : 1.0
Time consumption for accelerated CUDA training (device:cuda): 587.08953166008 sec
```



```
    Hardswish-159         [-1, 1024]          0
    Dropout-160           [-1, 1024]          0
    Linear-161           [-1, 31]       31,775
=====
Total params: 1,549,631
Trainable params: 1,549,631
Non-trainable params: 0
-----
Input size (MB): 0.57
Forward/backward pass size (MB): 34.60
Params size (MB): 5.91
Estimated Total Size (MB): 41.09
-----
Number of FLOPs: 0.087275 GFLOPs (87.27 MFLOPs)
<ipython-input-47-ea23060d7a90>:8: FutureWarning: You are using `torch.load` with `weights_only=False` (the current default value), which uses the default loaded_model.load_state_dict(torch.load(PATH))
[(pretraining || test loss: 1.5429563522338867) [accuracy_test: 86.79 %]]
```

```
Precision/Recall/F-beta score: (0.9106718578416692, 0.8679245283018868, 0.8718748384663069, None)
NMI score: 0.9038479420767159, RI score: 0.7243880396658802
100%|██████████| 13/13 [00:04:00:00,  3.14it/s]
100%|██████████| 20/20 [00:03:00:00,  5.19it/s]
epoch 0 accuracy: 65.70048522949219 A-dist: 0.6280193328857422
epoch 1 accuracy: 64.73429870605469 A-dist: 0.589371919631958
epoch 2 accuracy: 65.70048522949219 A-dist: 0.6280193328857422
epoch 3 accuracy: 68.11594390869114 A-dist: 0.7246377468109131
epoch 4 accuracy: 68.59902954101562 A-dist: 0.7439610955899365
epoch 5 accuracy: 68.59902954101562 A-dist: 0.7439610955899365
epoch 6 accuracy: 66.66666412353516 A-dist: 0.6666665077209473
epoch 7 accuracy: 69.0821280273438 A-dist: 0.7632849216461182
epoch 8 accuracy: 69.56521606445312 A-dist: 0.7826085090637207
epoch 9 accuracy: 67.63285064697266 A-dist: 0.7053139209747314
A-distance = tensor(0.7053, device='cuda:0')
<ipython-input-51-6ae620c5f277>:221: UserWarning: *c* argument looks like a single numeric RGB or RGBA sequence, which shou
  plt.scatter(X_tsne[mask, 0], X_tsne[mask, 1], c=cmap_s(label), s=10,
WARNING:matplotlib.legend:No artists with labels found to put in legend. Note that artists whose label start with an unde
Saving t-SNE to ./output/W5-3_tSNE.png
```

