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Class Discriminative Adversarial Learning for Unsupervised Domain Adaptation

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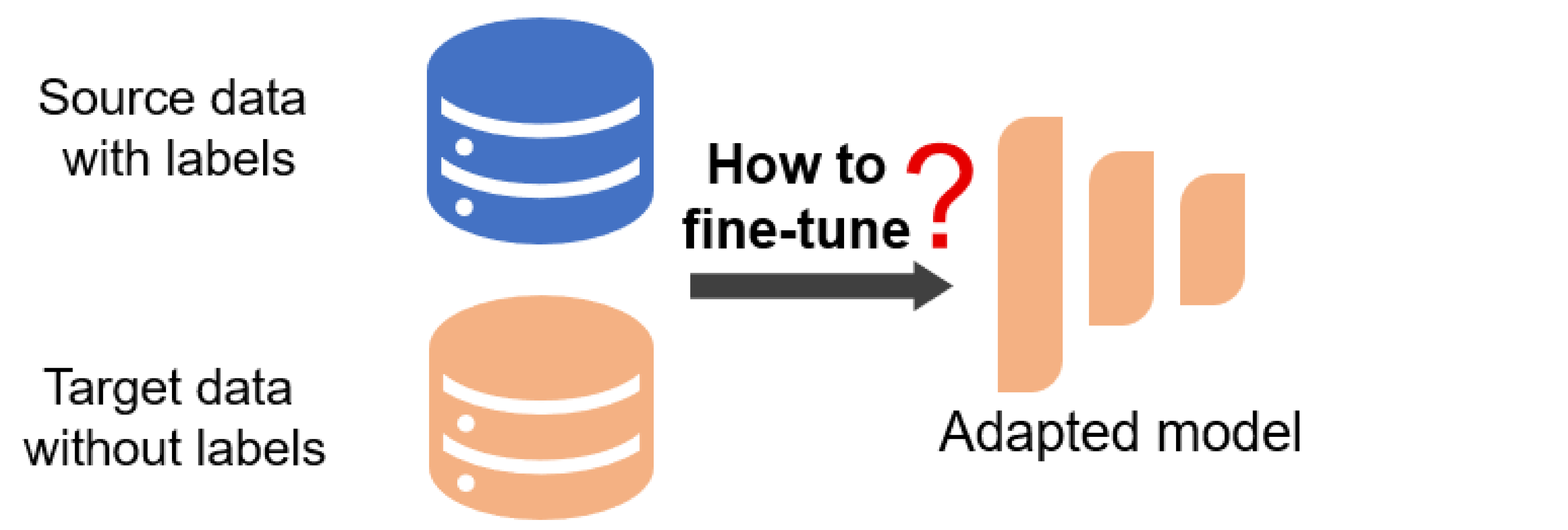
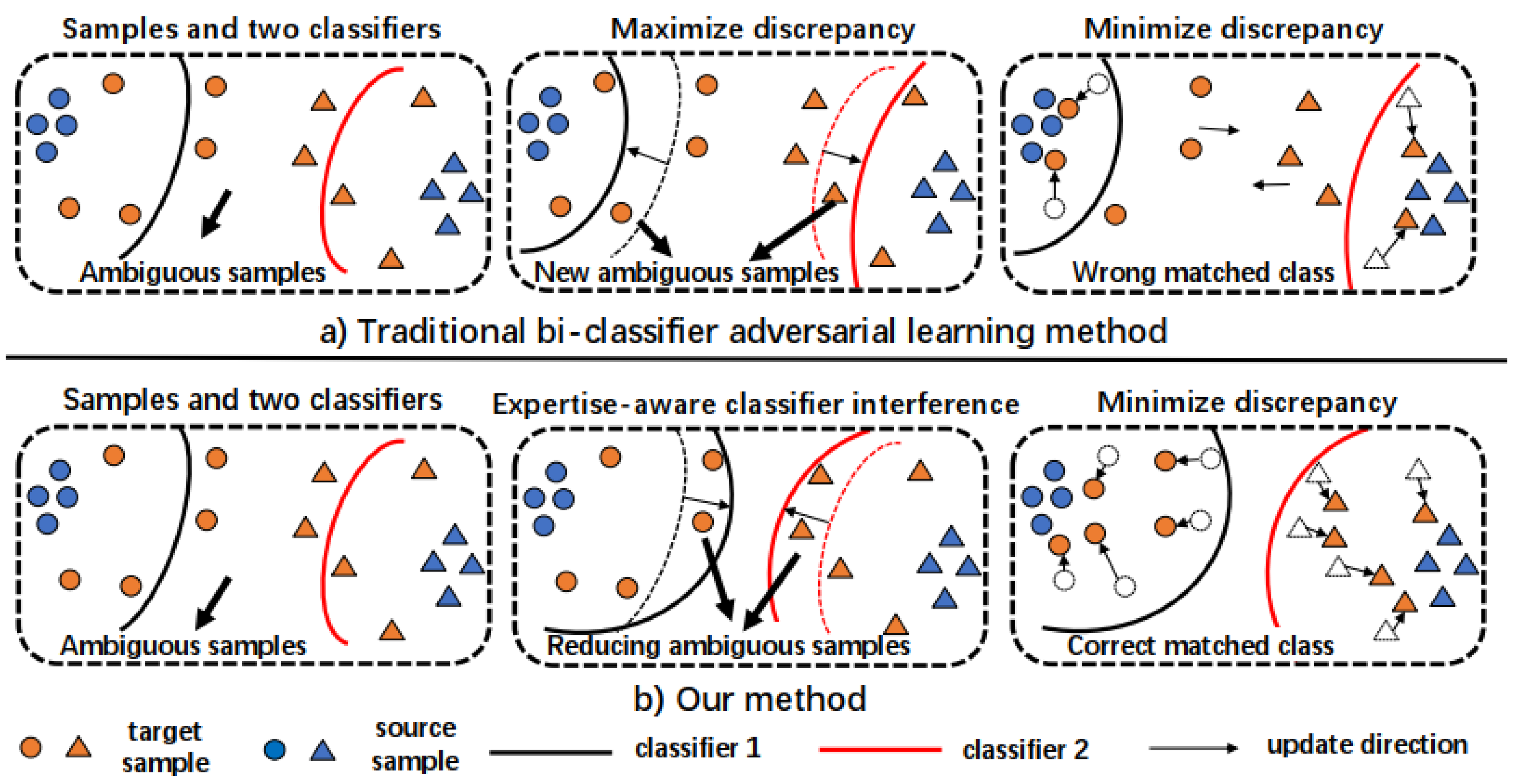
Problem & Proposed method

» Problem statement



Train a adapted model that works well in target domain

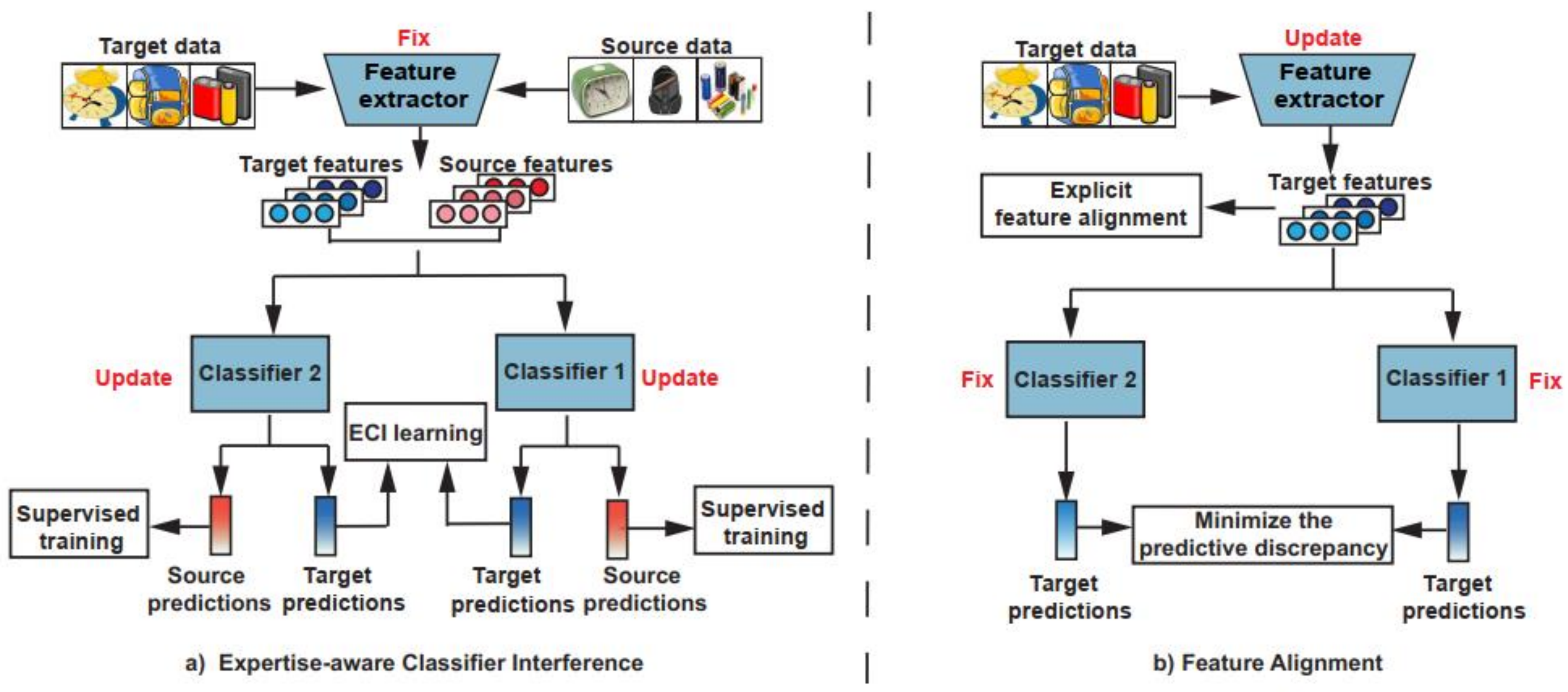
» Overview of proposed method



» Our contributions:

- Propose a novel Class Discriminative Adversarial Learning (CDAL) framework.
- CDAL can more effectively improve the discrimination ability of both adapted classifiers whilst reasoning away ambiguous target samples during training.
- Extensive experiments show that CDAL outperforms state-of-the-art methods by a clear margin on three standard datasets.

» Architecture of CDAL



An illustration of our Class Discriminative Adversarial Learning (CDAL) method. In the first step, the model (including the feature extractor and two classifiers) is trained by labeled source samples. (a) In the second step, the feature extractor is fixed while the two classifiers are updated by the proposed Expertise-aware Classifier Interference (ECI) strategy. Note, the supervised training supervisory on source domain is applied to preserve the classification ability. (b) In the third step, the feature extractor is then optimized by minimizing the discrepancy between the two fixed classifiers. Feature alignment is also applied across domains.

Experiments

» Experimental results

MCD [33]	CVPR18	77.3	89.2	92.7	88.2	71.0	92.3	85.1
MCD+ECI	Ours	79.3 ±0.2	92.5 ±0.1	96.3 ±0.1	90.5±0.2	78.0±0.2	94.8±0.1	88.6
SWD [16]	CVPR19	78.3	90.3	93.2	89.7	73.3	93.8	86.4
SWD+ECI	Ours	79.8±0.1	92.7±0.2	96.8±0.0	92.9±0.1	77.3±0.2	96.5±0.1	89.3
CDAL	Ours	80.4±0.1	**93.7±0.1**	97.8±0.0	**93.3±0.1**	**80.2±0.3**	**97.5±0.2**	**90.5**

The performance of our method on ImageCLEF

MCD[33]	CVPR18	48.9	68.3	74.6	61.3	67.6	68.8	57.0	47.1	75.1	69.1	52.2	79.6	64.1
MCD+ECI	Ours	57.4	74.0	78.6	62.3	73.7	75.0	64.4	54.5	81.1	73.3	60.3	83.7	69.9
SWD[16]	CVPR19	51.3	70.3	75.0	56.2	69.4	71.6	59.8	53.8	80.2	71.1	59.2	83.4	66.8
SWD+ECI	Ours	58.0	75.4	79.0	64.1	73.3	74.9	64.6	54.1	81.1	72.5	60.5	83.8	70.1
CDAL	Ours	**59.5 ±0.3**	77.8 ±0.1	80.0 ±0.1	**67.0 ±0.2**	**77.1 ±0.2**	**76.6 ±0.0**	**66.6 ±0.2**	56.2 ±0.1	**81.8 ±0.0**	74.3 ±0.1	60.6 ±0.0	84.6 ±0.1	**71.8**

The performance of our method on Office-Home

MCD[33]	CVPR18	87.0	60.9	83.7	64.0	88.9	79.6	84.7	76.9	88.6	40.3	83.0	25.8	71.9
MCD+ECI	Ours	93.4	77.2	76.9	51.2	89.9	92.1	83.4	74.8	84.7	72.3	85.8	55.2	78.1
SWD[16]	CVPR19	90.8	82.5	81.7	70.5	91.7	69.5	86.3	77.5	87.4	63.6	85.6	29.2	76.4
SWD+ECI	Ours	93.6	78.6	76.7	51.1	90.3	93.2	83.4	75.7	85.2	75.6	85.8	57.0	78.9
CDAL	Ours	**97.5**	84.9	81.0	70.5	**97.1**	**97.3**	**90.6**	80.9	**96.2**	**94.9**	**88.2**	48.7	**85.7**

The performance of our method on Visda-17

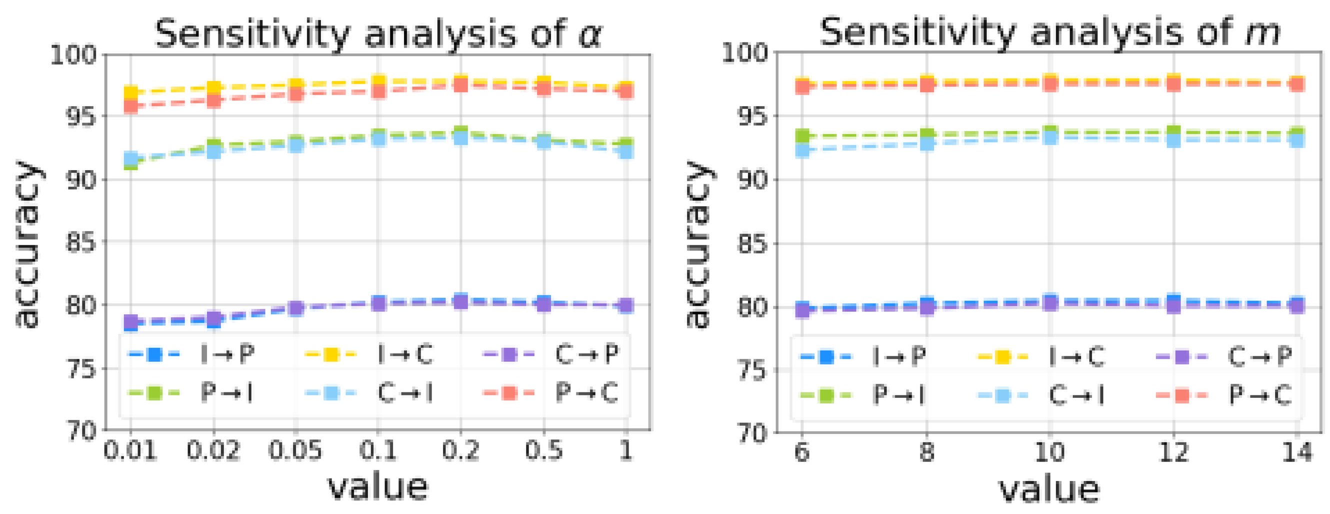
» Ablation studies

Method	I→P	P→I	I→C	C→I	C→P	P→C
PSE	74.0	89.7	93.2	88.6	66.8	93.0
MCD	77.3	89.2	92.7	88.2	71.0	92.3
MCD+ECI	**79.3**	**92.5**	**96.3**	**90.5**	**78.0**	**94.8**

The ablation study of our method on second step

Method	I→P	P→I	I→C	C→I	C→P	P→C
MCD	77.3	89.2	92.7	88.2	71.0	92.3
MCD+ECI	79.3	92.5	96.3	90.5	78.0	94.8
MCD+CLU	79.2	93.1	97.1	91.8	76.4	96.2
CDAL	**80.4**	**93.7**	**97.8**	**93.3**	**80.2**	**97.5**

The ablation study of our method on full algorithm



The Sensitivity analysis of (l) loss weight α and (r) size of memory m.

Conclusion and others

» Conclusion

- Investigate the problem of ambiguous target samples in the bi-classifier adversarial learning;
- Propose a Class Discriminative Adversarial Learning method which employs an ECI strategy and a representation regularization.

» Citation

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» Reproducibility

Code is available at: https://github.com/buerzlh/CDAL.

» Contact

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