VisDA Classification Challenge:

Runner-Up Talk

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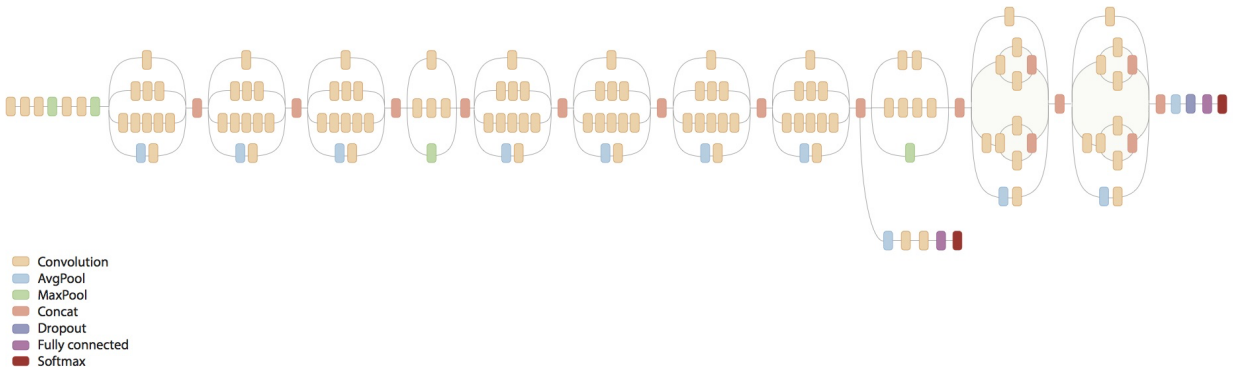
VisDA Classification Challenge

Our Approach

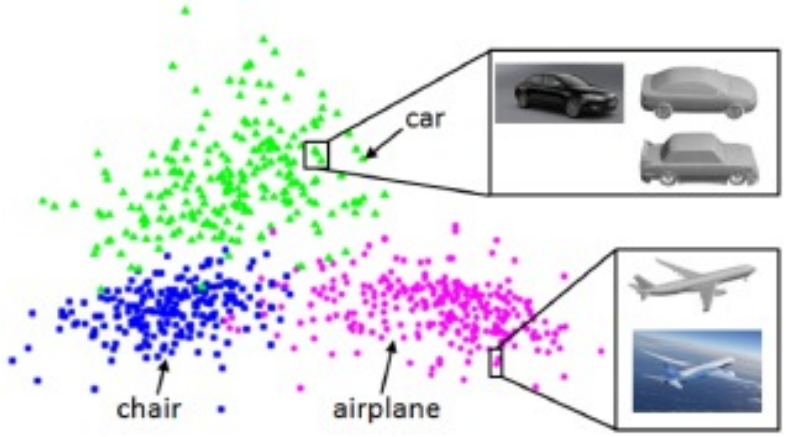
- **Assembly of Shallow Domain Adaptation Networks (SDAN)**
- **We extract deep features**
  - Off-the-shelf models pre-trained on ImageNet
  - Inception ResNet v2, Inception v3 and v4, ResNet 152



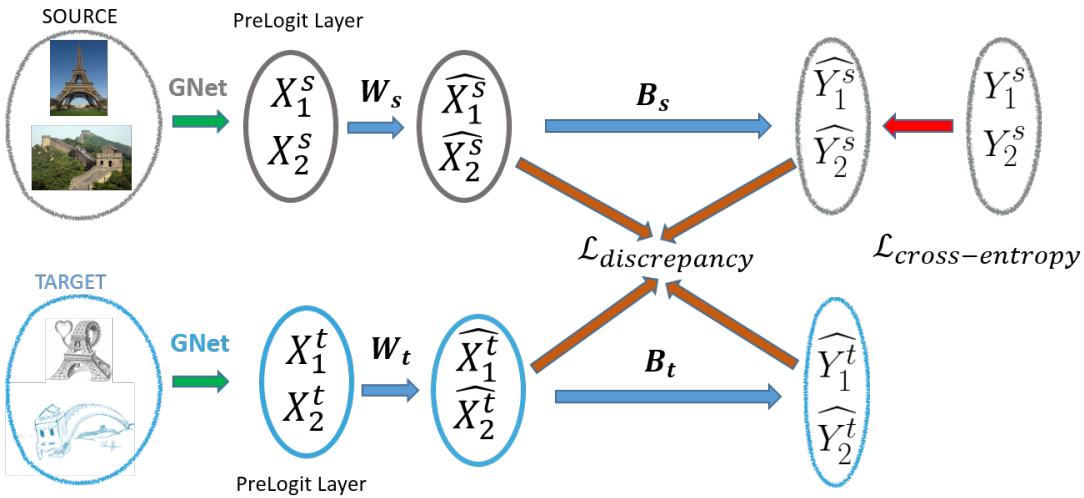
- **We test two groups of methods**
  - Discrepancy-based SDANs and their multiple variants
  - Adversarial Learning SDANs

Discrepancy-based SDANs

- Max Mean Discrepancy (MMD) with multiple kernels [Gretton'12]

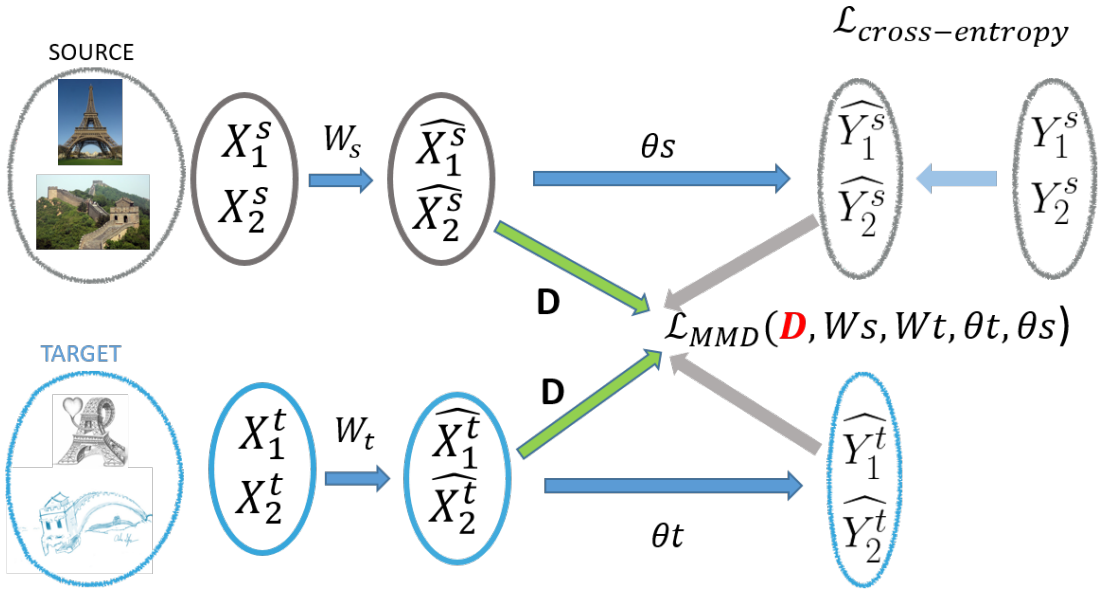


- MMD in DAN for learning transferable features [Long'15]



SDAN Variants

- **Residual SDAN**: $W_t = W_s + W_n$, where $W_n \sim N(0, \frac{2}{n_d})$
- **Random Kernels**: in any batch, 5 MMD kernel bandwidths are drawn from a Gamma distribution
- **Adversarial SDAN**: non-shared version
  - Define D_p be a projection (analog to Discriminator) in the kernel space

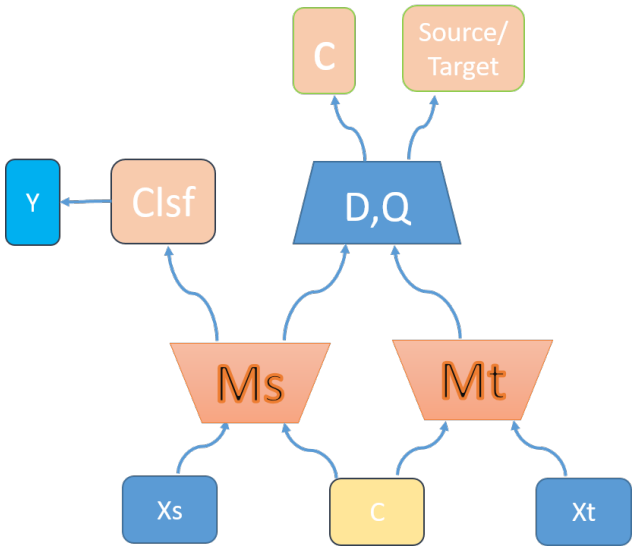


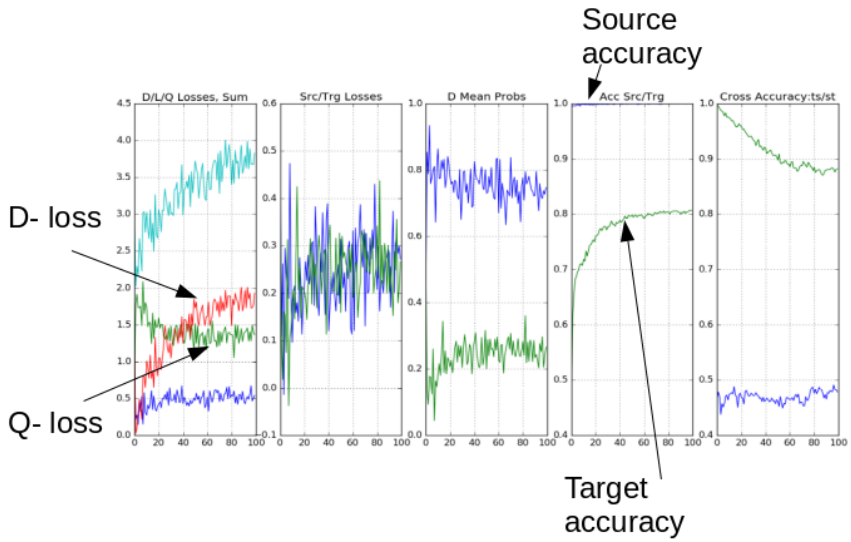
- For the loss L_{MMD}, alternate two optimization steps:
- $min_{W_s, W_t} L_{MMD}$ and $max_{D_p} L_{MMD}$

Adversarial Learning

Extend InfoGAN to Domain Adaptation

- Source/Target Mappers, Classifier and Discriminator like in ADDA [Tzeng'17]
- Latent variables *c*: class labels for Source, random for Target
- Shared layers of Discriminator and *Q*-function





Assembling approach

- **Average the softmax values or by the majority voting**
- **Combine methods with a good expected accuracy and important variability**
  - Different deep features
  - Shared weights and residual SDANs
  - MMD kernels with fixed or random kernel bandwidths
  - Subsets of training data to adapt SDANs
  - Different D and Q layer sharing in adversarial SDANs

Averaging: 2 levels

- **Averaging SDAN versions with different parameters yields** $\sim$ 3%
  - ResNet features:

SDAN	Resid	RndKrnls	Resid+RndKrnls	...	All
77.6	77.95	79.1	77.55	...	**81.6**

- **Averaging of 'Averaged' SDANs by features yields again** $\sim$ 3%

ResNet	Incep-ResNet	InceptV3	InceptV4	All
81.6	84.9	84.1	84.1	**87.4**

Leaderboard: ImageNet Pretraining

#	User	Team Name	Per Category Accuracy											MeanAcc
			plane	bcycl	bus	car	horse	horse	mcycl	person	plant	sktbd	train	truck	
1	GF_ColourLab_UEA		96.9	92.4	92.0	97.2	95.2	98.8	86.3	75.3	97.7	93.3	94.5	93.3	92.8
2	NLE_DA		94.3	86.5	86.9	95.1	91.1	90.0	82.1	77.9	96.4	77.2	86.6	88.0	87.7
3	BUPT_OVERFIT	BUPT_OVERFIT	95.7	67.0	93.4	97.2	90.6	86.9	92.0	74.2	96.3	66.9	95.2	69.2	85.4