A Compact DNN: Approaching GoogLeNet-Level Accuracy of Classification and Domain Adaptation

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Motivation

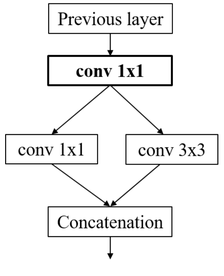
Previous compact DNNs (SqueezeNet & FaConvNet)

- No accuracy loss on image classification
- Decreased domain adaptation (DA) quality

Basic explanation of degraded DA accuracy

- Weakened feature representation ability by extensive use of small convs (1x1 & 3x3)

SqueezeNet



	ImageNet	DA (A->W)
AlexNet (61 M)	57.2	73.0
SqueezeNet (1.2 M)	57.5	**64.4**
FaConvNet (2.8 M)	70.1	**71.8**

Our DNN architecture (#Param: 4.1 M)

- Captures more diverse details with fewer parameters
- Integrates appearances (conv) and shapes (deconv)

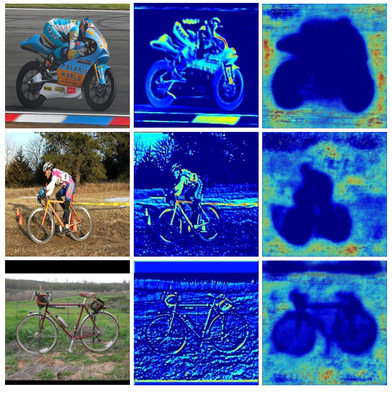
Our unsupervised DA method

- Source & Target reconstruction
- Feature discrepancy reduction: Maximum mean discrepancy (G-MMD) with a Gaussian kernel

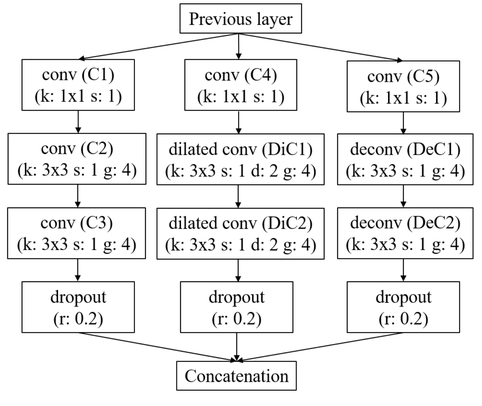
$$L_M = \left\| \frac{1}{N_s}\sum_{1}^{N_s}\psi(x_s) - \frac{1}{N_t}\sum_{1}^{N_t}\psi(x_t) \right\|_{\mathcal{H}}$$

- Source label prediction

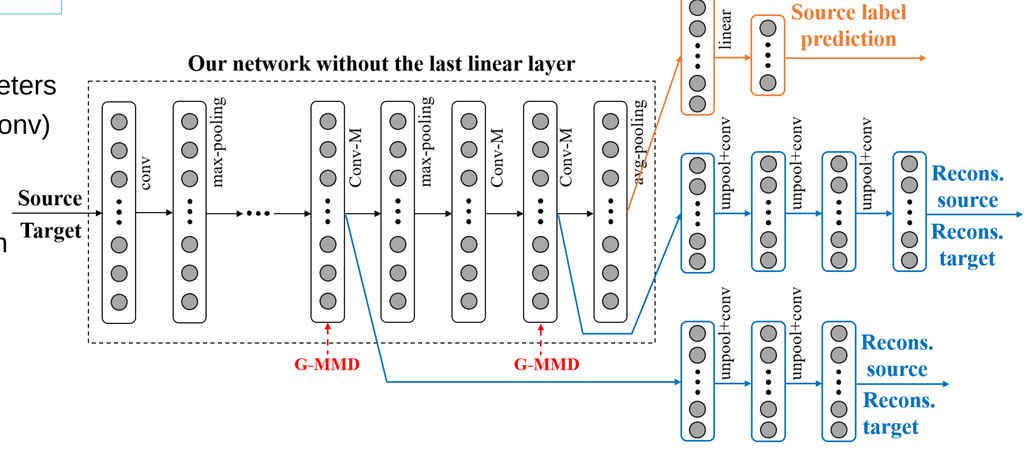
Complementary features Conv (mid.) & deconv (right)



Our Conv-M module (Conv & dilated-conv & deconv)



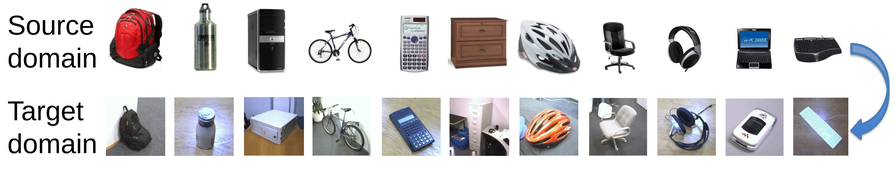
Our DA method (Reconstruction & divergence reduction & source label prediction)



ImageNet classification

	#Param.	Top-1	Top-5
AlexNet	61 M	57.2	80.3
GoogLeNet	7 M	68.7	88.9
VGG16	134 M	**71.9**	**90.6**
Our network	**4.1 M**	68.9	89.0

Unsupervised DA on *Office-31* & *Office-Caltech*



	A->W	D->W	W->D	W->A	A->D	D->A
GRL (AlexNet)	73.0	96.4	99.2	53.6	72.8	54.4
TRANSDUCTION (AlexNet)	80.4	96.2	98.9	62.5	83.9	56.7
GRL (Our net)	80.1	96.7	99.2	64.1	78.0	65.4
Our DA (Our net)	82.6	**97.0**	99.4	67.4	80.1	67.3
Our DA (GoogLeNet)	**83.0**	96.9	**99.5**	**67.7**	**80.5**	**67.5**