Domain Adaptation for Sentiment Analysis

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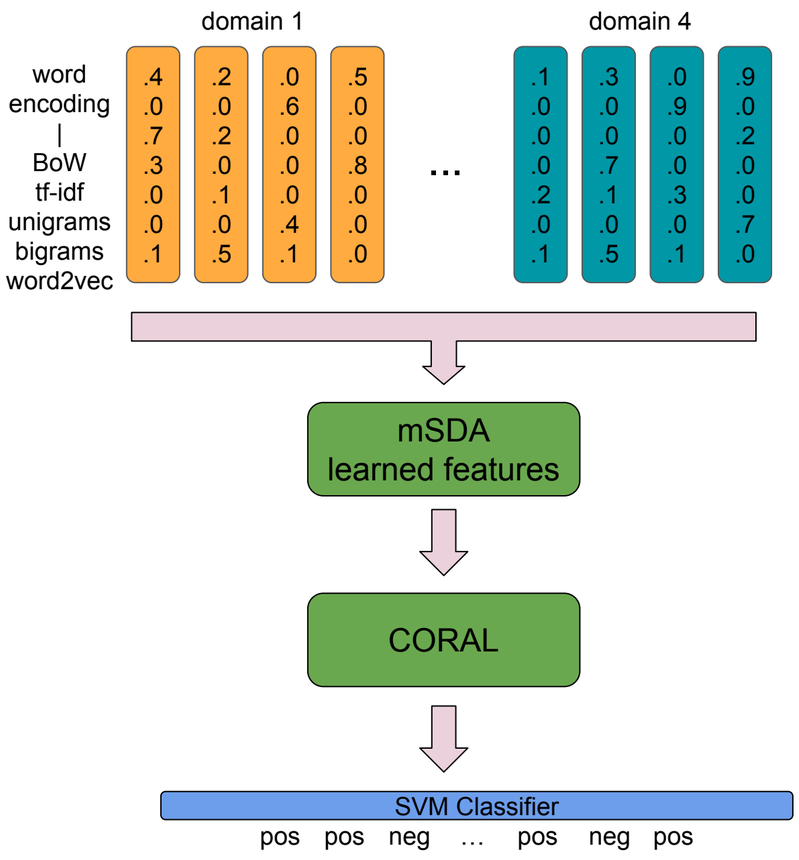
Introduction

Domain adaptation aims to generalize a classifier that is trained on a source domain, for which typically plenty of training data is available, to a target domain, for which labeled data is scarce. Here we use the reduced Amazon reviews dataset having 4 domains - Books, Kitchen, Electronics and DVD, to compare and analyse three methods : **CORAL, MSDA and DANN.**

Approach



Experimental Results

Model	K=>D	D => B	B => K	E => D	E=>K
BOW SVM Baseline	52.47	50.38	52.00	51.41	50.19
BOW CORAL	52.84	50.48	53.12	51.57	50.85
BOW mSDA (4 layers)	53.4	46.5	52.3	50.4	53.2
Embeddings: mSDA (4 layers)	58.3	57.5	57.2	58.0	60.9
TF-IDF: mSDA (4 layers)	49.8	49.2	47.1	53.7	58.0

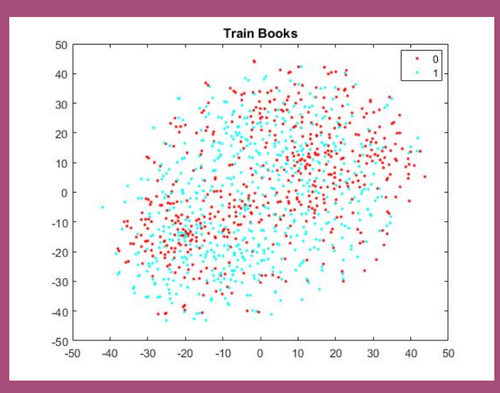
BEST DATA : PREPROCESSED UNIGRAM, BIGRAM

Model	K => D	D => B	B =>K	E=>D	E=>K
SVM Baseline	71.89	71.56	74.63	71.89	83.63
CORAL	73.92	77.61	77.30	74.84	84.15
mSDA (4 layers)	73.68	77.45	77.19	74.68	82.10
DANN	78.9	82.5	84.3	78.1	88.1

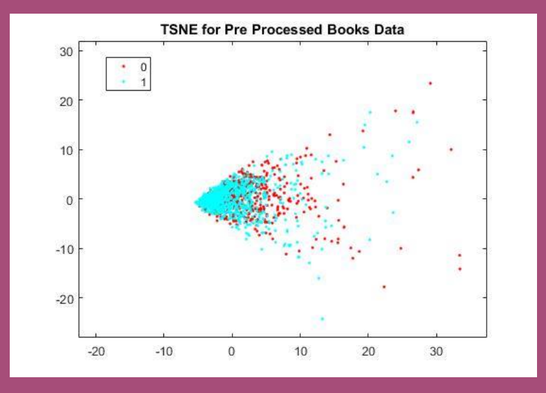
K - Kitchen
B - Books
E - Electronics
D - DVD

CORAL - Correlation Alignment
mSDA - Marginalized Denoising Autoencoders
DANN - Domain Adversarial Neural Networks

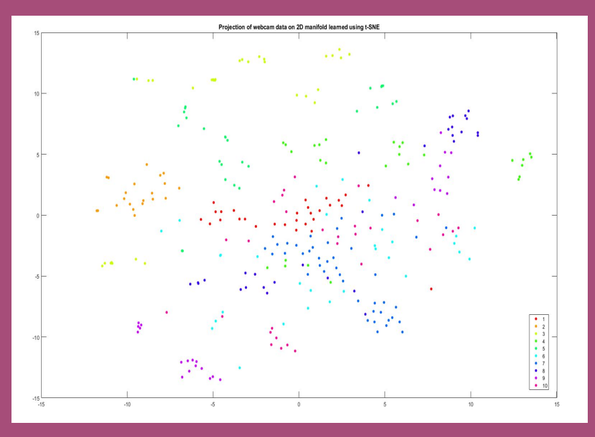
Data visualisation



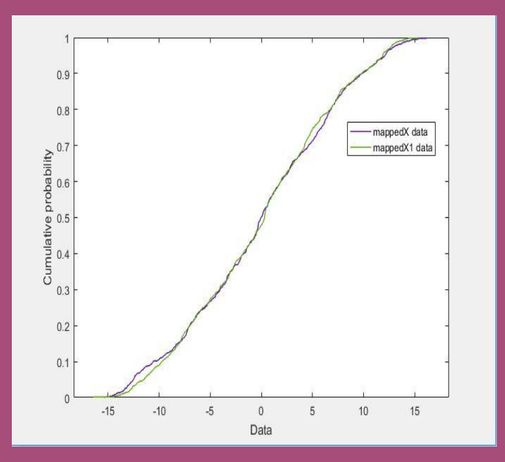
t-SNE raw BOW books



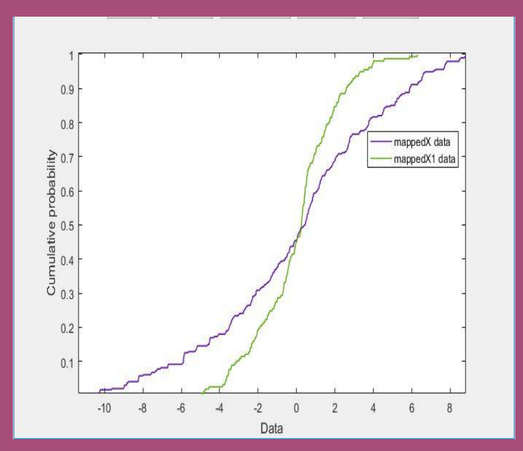
t-SNE processed books data



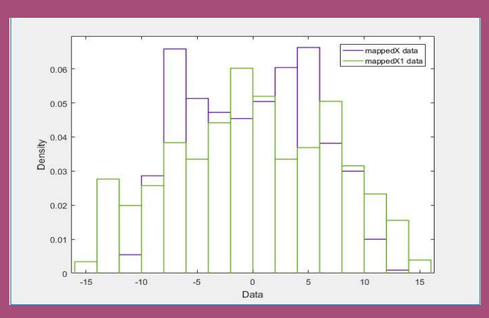
t-SNE webcam



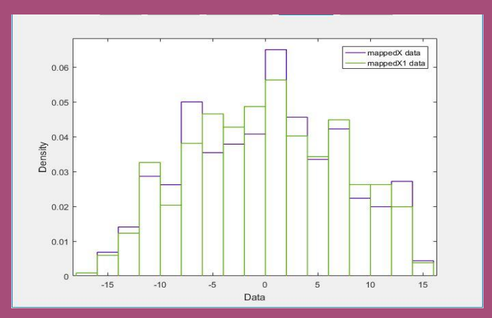
CDF Kitchen, Electronics



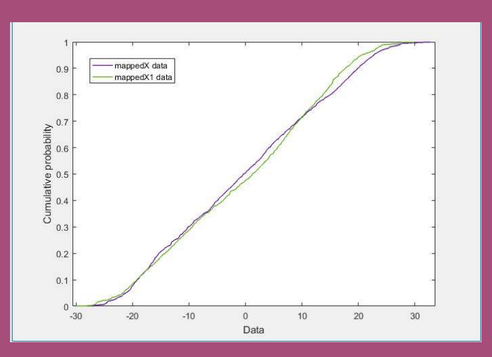
CDF Webcam, DSLR (Image Datasets)



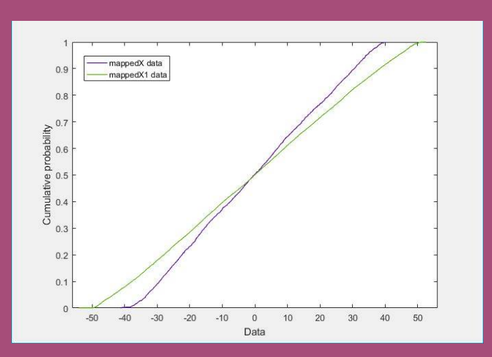
Books, kitchen



Kitchen, Electronics



Books, kitchen (with just pre processed data)



Books, kitchen (MSDA hidden representations)

Conclusion

- Just BOW features are useless, need preprocessing, n-gram features.
- CORAL results depend heavily on the source and target data distribution. If the source and target distributions are different, then CORAL works!
- mSDA works better with embeddings, because the embeddings are giving better feature compared to BOW, but still not as good as n-gram. Because we are using off-the-shelf embeddings, while n-gram is more task focused.
- mSDA works better when the distributions are similar while CORAL is the other way around.
- Both mSDA and CORAL work separately. By combining them together, we observed some promising results from the data plot.