Transfer Learning with Active Queries from Source Domain

实验结果

优化目标修改

原优化目标

$$\min_{\alpha,\beta} ||\frac{1}{n_S}\sum_{x\in S}\beta(x)\phi(x) - \frac{1}{n_T}\sum_{x\in T}\phi(x)||^2 +$$
$$||\frac{1}{n_L}(\sum_{x\in S_L}\beta(x)\phi(x) + \sum_{x\in S_U}\alpha(x)\beta(x)\phi(x) + \sum_{x\in T_L}\phi(x)) -$$
$$\frac{1}{n_U}(\sum_{x\in S_U}(1-\alpha(x))\beta(x)\phi(x) + \sum_{x\in T_U}\phi(x))||^2 +$$
$$\lambda\sum_{x\in S_U}\alpha(x)\beta(x)|g(x)|$$

Target也可被Query且beta被固定为1

$$s.t. \quad \alpha(x)\in\{0,1\}, \forall x\in S_U; \quad \sum_{x\in S_U}\alpha(x) = n_Q; \quad \beta(x)\in[0,1], \forall x\in S$$

修改后目标

$$\min_{\alpha,\beta} ||\frac{1}{n_S}\sum_{x\in S}\beta(x)\phi(x) - \frac{1}{n_T}\sum_{x\in T}\phi(x)||^2 +$$
$$||\frac{1}{n_L}(\sum_{x\in S_L}\beta(x)\phi(x) + \sum_{x\in S_U\cup T_U}\alpha(x)\beta(x)\phi(x) + \sum_{x\in T_L}\phi(x)) -$$
$$\frac{1}{n_U}(\sum_{x\in S_U\cup T_U}(1-\alpha(x))\beta(x)\phi(x))||^2 +$$
$$\lambda\sum_{x\in S_U\cup T_U}\alpha(x)\beta(x)|g(x)|$$

$$s.t. \quad \alpha(x)\in\{0,1\}, \forall x\in S_U\cup T_U; \quad \sum cost(\alpha(x)) = budget; \quad \beta(x)\in[0,1], \forall x\in S\cup T_U$$

二次规划式修改

alpha

$$\min_{\alpha} \frac{1}{2}\alpha^{\top} A\alpha + \mathbf{a}^{\top}\alpha + \text{constant}$$

$$s.t. \quad \alpha \in [0,1]^{n_{S_U}}, \quad \alpha^{\top}\mathbf{1} = n_Q,$$

where

$$A = (\frac{1}{n_L} + \frac{1}{n_U})^2 (\beta_{S_U}\beta_{S_U}^{\top}) \circ K_{S_U,S_U},$$

$$\begin{aligned}\mathbf{a} = &-(\frac{1}{n_U^2} + \frac{2}{n_L n_U})(\beta_{S_U}\beta_{S_U}^{\top}) \circ K_{S_U,S_U}\mathbf{1} \\ &+(\frac{1}{n_L^2} + \frac{2}{n_L n_U})(\beta_{S_U}\beta_{S_L}^{\top}) \circ K_{S_U,S_L}\mathbf{1} \\ &+(\frac{1}{n_L^2} + \frac{2}{n_L n_U})(\beta_{S_U}\mathbf{1}^{\top}) \circ K_{S_U,T_L}\mathbf{1} \\ &-(\frac{1}{n_U^2} + \frac{2}{n_L n_U})(\beta_{S_U}\mathbf{1}^{\top}) \circ K_{S_U,T_U}\mathbf{1} \\ &+\frac{\lambda}{2}\beta_{S_U} \circ |g_{S_U}|.\end{aligned}$$

删除该项
并对下标作相应修改
（时间原因没有给出）

二次规划式修改

beta

$$\min_{\beta} \frac{1}{2}\beta^{\top} B\beta + \mathbf{b}^{\top}\beta + \text{constant}$$

$$s.t. \quad \beta \in [0,1]^{n_{S_L}+n_{S_U}},$$

where

B_{11}, B_{12}, B_{21}, B_{22} 无变化不再给出

$$B = \lambda \frac{1}{n_S}^2 K_{S,S} + \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix},$$

$$\mathbf{b} = -\frac{\lambda}{n_S n_T} K_{S,T}\mathbf{1}$$

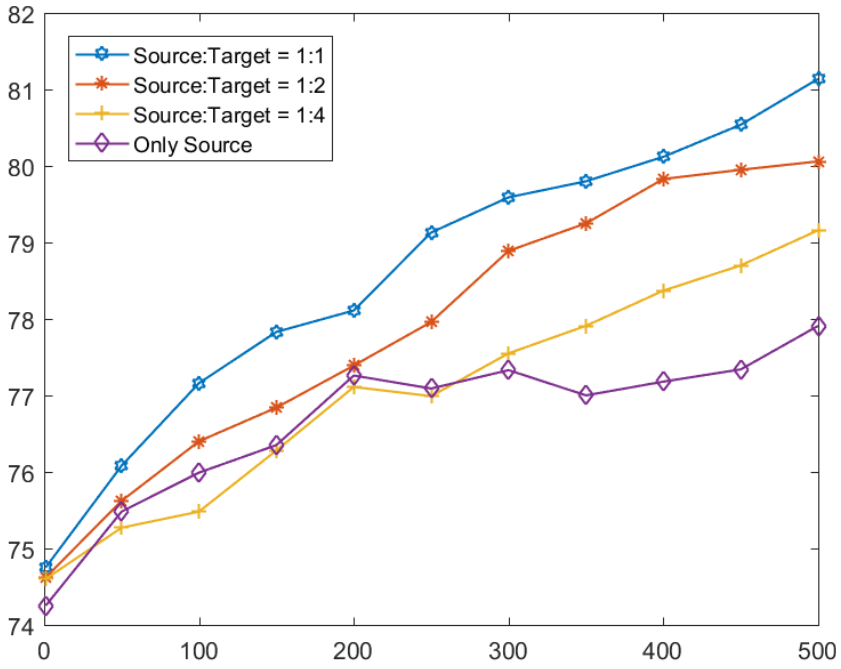
删除该项

删除该项

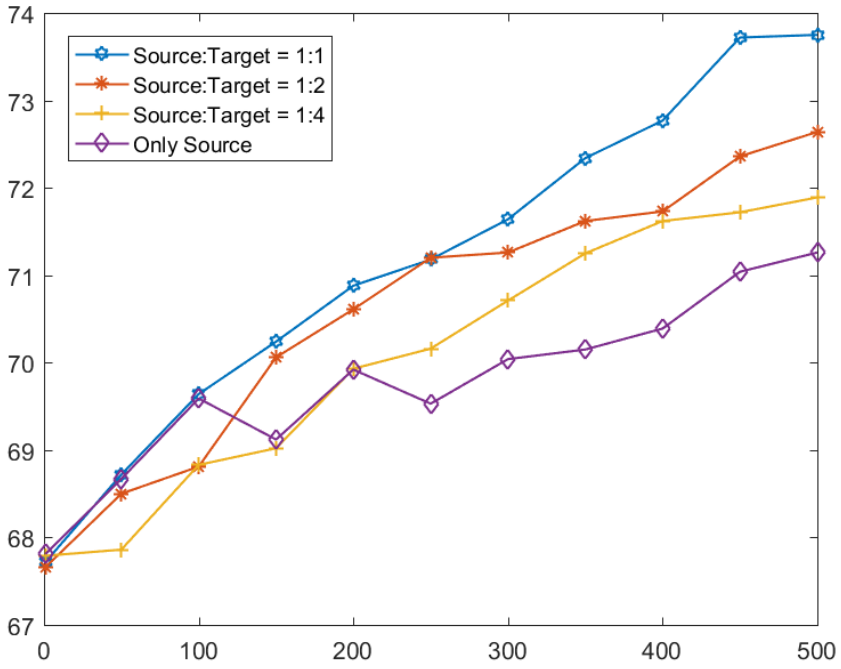
$$+ \begin{pmatrix} \frac{1}{n_L^2} K_{S_L,T_L}\mathbf{1} - \frac{1}{n_L n_U} K_{S_L,T_U}\mathbf{1} \\ \hline K_{S_U,T_L}\mathbf{1} \circ \left((\frac{1}{n_L^2} + \frac{1}{n_L n_U})\alpha - \frac{1}{n_L n_U}\mathbf{1} \right) \\ -K_{S_U,T_U}\mathbf{1} \circ \left((\frac{1}{n_U^2} + \frac{1}{n_L n_U})\alpha - \frac{1}{n_U^2}\mathbf{1} \right) \\ +\frac{\lambda}{2}\alpha \circ |g_{S_U}| \end{pmatrix}$$

实验结果

横轴：Cost
纵轴：Accuracy
Budget：10
Source Domain的Cost固定为1
Target Domain的Cost分别为1、2、4



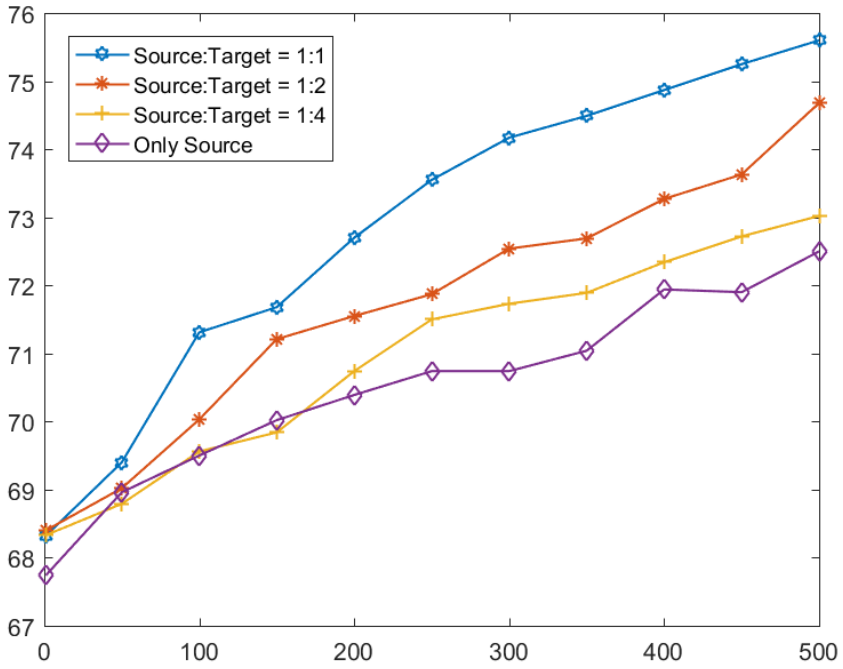
D2K



E2B

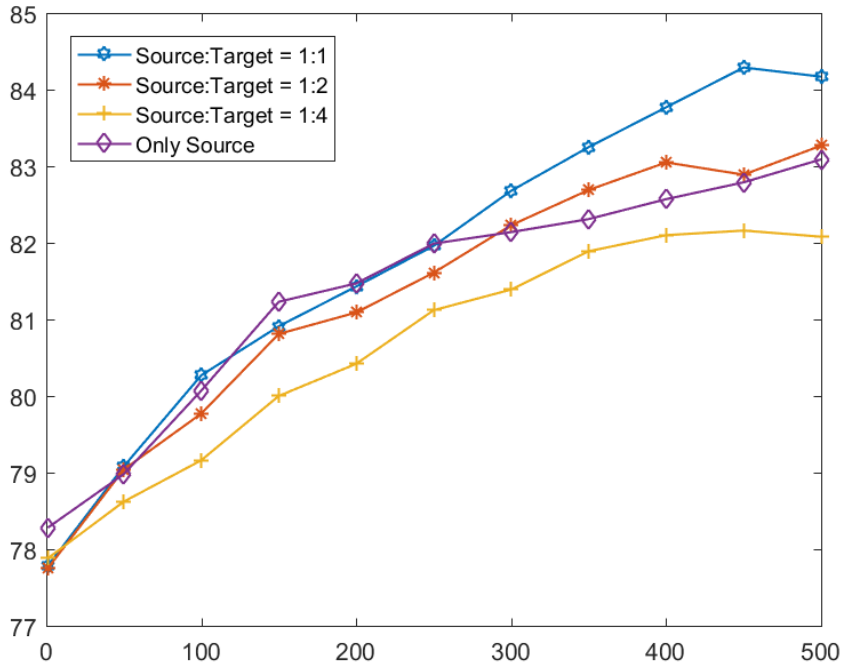
实验结果

横轴：Cost
纵轴：Accuracy
Budget：10
Source Domain的Cost固定为1
Target Domain的Cost分别为1、2、4



E2D

E2K数据集上，Target的Cost设置为4时，
性能不如只用Source查询



E2K