CS272 Computer Vision II: Homework Instruction and Report Template

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Abstract

The homework2 of CV2 by Dong Sixun[1] .

1. Q1

1.1. Checkpoints

Show images in each domain of Office-31, give a whole picture over the UDA problem including setting and few introductions. Show your model and according Results. (30 pts)

1.2. Solution

Setting: The setting of UDA as Fig. 1 shown. And the example of dataset and domains are as Fig. 2 shown.

UDA: The source domain and the target domain share the same features and categories, but the feature distributions are different. How to use the informative source domain samples to improve the performance of the target domain model. The source domain represents a field different from the test sample and has rich supervised annotation information; the target domain represents the field where the test sample is located, with no labels or only a few labels. The source and target domains tend to belong to the same class of tasks, but with different distributions.

Experiment: The model as Fig. 3 shown. I finetune the last layer to let the outdim be 31, equal to the number of classes. The model is trained 100 epoch and I used early stop, SGD, batch size 64 and lr $1e-4$. Others uses default parameters. And I use **amazon** as source domain and anothers as target domains. The loss function I choosed and result as Tab. 1 shown. All experiments use three kinds of data augment: RandomCrop, RandomHorizontalFlip and Normalize.

[1]The implement of model is referred: `https://github.com/jindongwang/transferlearning`

Table 1. The result of Q1, Q2 and Q3

Mothed	ACC	
	A-D	**A-W**
Resnet50 + CE[4]	76.1104	74.8428
Resnet50 + MMD[2]	83.7349	85.5346
Resnet50 + ADV[1]	81.7269	81.7269

2. Q2

2.1. Checkpoints

Specify how MMD help in DA from your view, show the results.

2.2. Solution

MMD: MMD is used as a test statistic to judge wether any order of two random variables is the same, then the two distributions are consistent. And when the two distributions are not the same, then the moment that makes the largest difference between the two distributions should be used as the standard to measure the two distributions.

Experiment: Use SGD as optimizer and use default parameters. Batch size is 32. LR is $3e-3$ and I didn't use early stop but use learn rate decay which is 0.75. The model is trained 20 epoch and find out the best performance for the valid set. Then test on the target domain. Following the Q1, I choose **amazon** as source domain and anothers as target domains. The result is as Tab. 1 shown, where **A-D** means **amazon** is source domain and **dslr** as target domain and **A-W** means **amazon** is source domain and **webcam** as target domain. All experiments use three kinds of data augment: RandomCrop, RandomHorizontalFlip and Normalize.

3. Q3

3.1. Checkpoints

Specify how GAN works and introduce your design. Show the testing performance. (30 pts)

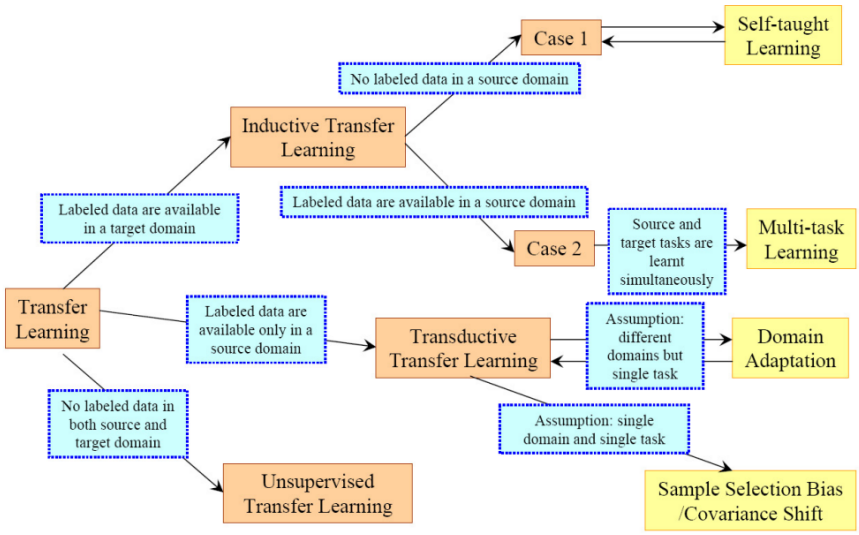

Figure 1. An Overview of Different Settings of Transfer[3].

Figure 2. The example of the dataset office-31

```python
def load_model(model_name):
    model = torchvision.models.resnet50(pretrained=True)
    n_features = model.fc.in_features
    fc = torch.nn.Linear(n_features, args.n_class)
    model.fc = fc
    model.fc.weight.data.normal_(0, 0.005)
    model.fc.bias.data.fill_(0.1)
    return model
```

Figure 3. the model of Q1

3.2. Solution

The help of GAN: In the domain adaptation problem, there is a source domain and a target domain. Compared with generative adversarial networks, the domain adaptation problem eliminates the process of generating samples and directly regards the data in the target domain as generated samples. Therefore, the purpose of the generator has changed. It is no longer to generate samples, but to act as a feature extractor, that is, how to extract features from the source domain and the target domain, so that the discriminator cannot distinguish the extracted features. From the source domain, or the target[1].

Experiment: Use SGD as optimizer and use default parameters. Batch size is 32. LR is $1e-2$ and I didn't use early stop but use learn rate decay which is 0.75. The model is trained 20 epoch and find out the best performance for the valid set. Then test on the target domain. Following the Q1 and Q2, I choose **amazon** as source domain and anothers as target domains. The result is as Tab. 1 shown, where **A-D** means **amazon** is source domain and **dslr** as target domain and **A-W** means **amazon** is source domain and **webcam** as target domain. All experiments use three kinds of data augment: RandomCrop, RandomHorizontalFlip and Normalize.

4. Q4

Give up.

References

[1] Yaroslav Ganin and Victor Lempitsky. Unsupervised domain adaptation by backpropagation. In *International conference on machine learning*, pages 1180–1189. PMLR, 2015.

[2] Mingsheng Long, Yue Cao, Jianmin Wang, and Michael Jordan. Learning transferable features with deep adaptation networks. In *International conference on machine learning*, pages 97–105. PMLR, 2015.

[3] Sinno Jialin Pan and Qiang Yang. A survey on transfer learning. *IEEE Transactions on knowledge and data engineering*, 22(10):1345–1359, 2009.

[4] Sasha Targ, Diogo Almeida, and Kevin Lyman. Resnet in resnet: Generalizing residual architectures. *arXiv preprint arXiv:1603.08029*, 2016.