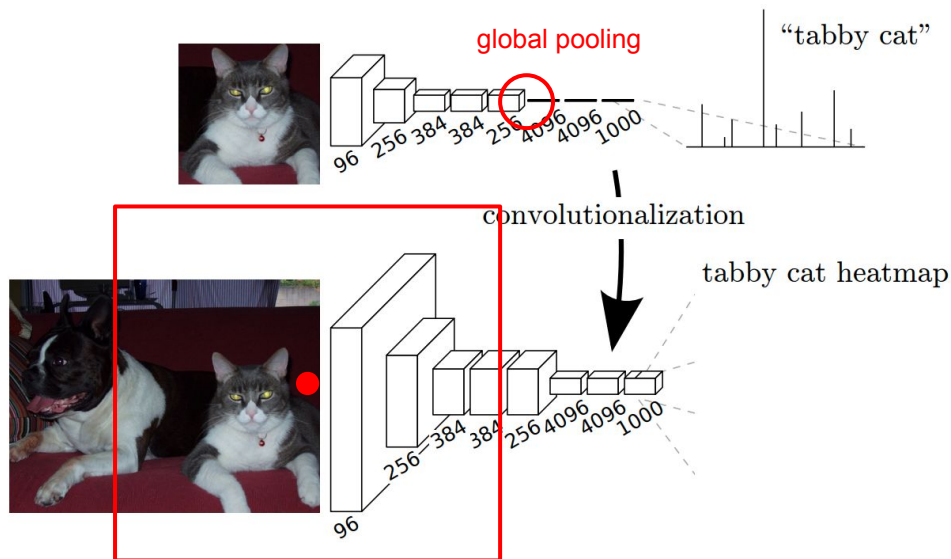


Fully Convolutional Networks for Semantic Segmentation - CONS

Xingyi Zhou

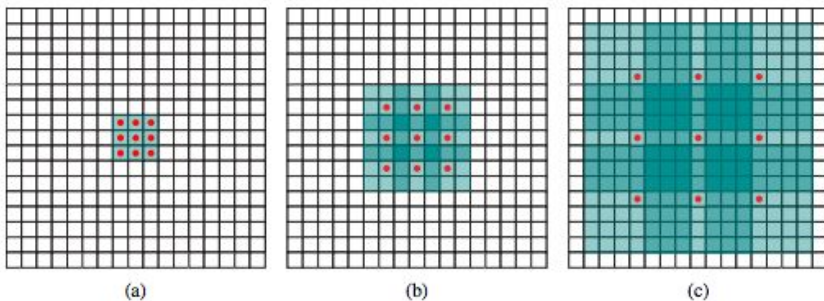
#1: Introduce a trade-off between receptive field and output resolution



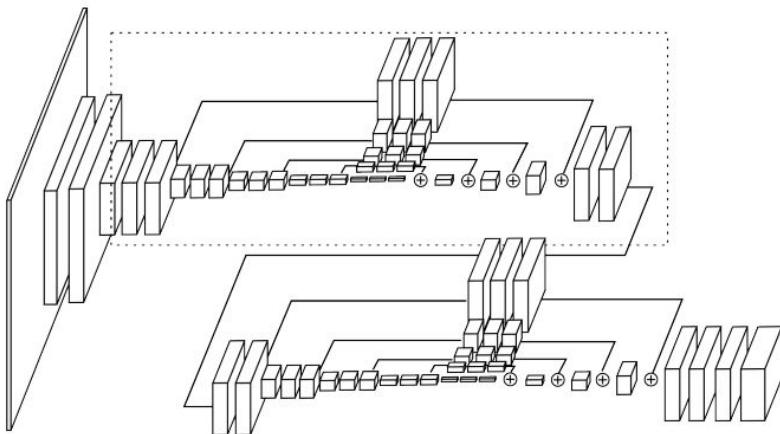
	FCN-AlexNet	FCN-VGG16	FCN-GoogLeNet ⁴
mean IU	39.8	56.0	42.5
forward time	50 ms	210 ms	59 ms
conv. layers	8	16	22
parameters	57M	134M	6M
rf size	355	404	907
max stride	32	32	32

lower resolution, lower spacial information, higher reseptive field, higher sementic

#1: Introduce a trade-off between receptive field and output resolution (Continued)

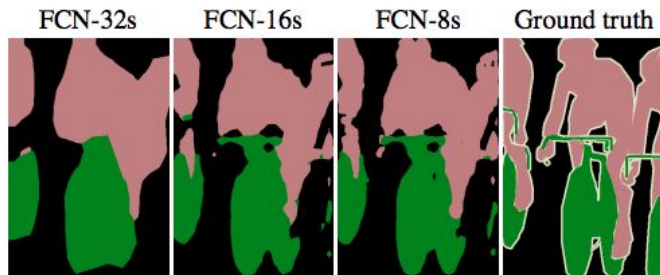


Yu et al. ICLR2016, dilated convolution



Newell et al. ECCV 2016, stacked hourglass network

#2: Experimental results not so good: small relative improvement from FCN-32s to FCN-8s



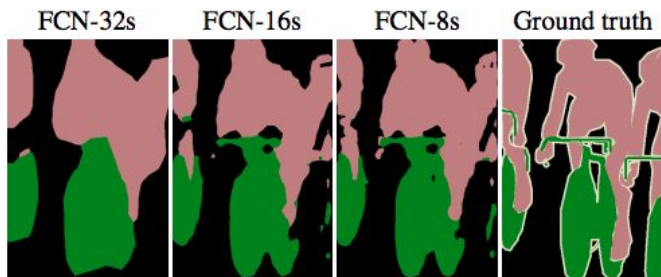
Upper bound

factor	mean IU
128	50.9
64	73.3
32	86.1
16	92.8
8	96.4
4	98.5

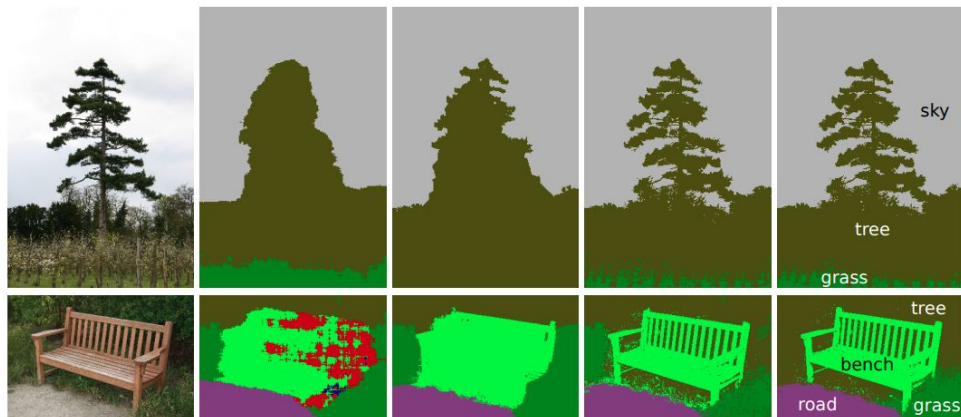
prediction

	pixel acc.	mean acc.	mean IU	f.w. IU
FCN-32s-fixed	83.0	59.7	45.4	72.0
FCN-32s	89.1	73.3	59.4	81.4
FCN-16s	90.0	75.7	62.4	83.0
FCN-8s	90.3	75.9	62.7	83.2

#3: Qualitative results not so good



Zheng et al. ICCV 2015, crf as rnn



Philipp et al. NIPS 2011, dense crf

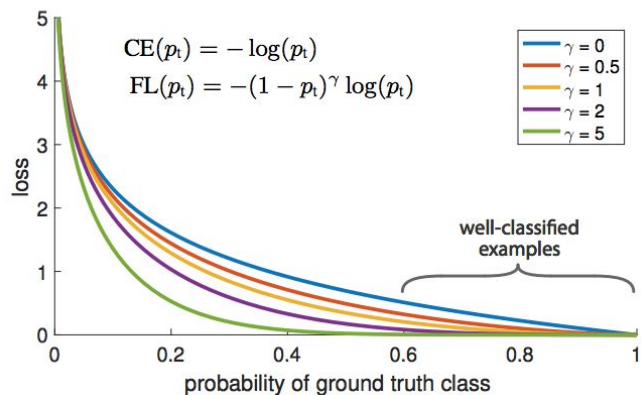
#4: Limited baseline comparison/ ablation study/ design choice

- The only baseline is FCN-32-fixed, which is an obvious suboptimal.
- AlexNet/ GoogleNet results?
- Other up-sampling technics (Nearest neighbor) with a learnable 1x1 conv?

	pixel acc.	mean acc.	mean IU	f.w. IU
FCN-32s-fixed	83.0	59.7	45.4	72.0
FCN-32s	89.1	73.3	59.4	81.4
FCN-16s	90.0	75.7	62.4	83.0
FCN-8s	90.3	75.9	62.7	83.2

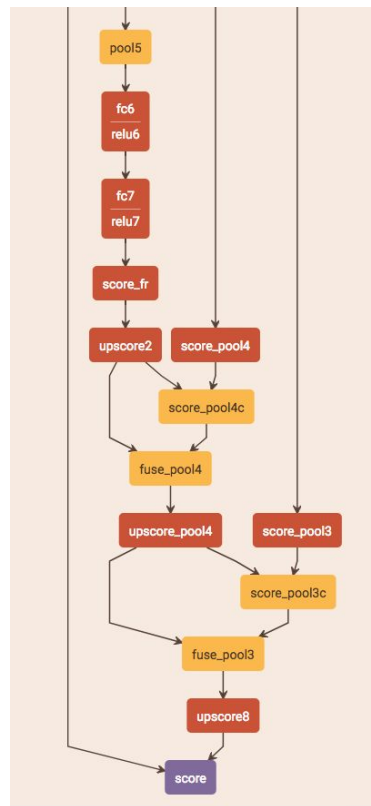
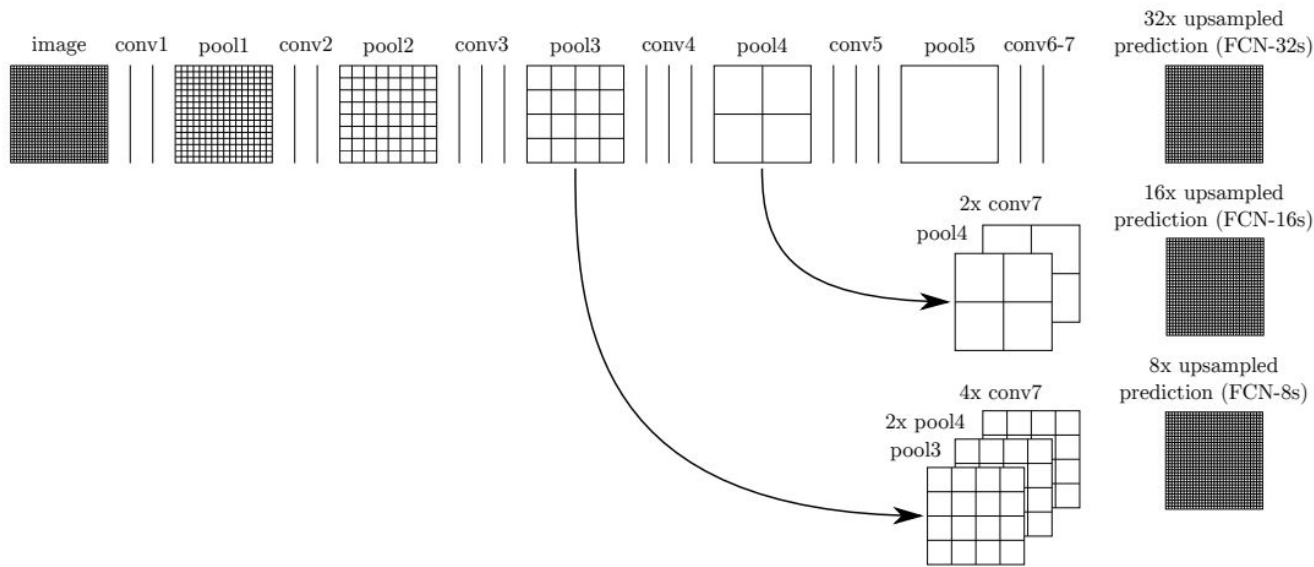
#5: Patch-wise training/ class balance experiments

- Problem: training all image pixels with the same loss may bias the prediction to background.
- Idea: adding more weights to some pixels.
- Patch sampling: **randomly** (uniformly among spacial) drop some pixels.
- And find it doesn't work.



Lin et al. ICCV 2017, Focal Loss for dense object detection

#6: Unclear description of upsample architecture



<https://github.com/shelhamer/fcn.berkeleyvision.org/blob/master/voc-fcn8s/deploy.prototxt>

<http://ethereon.github.io/netscope/#/editor>