Domain Adaptation for Text Recognition

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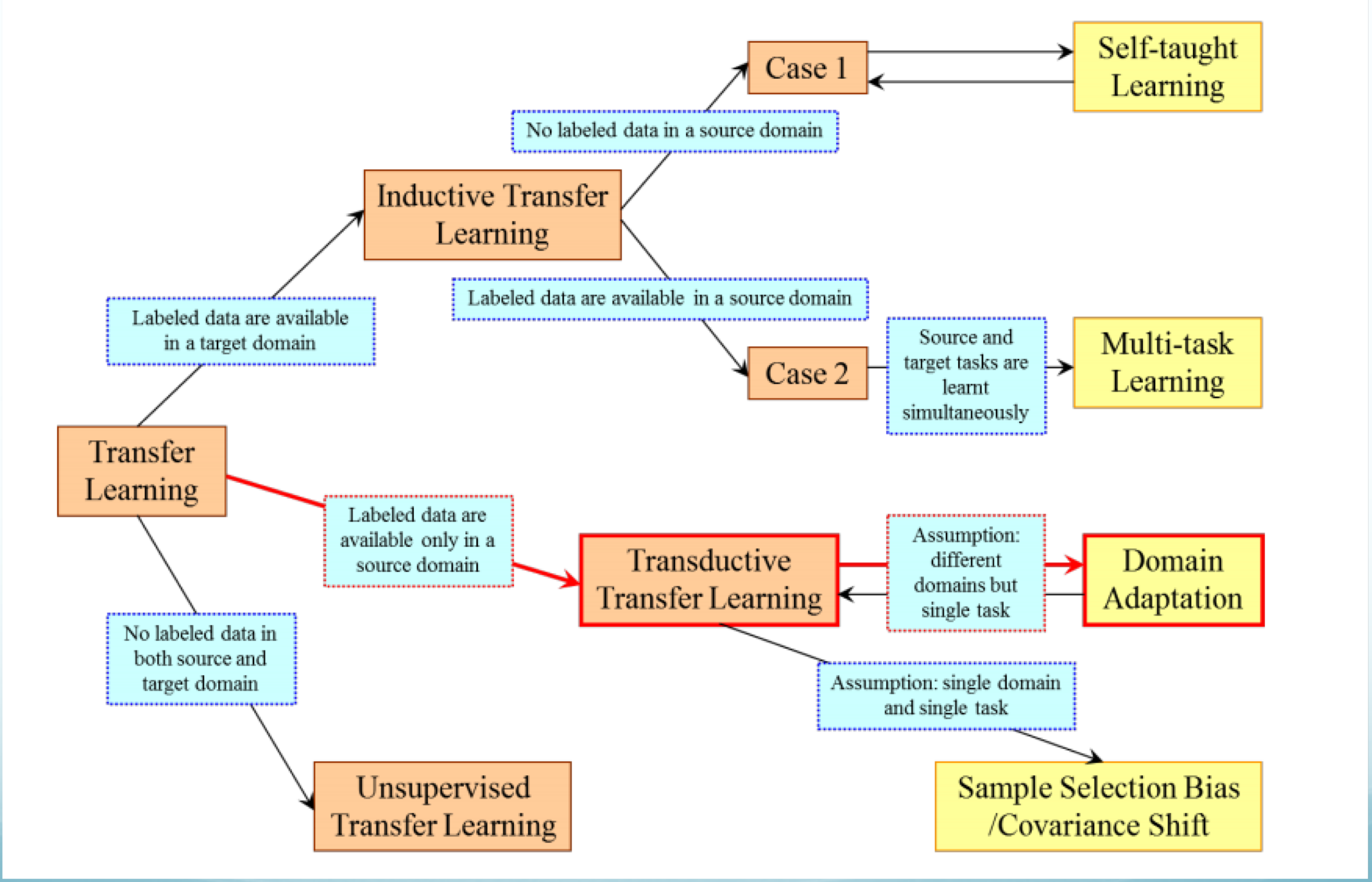
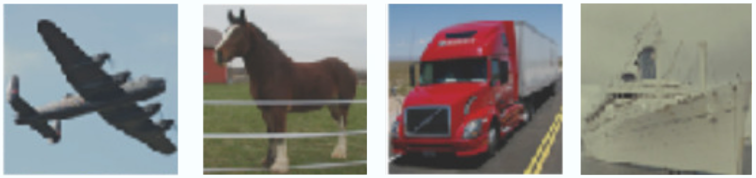
Overview



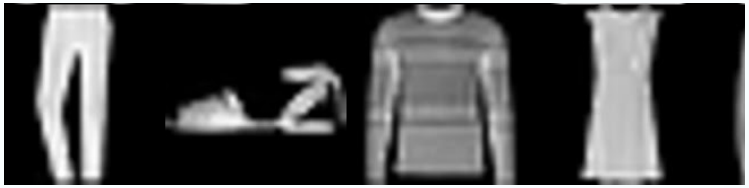
Case 1
Self-taught Learning
No labeled data in a source domain
Inductive Transfer Learning
Labeled data are available in a source domain
Labeled data are available in a target domain
Case 2
Source and target tasks are learnt simultaneously
Multi-task Learning
Transfer Learning
Labeled data are available only in a source domain
Transductive Transfer Learning
Assumption: different domains but single task
Domain Adaptation
No labeled data in both source and target domain
Assumption: single domain and single task
Unsupervised Transfer Learning
Sample Selection Bias /Covariance Shift

Datasets

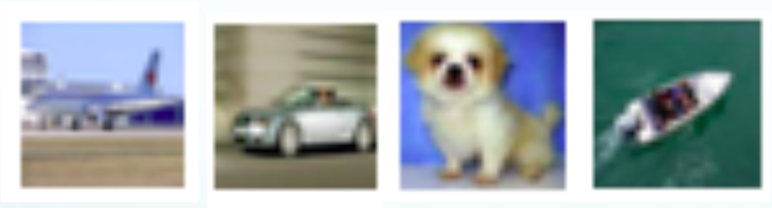
STL-10



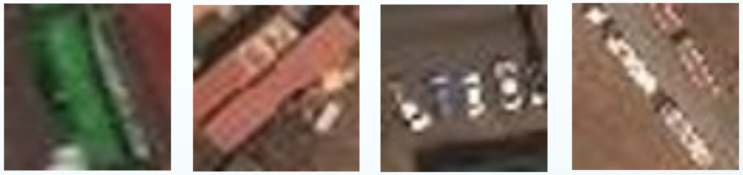
Fashion MNIST



CIFAR-10



xView-10

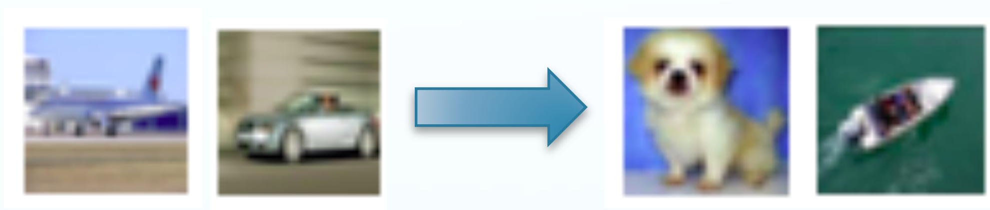


MNIST

Domains

- Train and Test in same domain

CIFAR-10



Train

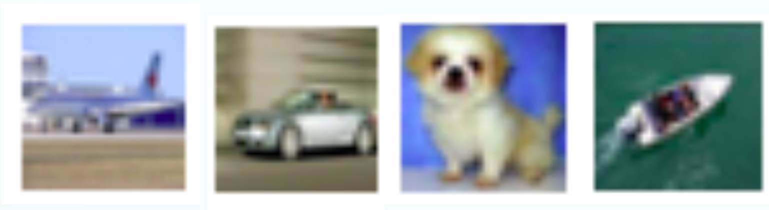
Test

Domain Shift

- Source and Target domain are different

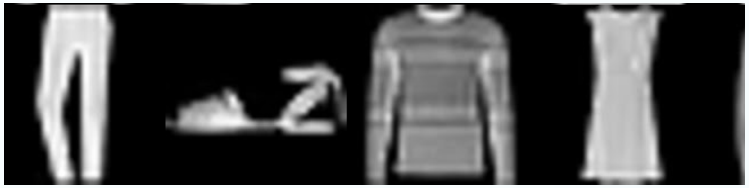
Source

CIFAR-10



Target

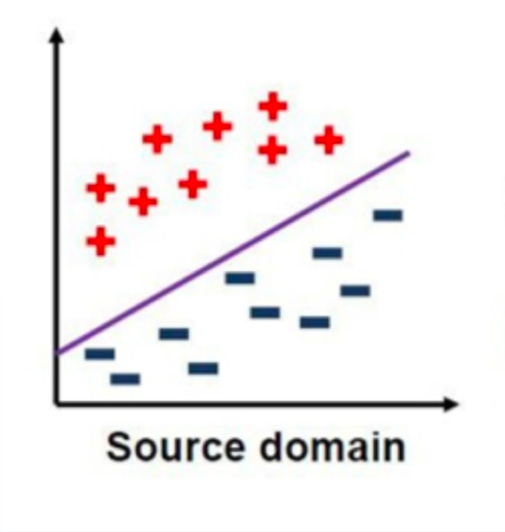
Fashion MNIST



Train

Test

Domain Shift



Why We Care?

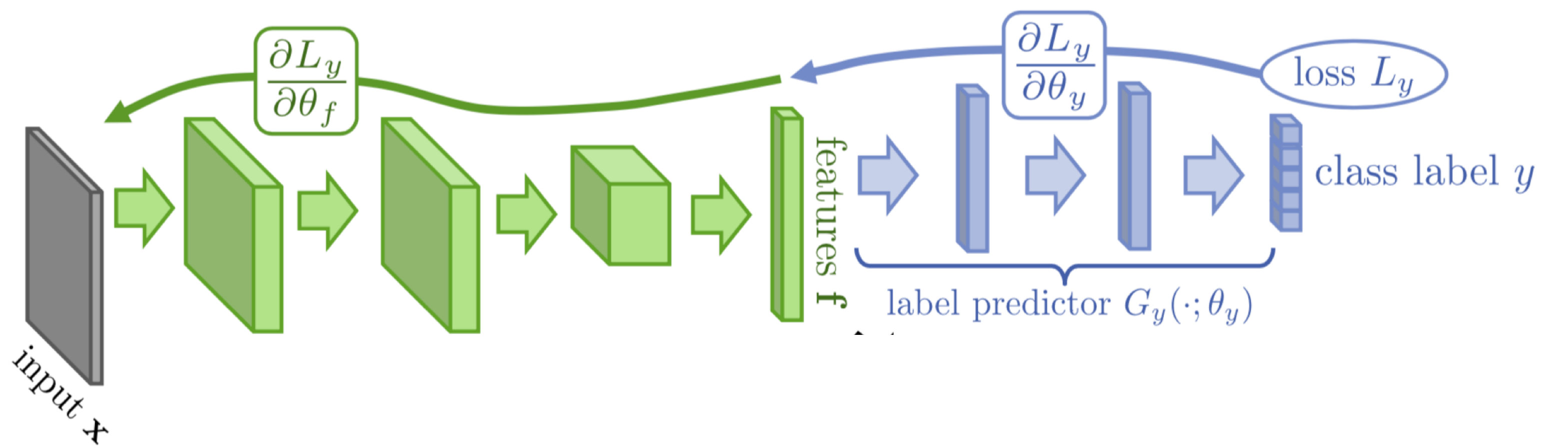
- Historical documents usually come from different domains:
  - Documents are different time, authors, etc
- Documents in Different Languages could cause also a domain shift

DA for Character Recog.

Source

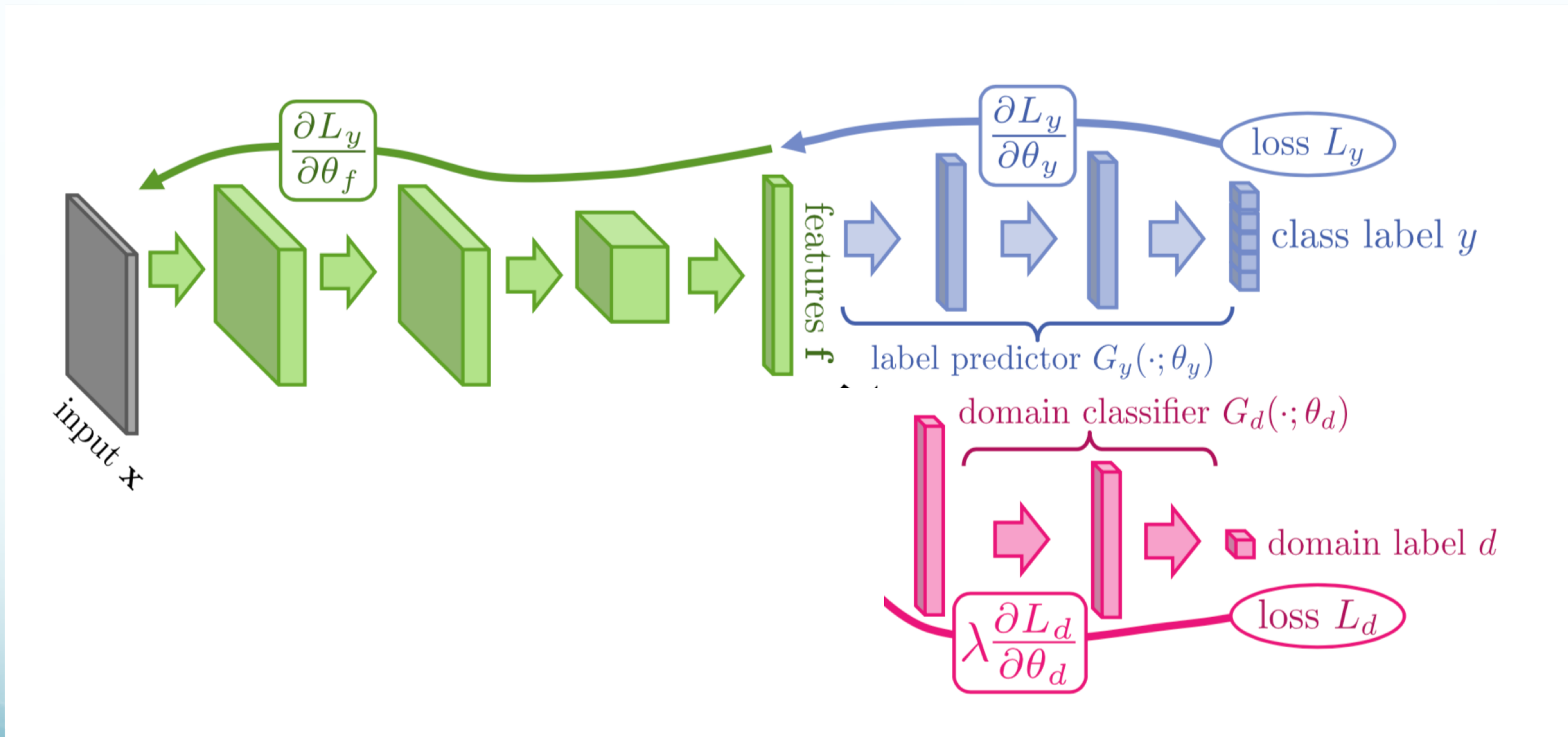
Target

Domain Adversarial Training (DANN) - Classifier



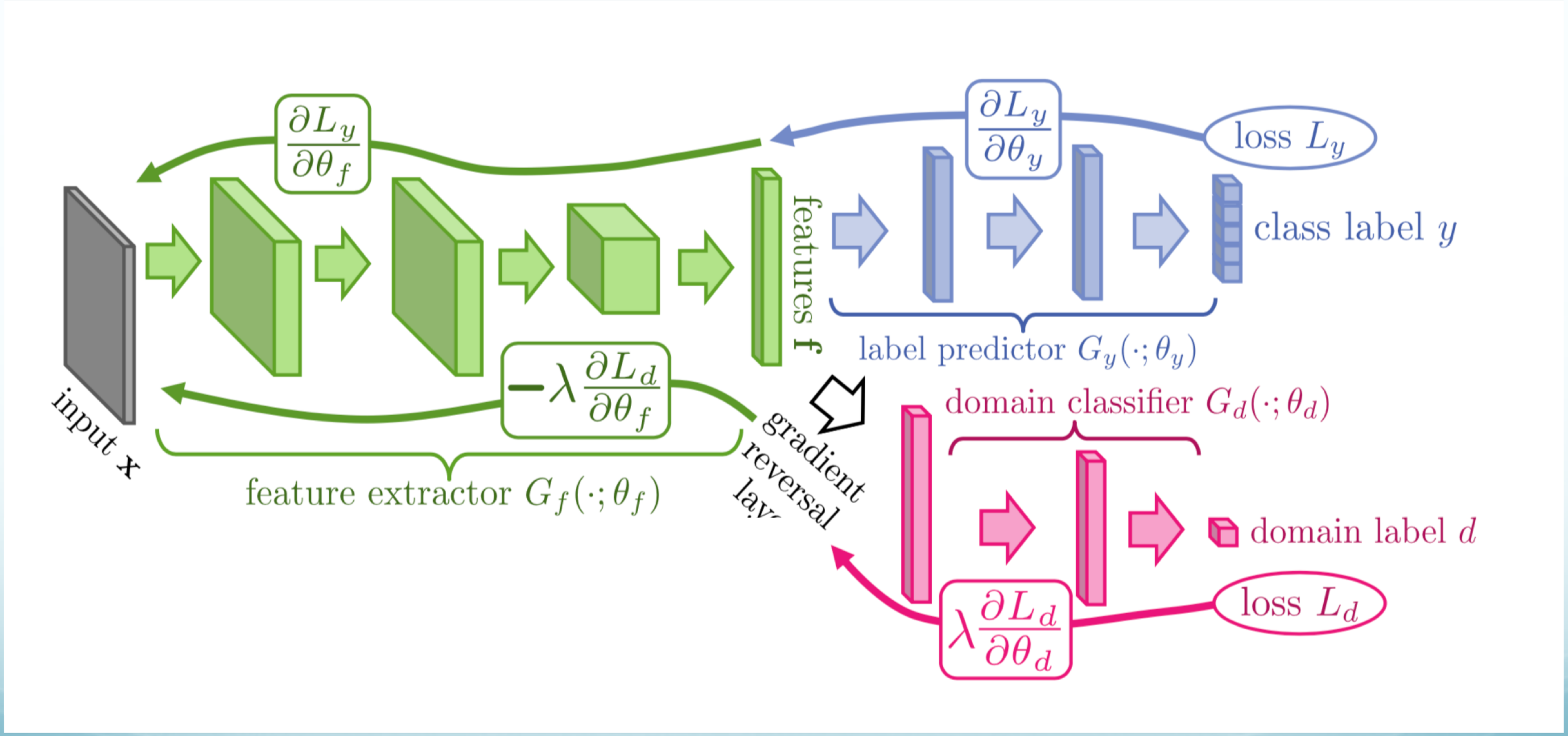
Ganin, Yaroslav, et al. "Domain-adversarial training of neural networks." The Journal of Machine Learning Research 17.1 (2016)

Domain Adversarial Training (DANN) - Discriminator



Ganin, Yaroslav, et al. "Domain-adversarial training of neural networks." The Journal of Machine Learning Research 17.1 (2016)

Domain Adversarial Training (DANN) – Reversal Layer



Ganin, Yaroslav, et al. "Domain-adversarial training of neural networks." The Journal of Machine Learning Research 17.1 (2016)

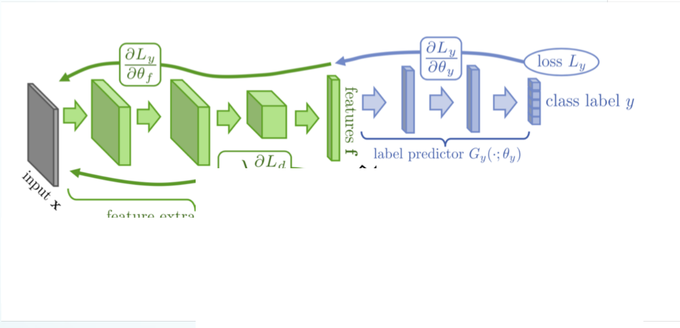
VADA

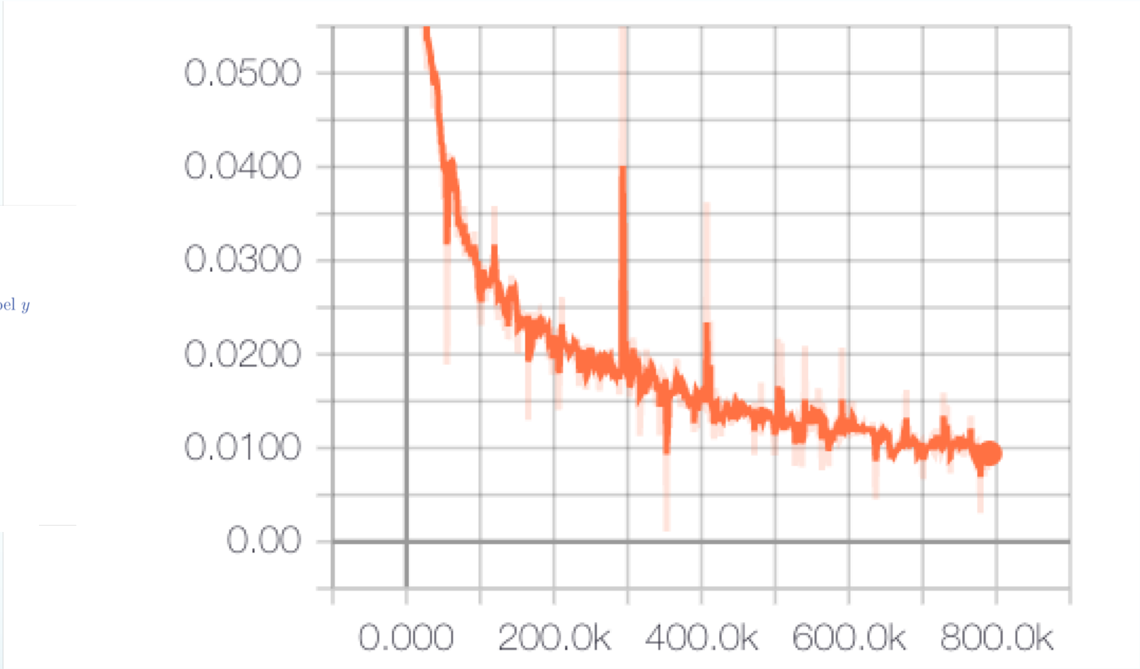
- Virtual Adversarial Domain Adaptation (Shu 2018)
- Unsupervised Domain Adaptation
- Conditional Entropy Minimization
- https://github.com/ozanciga/dirt-t

Results

Source Target	MNIST SVHN
Source Only	40.9
VADA	**74.0**

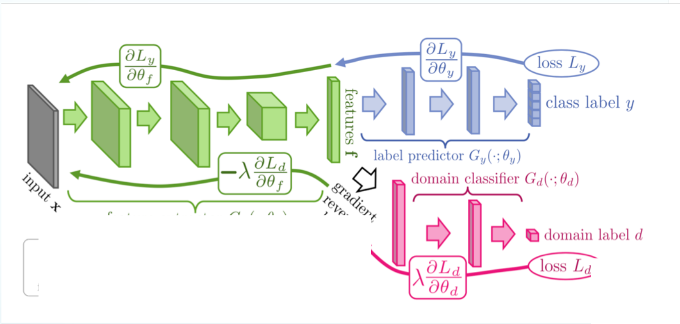
Results

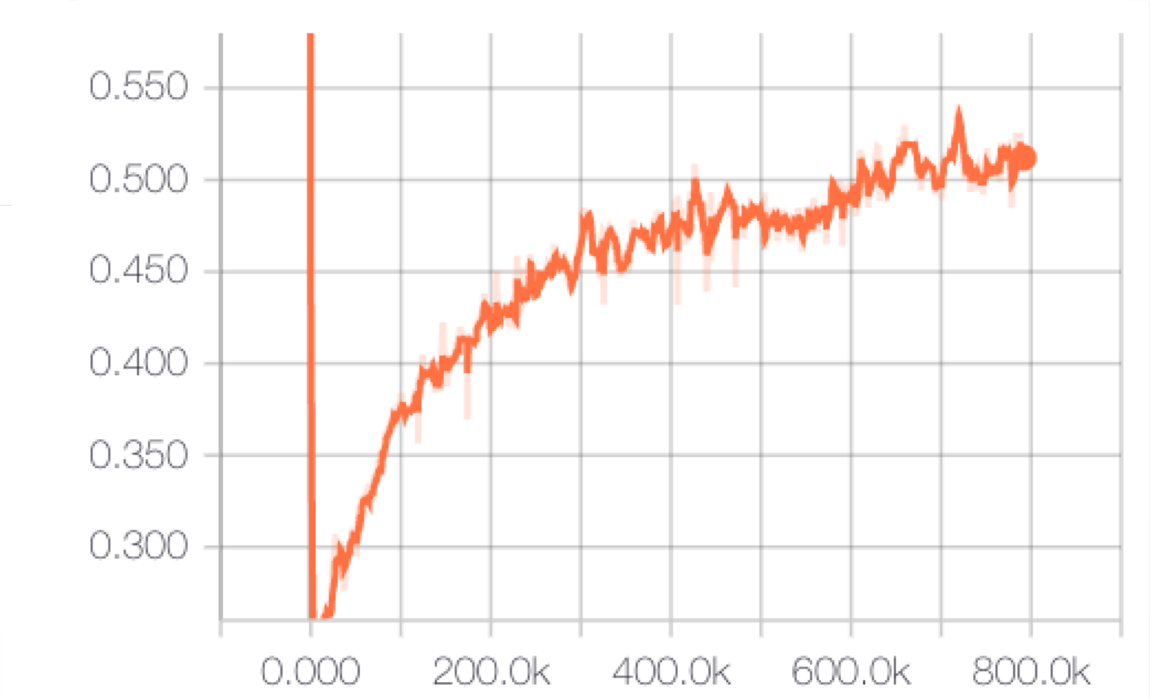




Source Classification Loss

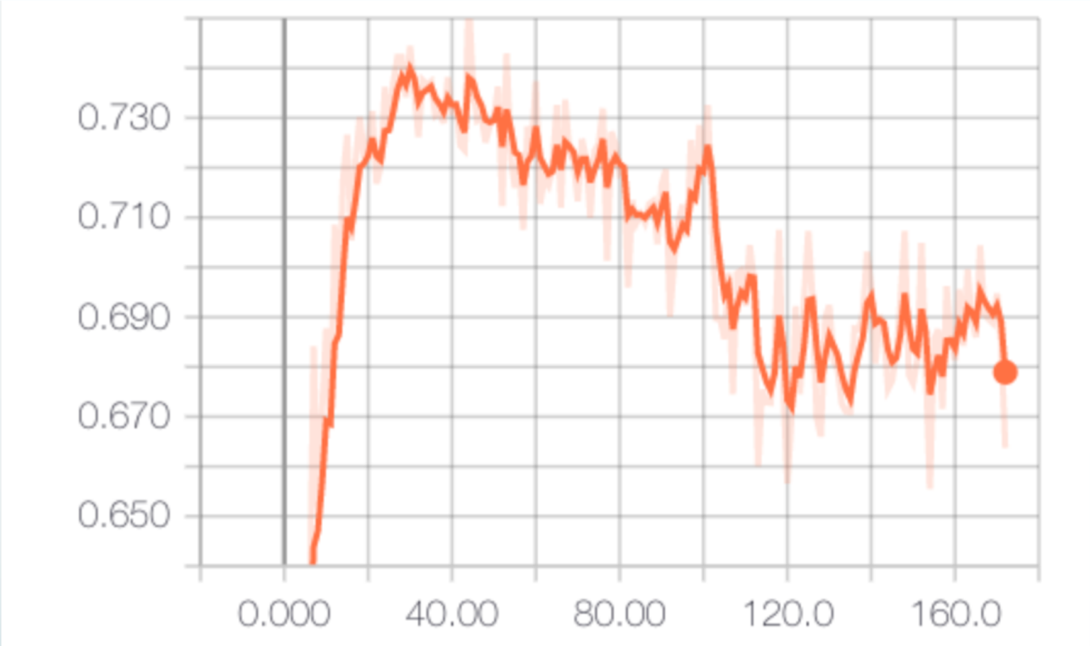
Results





Discriminator Loss

Results



Target Classification Accuracy

Conclusion and Future Work

- DA techniques can alleviate domain shift problem
- DA significantly improve over simple transfer leaning
- DA can be applied to other datasets relevant to text and handwriting recognition

References

- Ganin, Yaroslav, et al. "Domain-adversarial training of neural networks." The Journal of Machine Learning Research 17.1 (2016)
- Shu, Rui, et al. "A dirt-t approach to unsupervised domain adaptation." arXiv preprint arXiv:1802.08735 (2018).

Questions