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| *EASY TRANSFER LEARNING BY EXPLOITING INTRA-DOMAIN STRUCTURES* |
| *Jindong Wang et al., 2019, ICME* |
| *Read : 2020.04.27-2020.05.04* |

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| **Topic** |

no model selection and non-parametric - Transfer Learning Method

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| **Problems** |

- 기존 TL Methods는 parametric , model selection 과정에 cost가 높음

- Target domain에 unlabeled data가 존재하면 cross validation을 통한 hyperparameter tuning 불가

- src와 target data의 distribution이 다른 경우 handling이 어려움

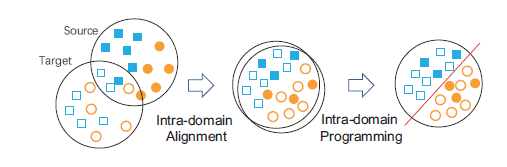
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| **Motivation** |

Intra-domain structure의 학습을 통해

🡪 intra-domain alignment로 non-parametric transfer feature

🡪 intra-domain programming에 의한 transfer classifier

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| **Proposed Method** |



**Intra-domain Alignment**

scr feature를 *whitening* 한 뒤, target distribution의 covariance를 곱하여 *Re-coloring* 하여Alignment

Eq. (9) : 🡨 CORAL

**Intra-domain Programming**

- 목표 : Probability annotation matrix 계산

(target이 class에 속할 확률을 계산한 행렬 (#class \* #target) )

- Loss function

* Gradient Descent로 학습: target이 class 중심으로부터 거리가 멀면 확률↓,

거리가 가까우면 확률↑

* Constraints : (는 확률)

: scr와 target은 same label space,

class는 최소 1개 이상의 원소를 가져야함

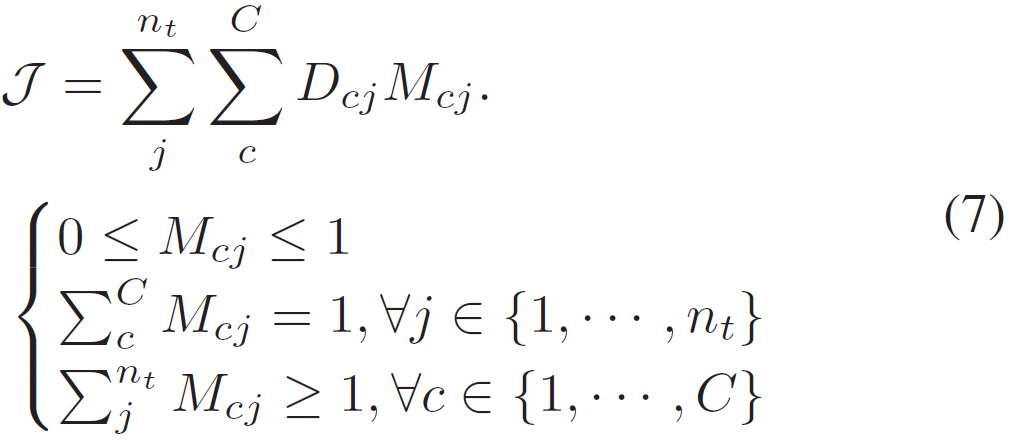
**Algorithm 1** EasyTL: Easy Transfer Learning

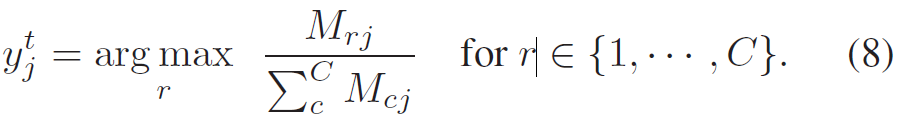
**Input :** Feature matrix **x***s,* **x***t* for Ω*s* and Ω*t*, respectively; andlabel vector **y***s* for Ω*s*

**Output :** Predicted label vector **y***t* for target domain.

1: (Optional) Perform intra-domain alignment via Eq. (9)

2: Solve Eq. (7) to obtain the probability annotation matrix Mand compute **y***t* using Eq. (8)





3: return Label vector

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| **Experiments** |

EasyTL(c) : only Intra-domain programming

EasyTL : full (Intra-domain alignment + Intra-domain programming)

Data Set :

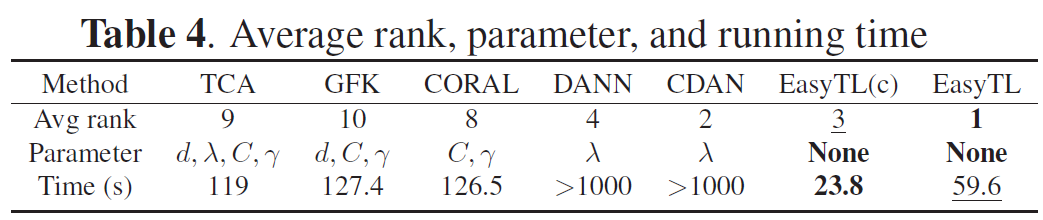
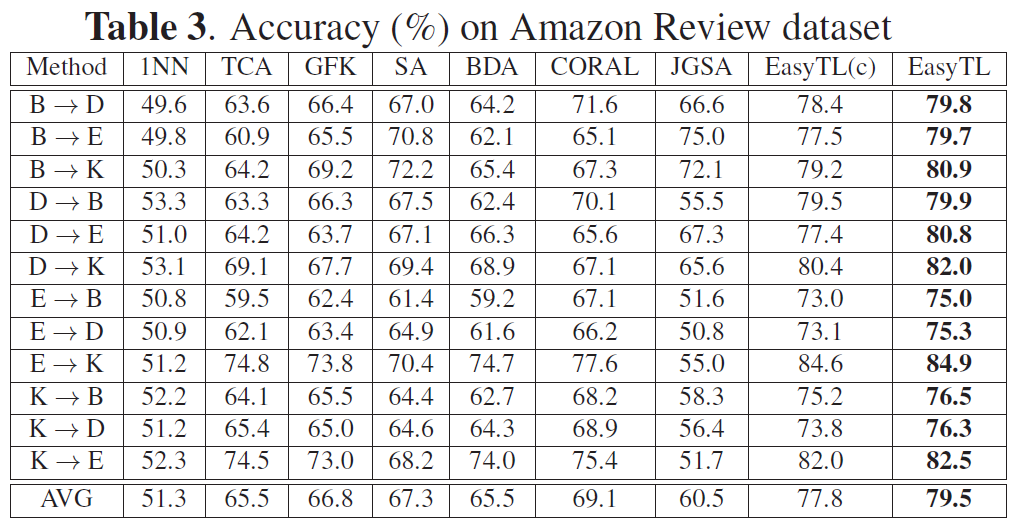
1) Amazon Review : positive/negative reviews of four kinds of products

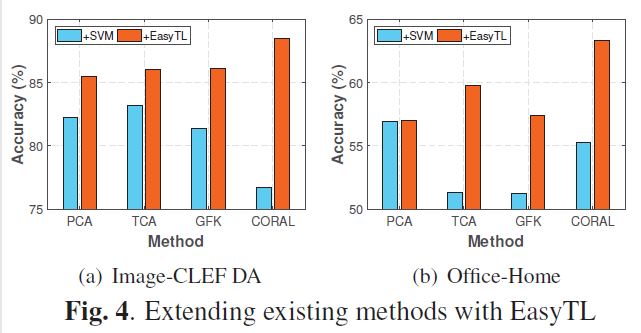
2) Office-Caltech : 10 common classes of images

3) Image-CLEF DA : 12 categories of images belonging to 3 domains

4) Office-Home : 15,500 images of 65 categories from 4 domains

**1. Accuracy and Efficiency** :





**2. 확장성** :

Intra-domain alignment에 PCA, TCA, GFK, CORAL을 사용하고,

Intra-domain programming에는

SVM과 EasyTL을 사용하여 성능비교

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| **Opinion… ? / Proposed** |

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| **Reference** |

**CORAL :** [17] B. Sun, J. Feng, and K. Saenko. Return of frustratingly easy domain adaptation. In AAAI, volume 6, page 8, 2016.

**Domain Adaption :** [12] S. J. Pan and Q. Yang. A survey on transfer learning. IEEE TKDE, 22(10):1345–1359, 2010

**Existing Method :**  [23] J. Wang, W. Feng, Y. Chen, et al. Visual domain adaptation with manifold embedded distribution alignment. In ACM MM, pages 402–410, 2018.

[24] J. Wei, J. Liang, R. He, and J. Yang. Learning discriminative geodesic flow kernel for unsupervised domain adaptation. In ICME, pages 1–6, 2018.

[26] J. Zhang,W. Li, and P. Ogunbona. Joint geometrical and statistical alignment for visual domain adaptation. In CVPR, 2017.