

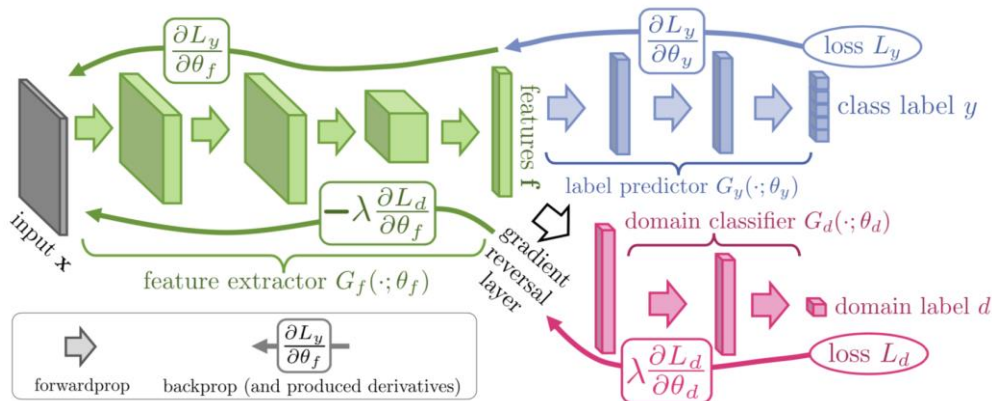
# Multi-Source Domain Adaptation

## Team 25

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### ARCHETECTURE

#### DANN (1 source → 1 target)

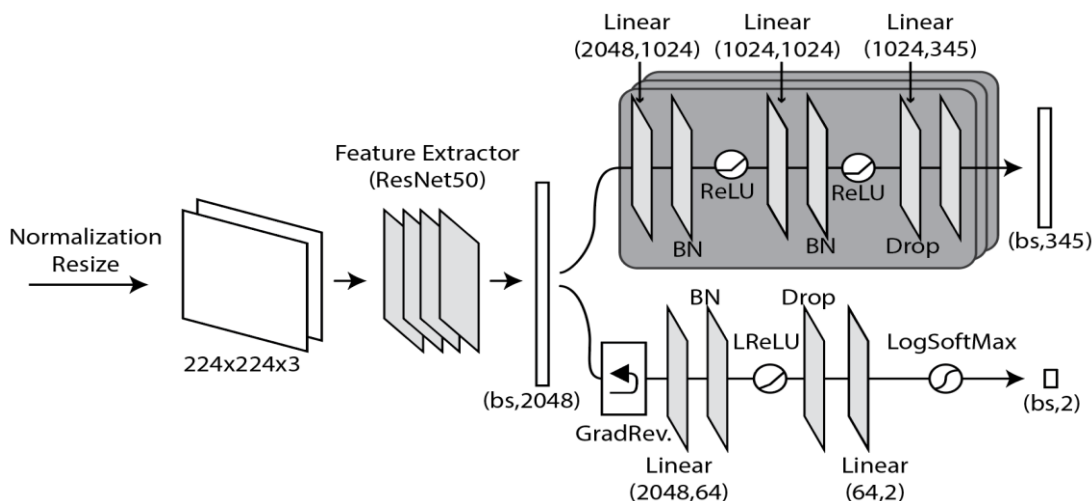


Using 1 label classifier and 1 domain classifier.

Domain loss (rev. gradient): Binary cross entropy loss

Classifier loss: Cross entropy loss

#### Improved DANN (3 source → 1 target)



Using 3 label classifiers and 1 domain classifier. (discriminator)

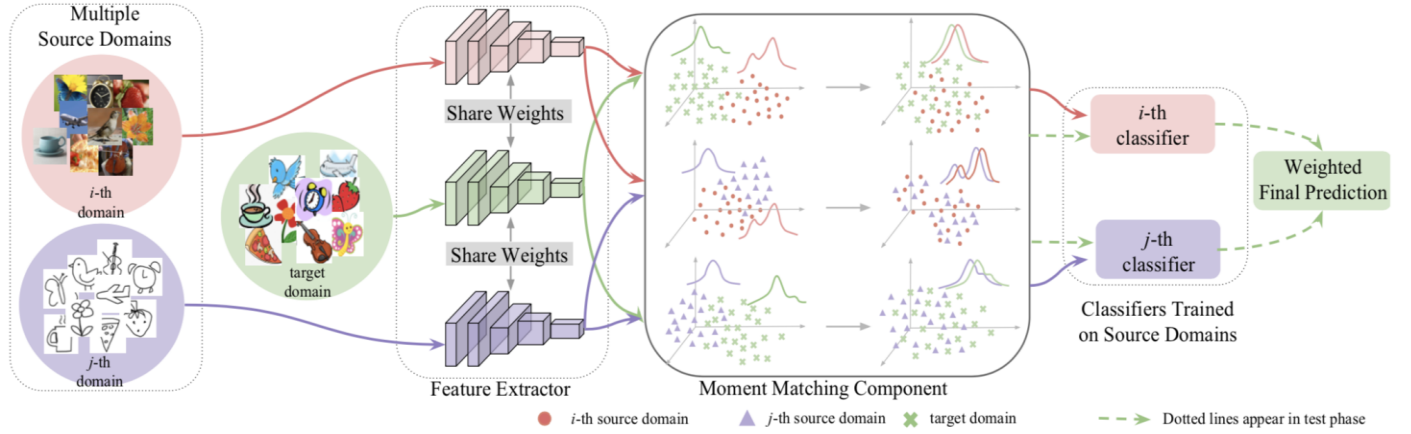
Label "0" for non-target domain, Label "1" for target domain.

Prediction is the linear combination of label predicting results.

Avg. weight:  $(w_1, w_2, w_3) = (1/3, 1/3, 1/3)$

Adaptive. weight:  $(w_1, w_2, w_3) = (\frac{1/L_1}{\sum_{n=1}^3 1/L_n}, \frac{1/L_2}{\sum_{n=1}^3 1/L_n}, \frac{1/L_3}{\sum_{n=1}^3 1/L_n})$

## M3SDA



Using 3 label classifiers. Adaptive weights for aggregation.

$$\text{Moment matching loss: } MD^2(\mathcal{D}_S, \mathcal{D}_T) = \sum_{k=1}^2 \left( \frac{1}{N} \sum_{i=1}^N \|\mathbb{E}(\mathbf{X}_i^k) - \mathbb{E}(\mathbf{X}_T^k)\|_2 + \binom{N}{2}^{-1} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \|\mathbb{E}(\mathbf{X}_i^k) - \mathbb{E}(\mathbf{X}_j^k)\|_2 \right)$$

Classifier loss: Cross entropy loss

## M3SDA- $\beta$

Each domain has 2 label classifiers. Adaptive weights for aggregation.

Step1: Train G and C pairs.

$$\min_{G, C} \sum_{i=1}^N \mathcal{L}_{\mathcal{D}_i} + \lambda \min_G MD^2(\mathcal{D}_S, \mathcal{D}_T)$$

Step2: Fix G. Train C pairs. Maximize discrepancy on target domain.

$$\min_{C'} \sum_{i=1}^N \mathcal{L}_{\mathcal{D}_i} - \sum_i |P_{C_i}(D_T) - P_{C_i'}(D_T)|$$

Step3: Fix C pairs. Train G. Minimize discrepancy on target domain.

$$\min_G \sum_i |P_{C_i}(D_T) - P_{C_i'}(D_T)|$$

# EXPERIMENT

## Parameters (iDANN)

ResNet101 (pretrained on ImageNet) for feature extractor.

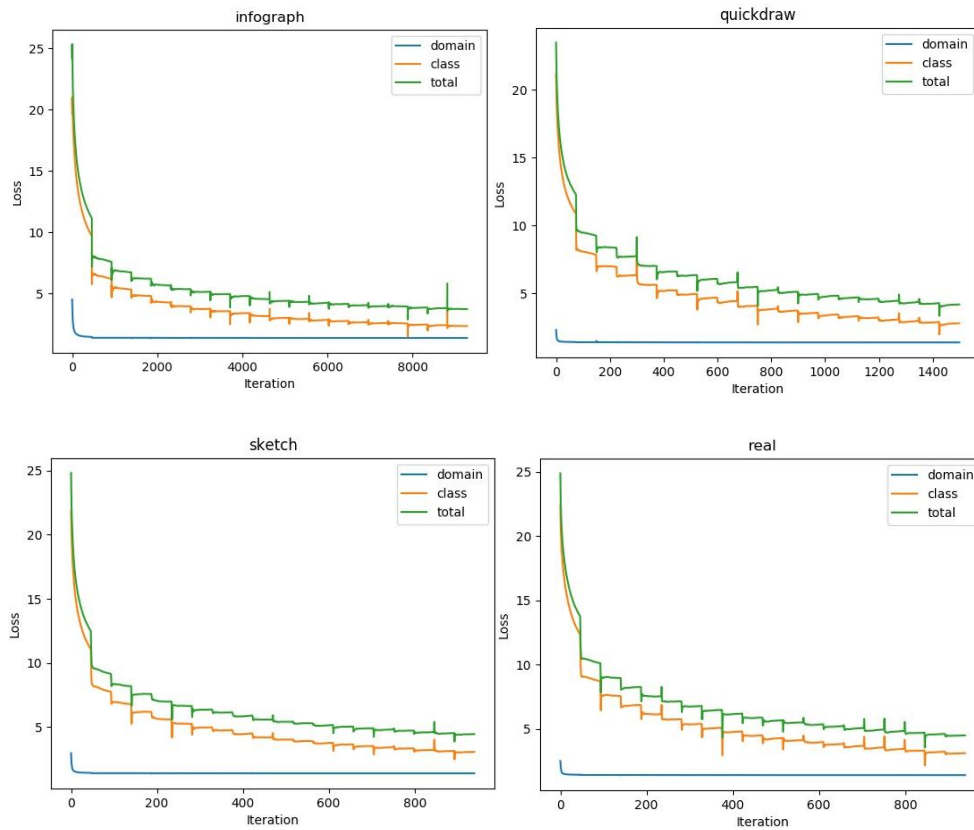
Epoch=20. SGD optimizer and Data augmentation (rotation).

LR=0.0001 for feature extractor, LR=0.002 for classifiers & discriminators.

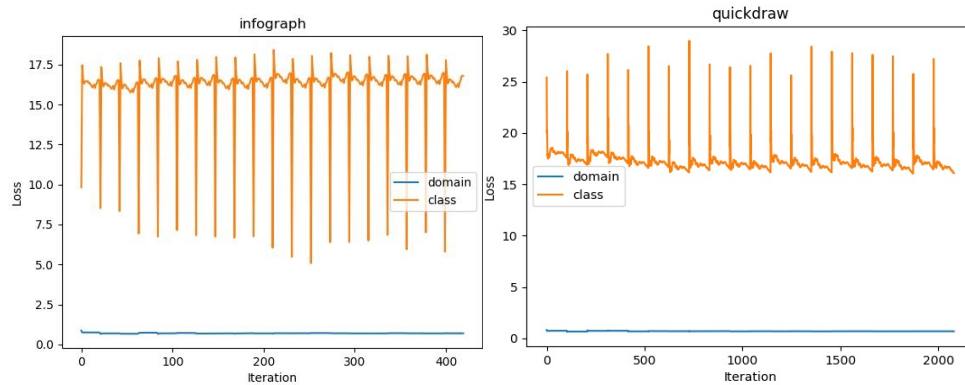
Adaptive LR on classifiers & discriminators, 0.001 after 5-th epoch, LR=0.0001 after 10-th epoch.

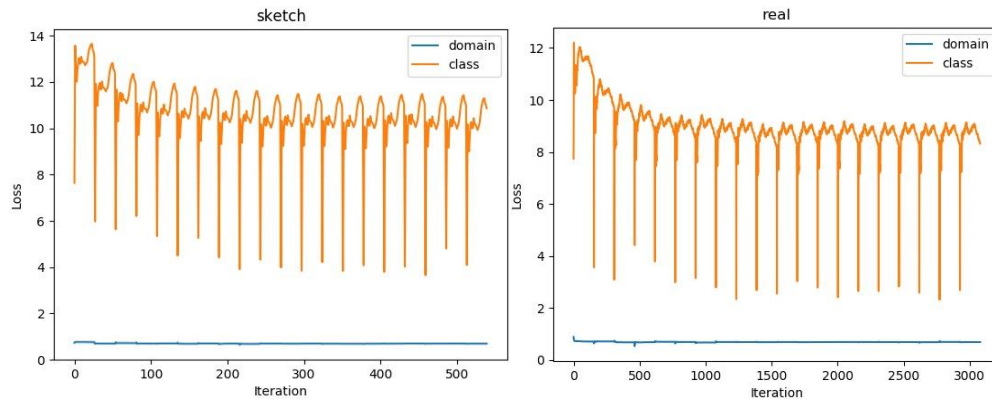
## Training Process (iDANN)

Training loss:

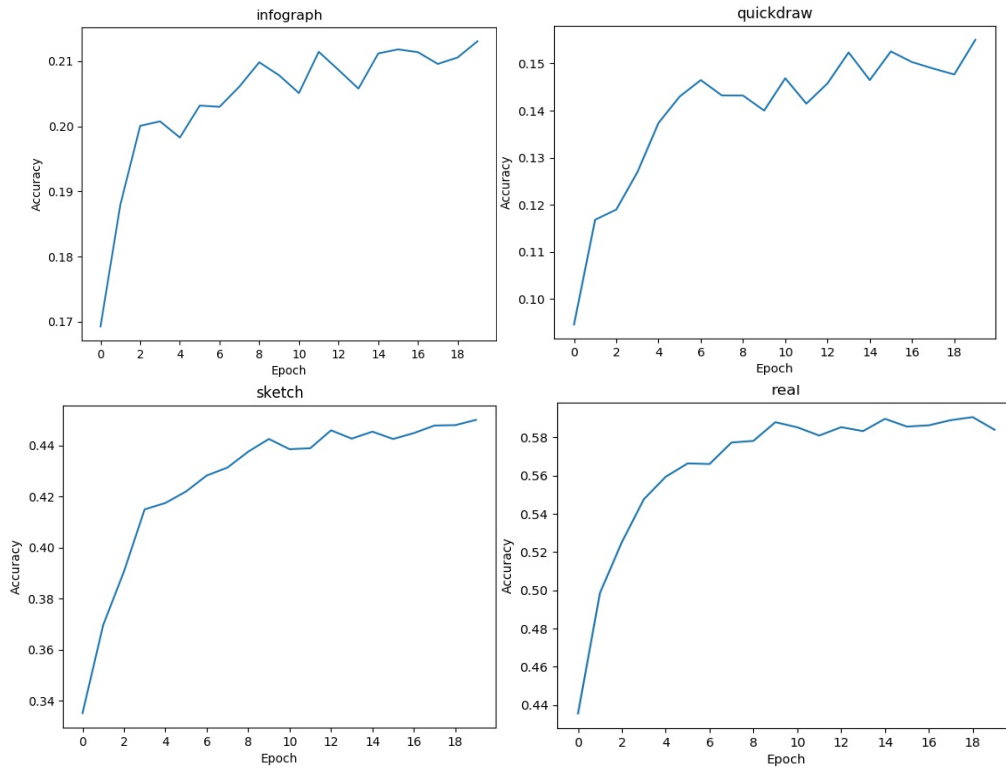


Validation loss:





Accuracy on validation set:



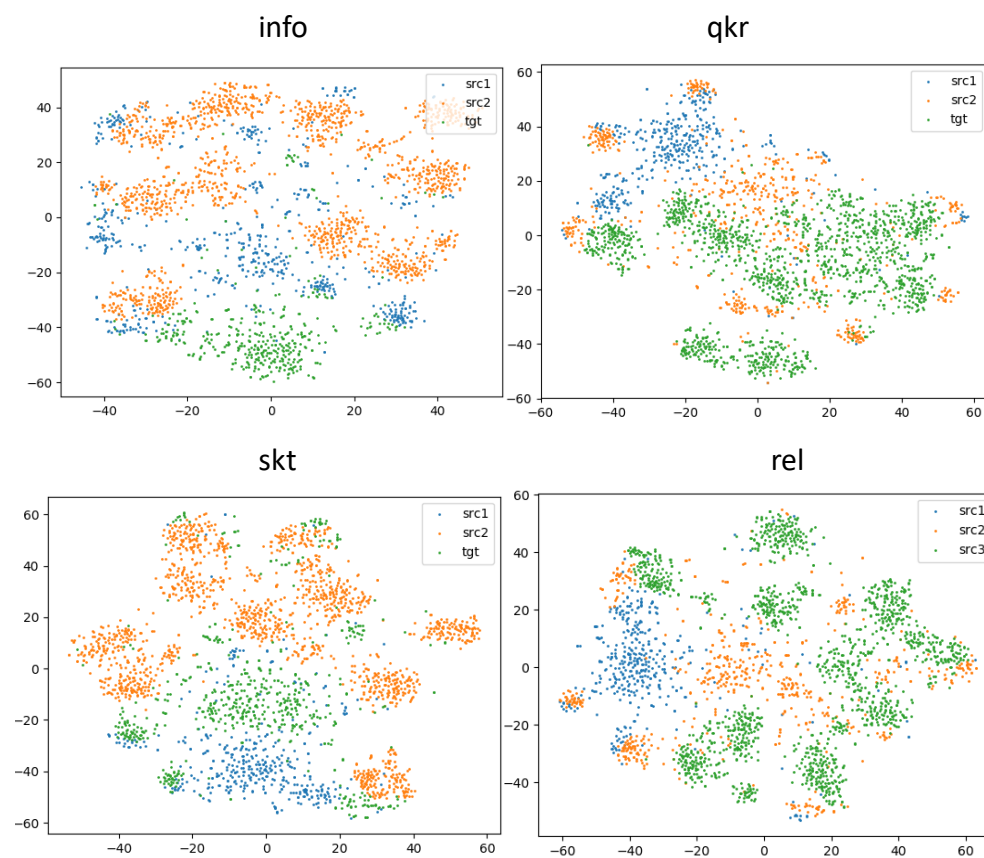
Accuracy Comparison:

	<i>info</i>	<i>qkr</i>	<i>skt</i>	<i>rel</i>
DANN	21.20%	15.46%	40.50%	52.30%
iDANN(Avg.)	20.96%	15.21%	44.29%	<b>59.79%</b>
iDANN(Adp.)	21.30%	15.51%	45.00%	59.31%
M3SDA- $\beta$	<b>21.91%</b>	<b>16.24%</b>	<b>46.31%</b>	53.36%

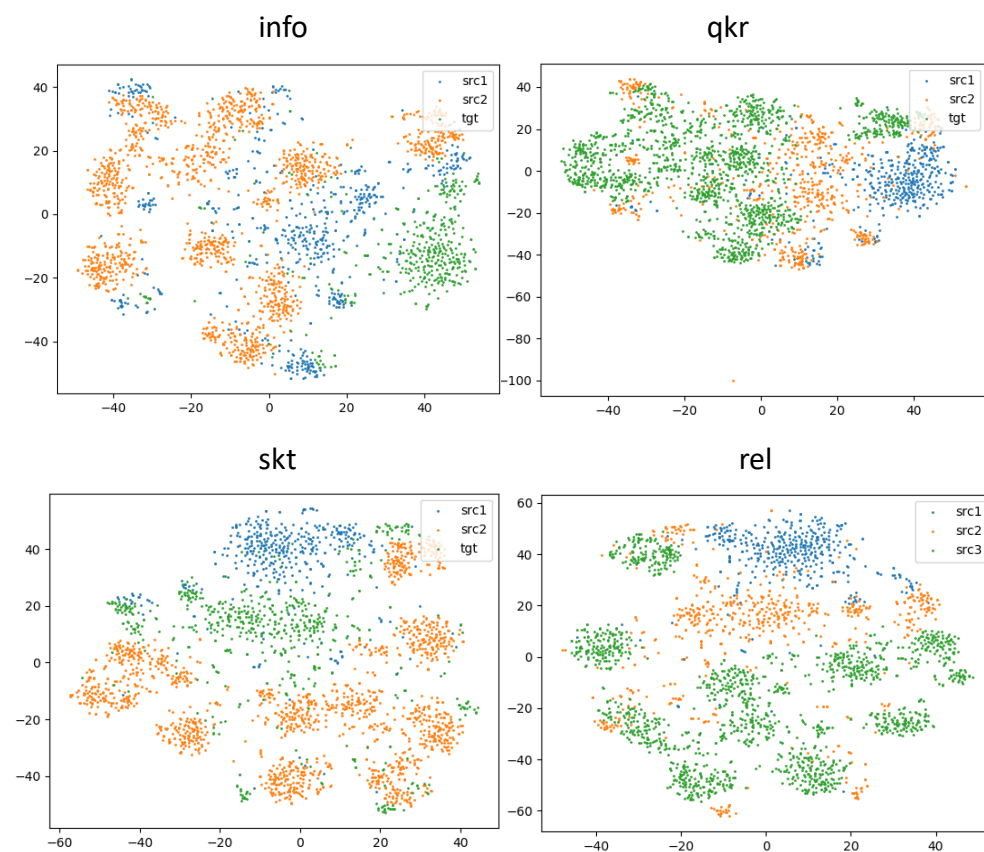
# Feature visualization (t-SNE)

Target v.s Source

## iDANN

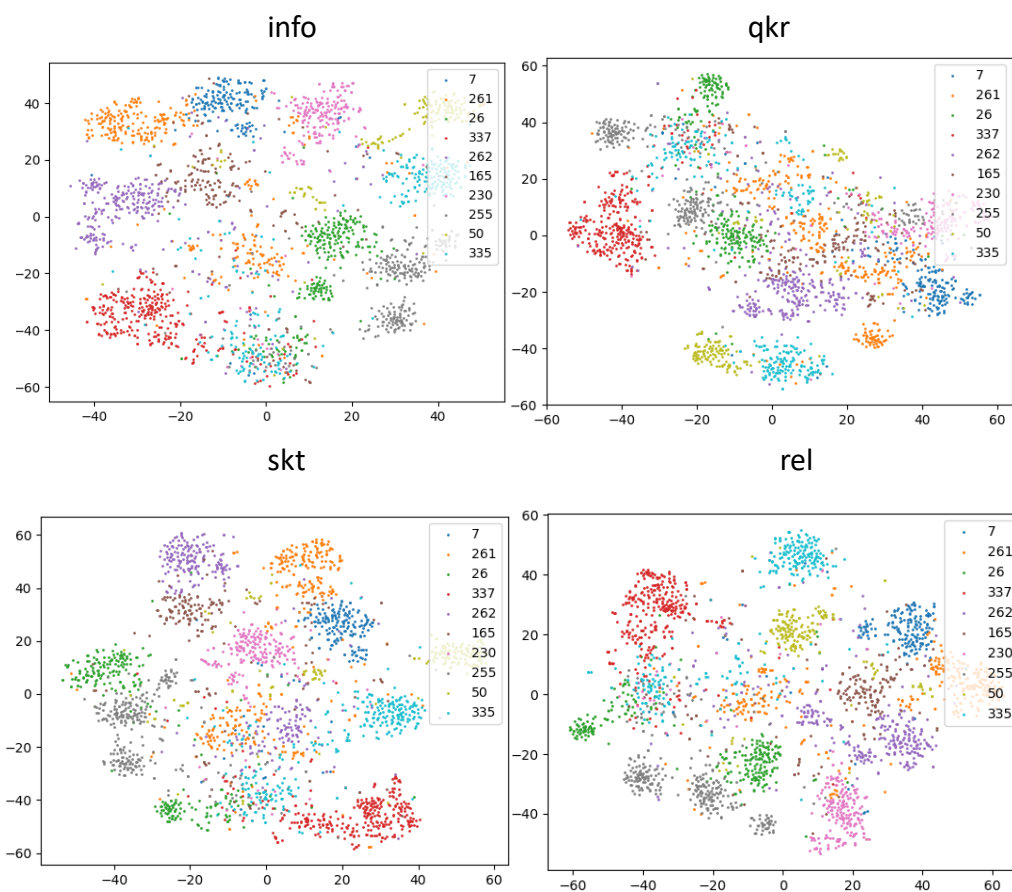


## M3SDA



Classification:

### iDANN



### M3SDA

