

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



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Motivation

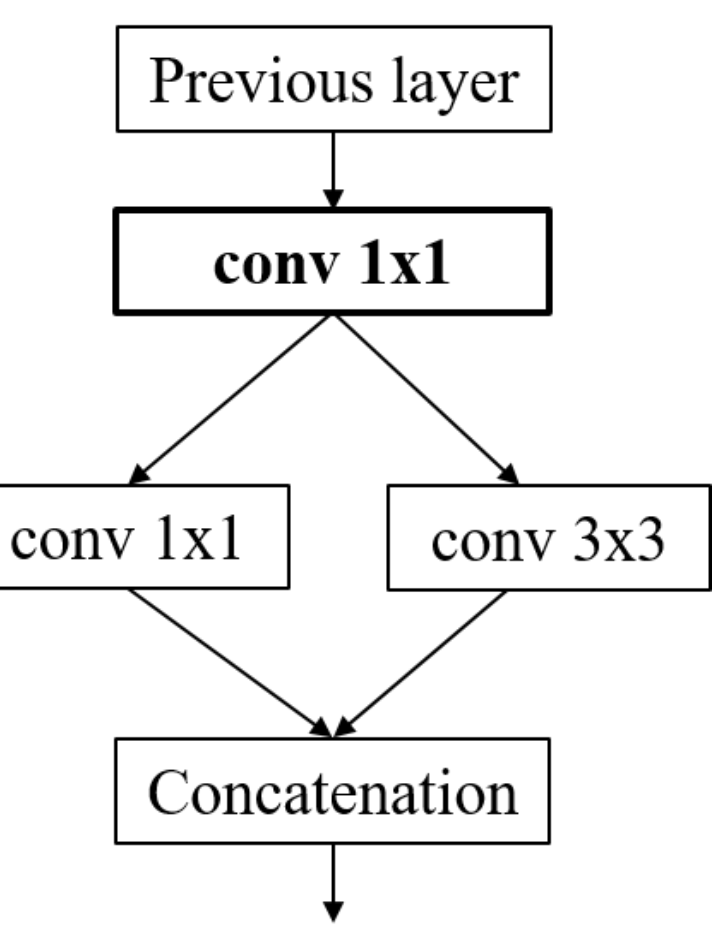
Previous compact DNNs (SqueezeNet & FaConvNet)

- 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)

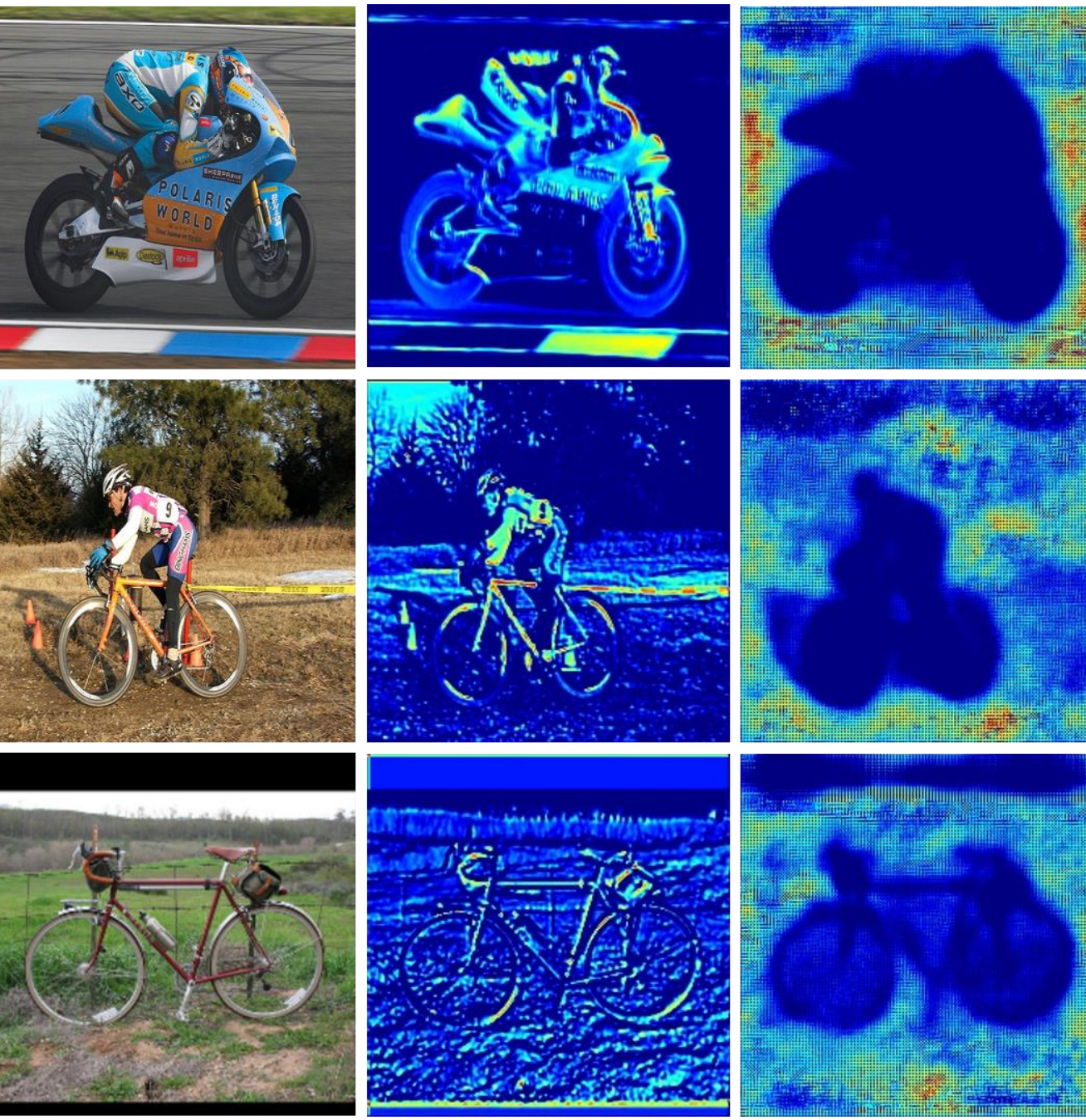
Our unsupervised DA method

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

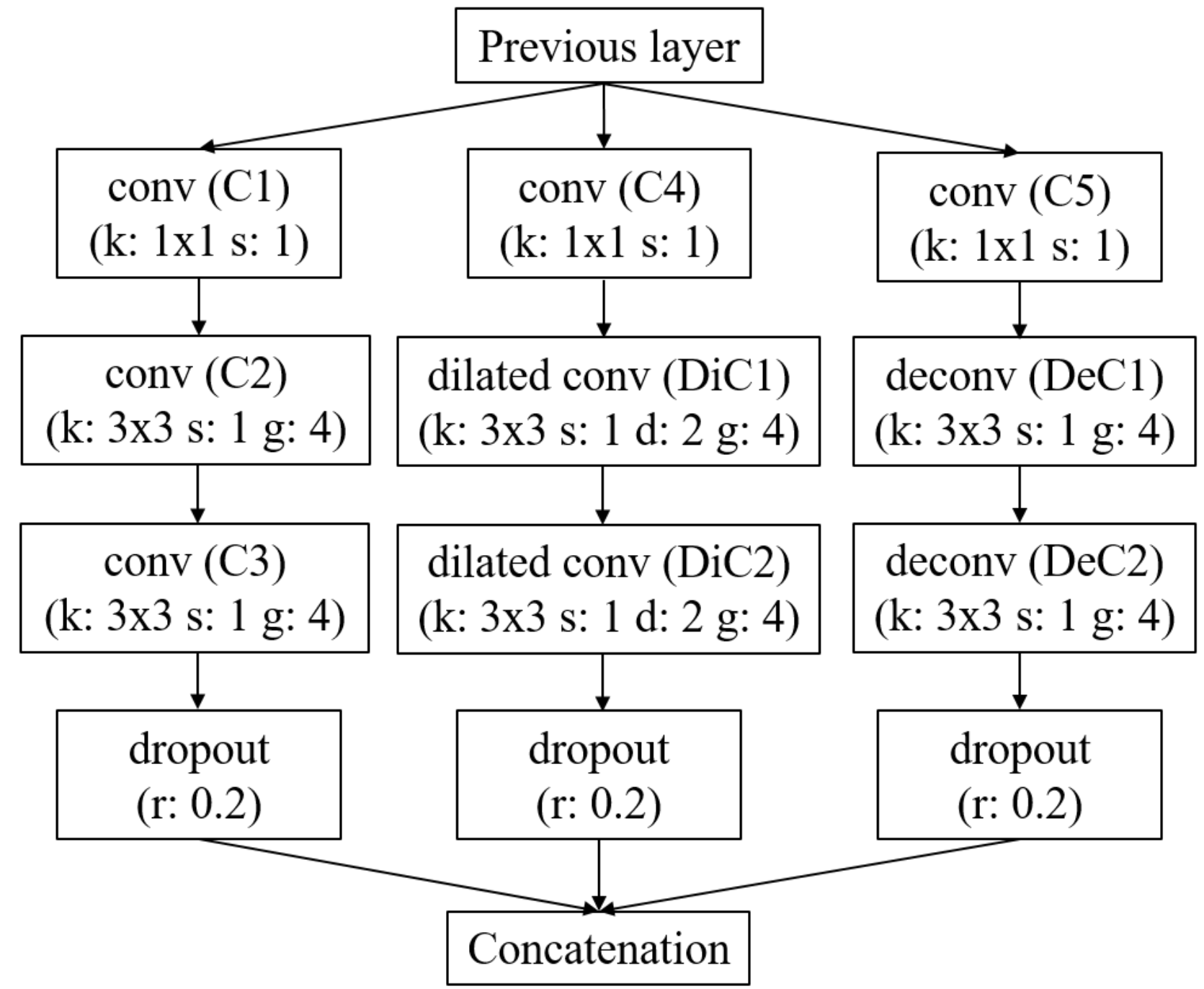
$$L_M = \left\| \frac{1}{N_s} \sum_1^{N_s} \psi(x_s) - \frac{1}{N_t} \sum_1^{N_t} \psi(x_t) \right\|_{\mathcal{H}}$$

- Source label prediction

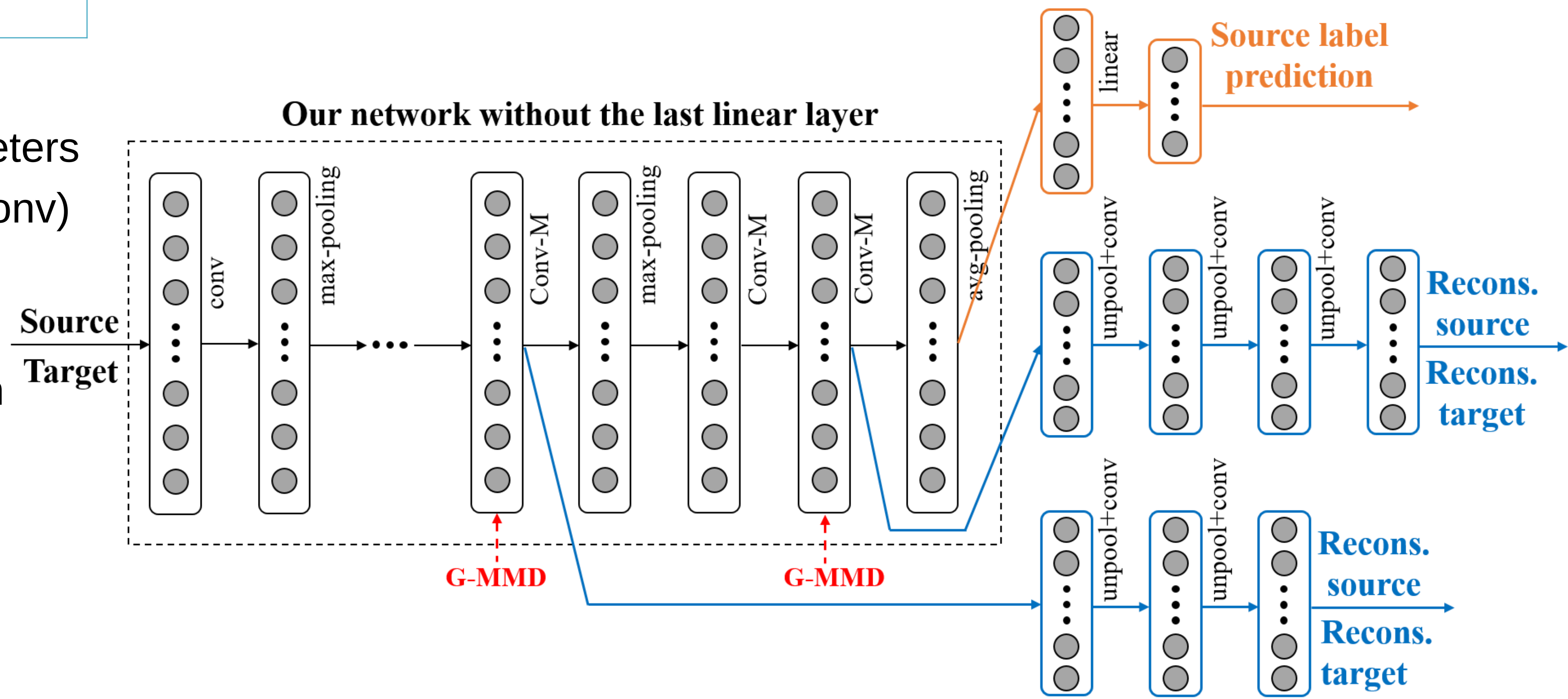
Complementary features Conv (mid.) & deconv (right)



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



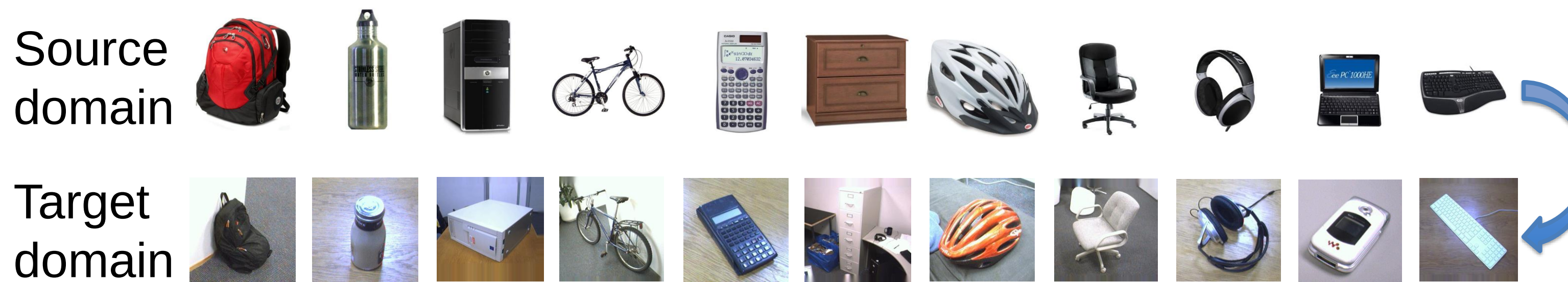
Our DA method (Reconstruction & divergence reduction & source label prediction)



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