SegNet

21 Nov
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Contents

- How to do Semantic Segmentation?
- How to upsample?
- FCN vs SegNet
- CamSeq1 Dataset
- Coding Issues

How to do Semantic Segmentation?

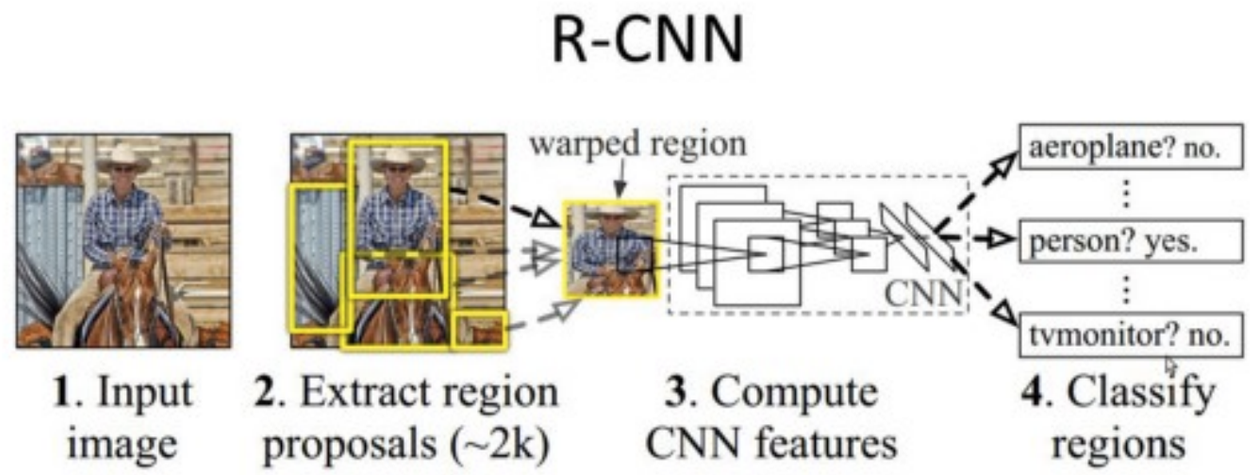
1. Region-Based Semantic Segmentation
2. Fully Convolutional Network
3. Weakly Supervised Semantic Segmentation

Source : https://goo.gl/oKGn7z (3 May, 2018)

1. Region-Based Semantic Segmetation

- More likely to ‘Detection’ as we already discussed

- R-CNN, SDS, Hypercolumns, Mask R-CNN

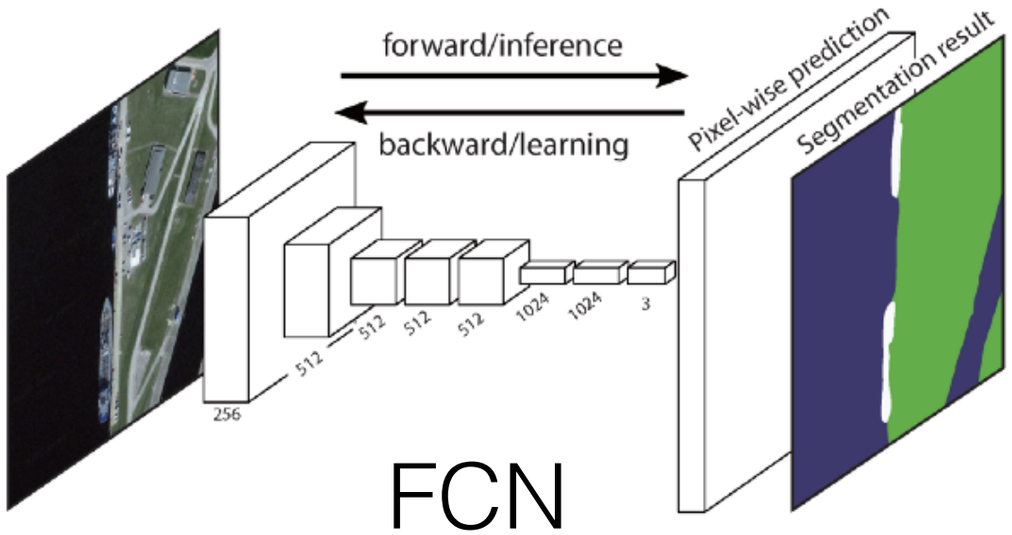


General framework: Region proposal + DCNN based region classification

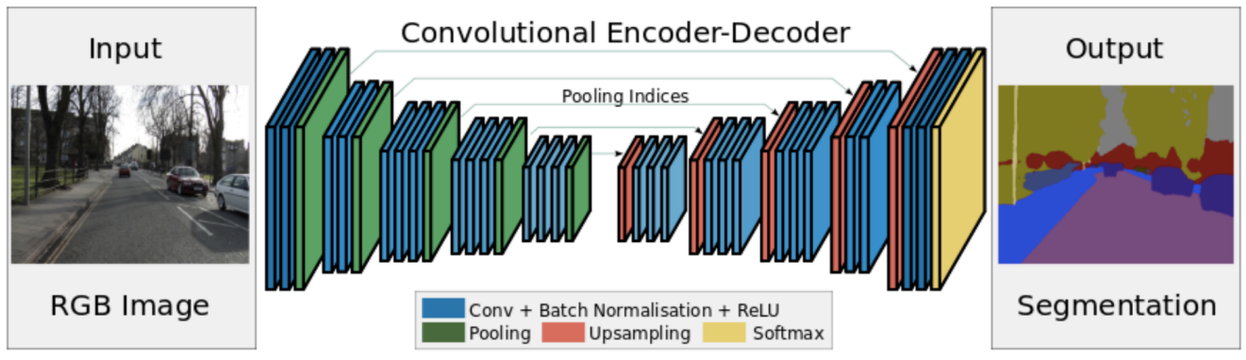
Rich Feature Hierarchies for Accurate Object Detection and Semantic Segmentation, R. Girshick, J. Donahue, T. Darrell, J. Malik,in CVPR 2014

2. Fully Convolutional Network

- Consisted with Encoder + Decoder
- Encoder detects the objects
- Decoder converts it to pixels
- Unlike Detection models, the end part of encoder is convolutional layer

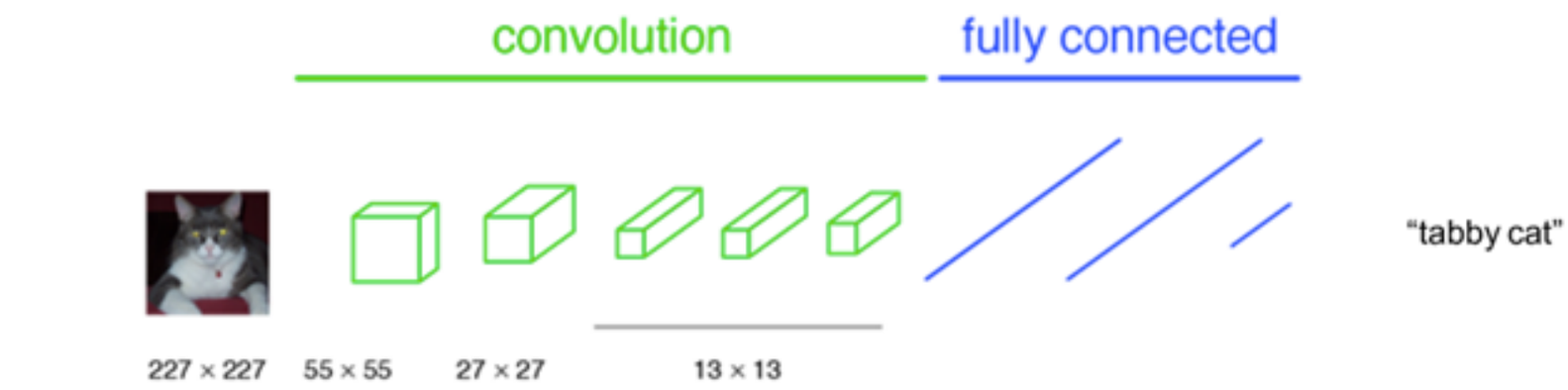


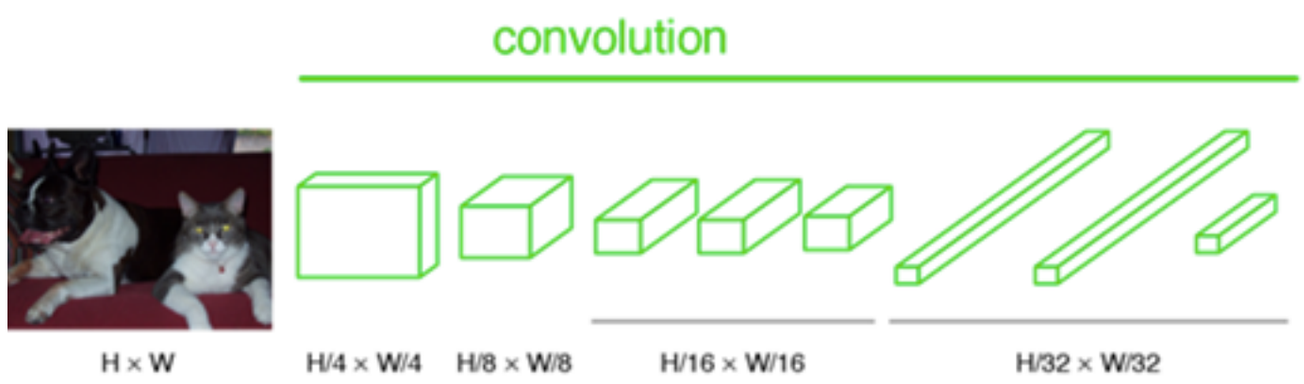
FCN



SegNet

2. Fully Convolutional Network





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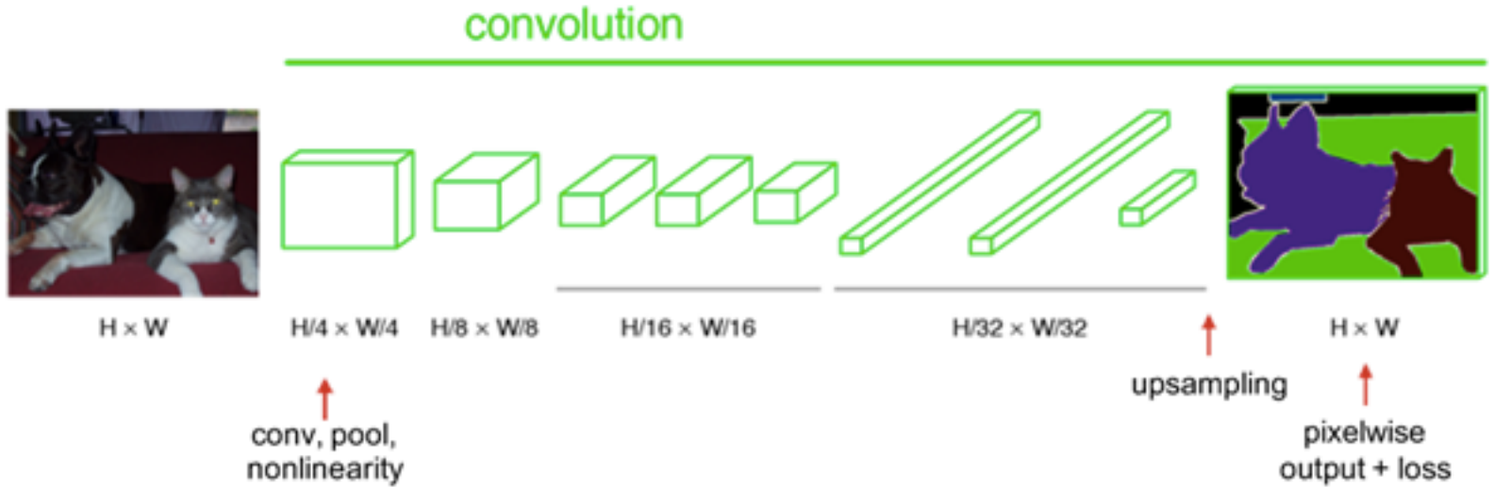
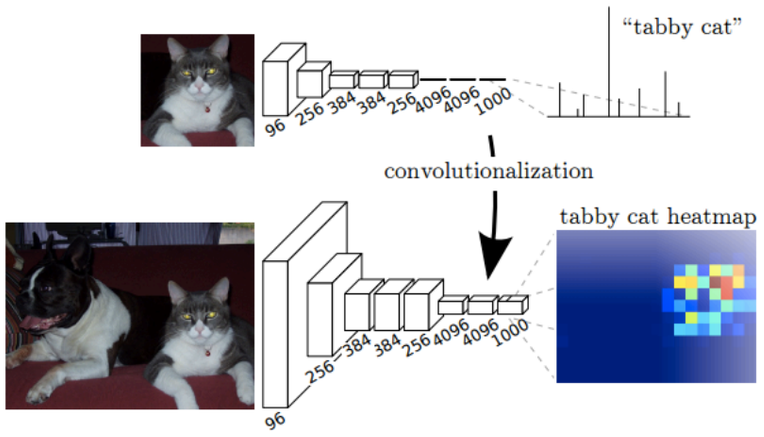


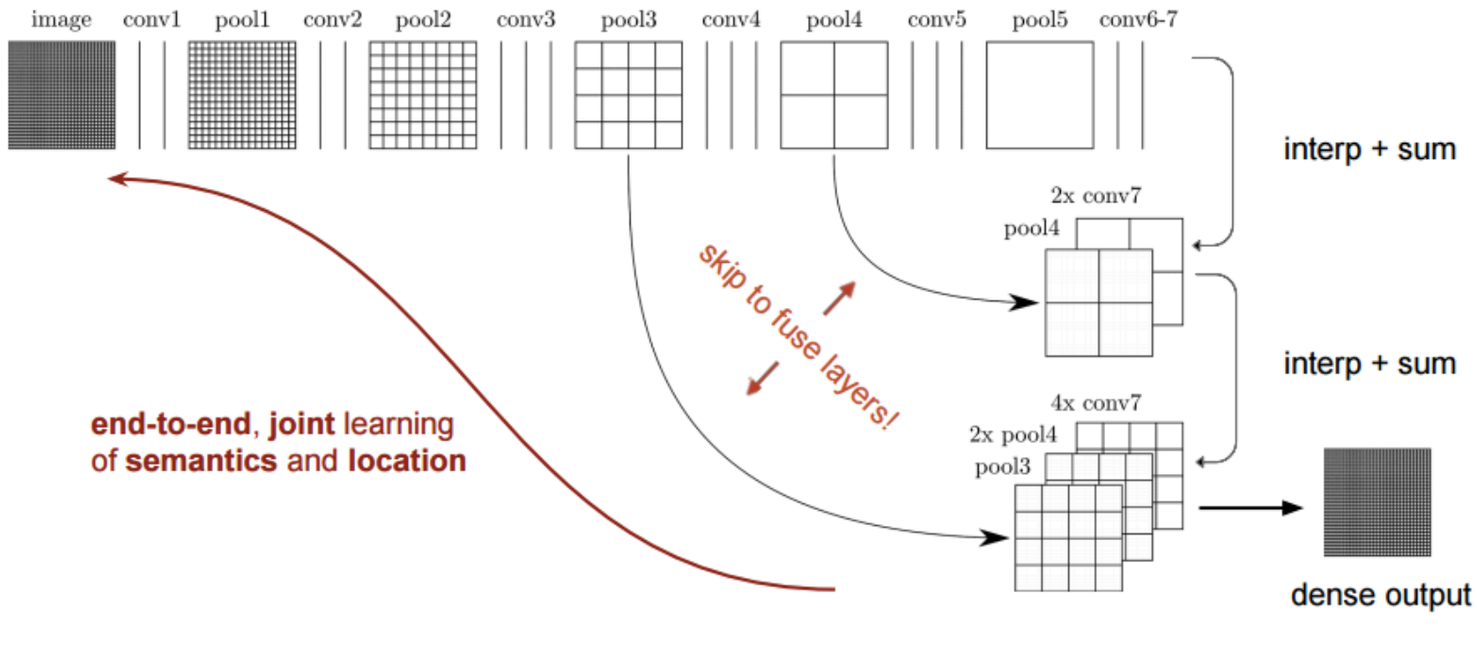
3. Weakly Supervised Semantic Segmentation

- Lots of ‘annotated’ images are needed to train
- Use ‘bounding boxes(result of detection)’ to train segmentation model
- Boxsup, Simple does it, Pixel-level labeling

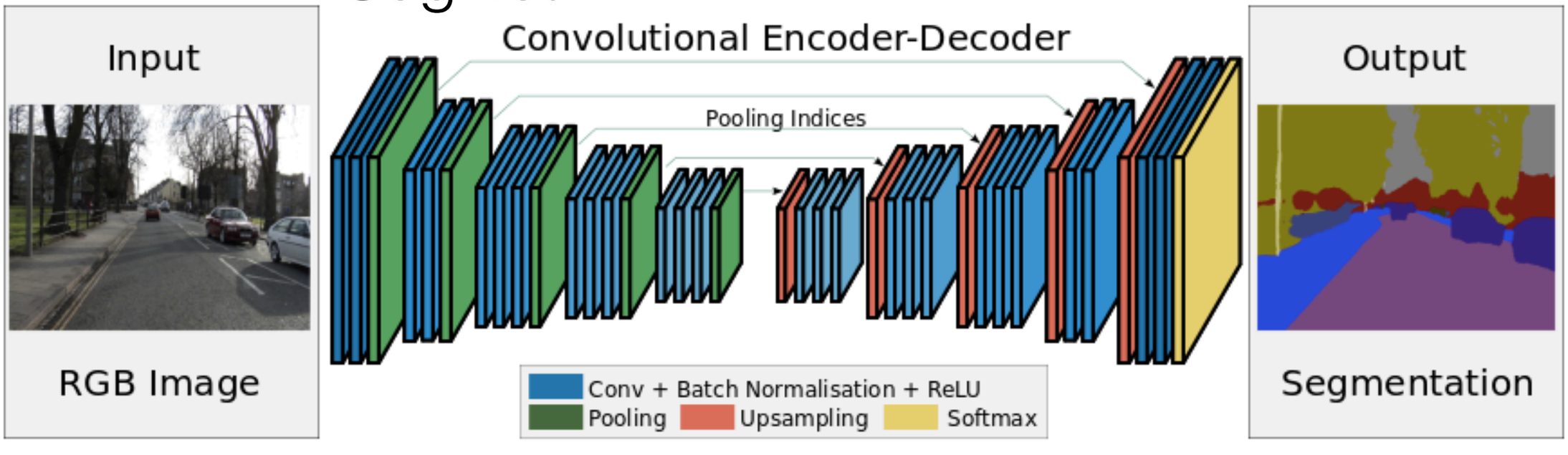
How to upsample?

FCN





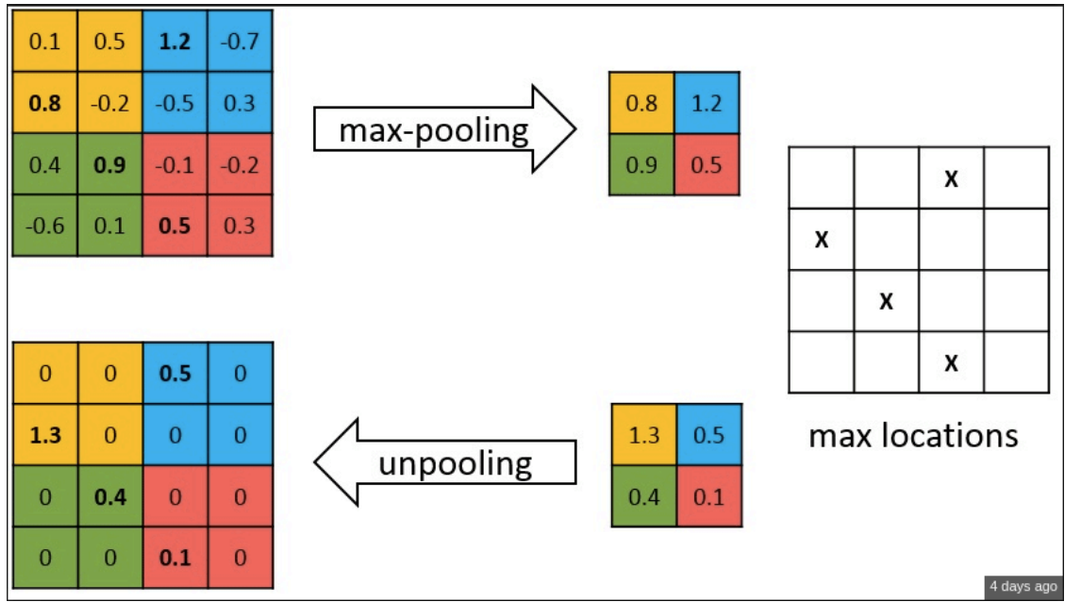
SegNet

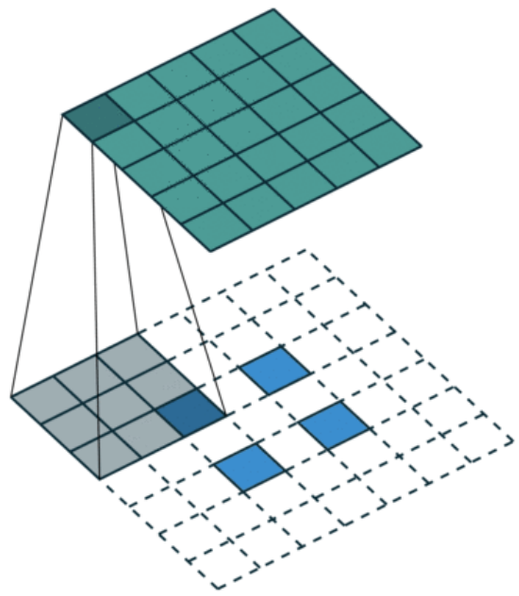


Upsampling, Deconvolution, Unpooling

- Upsampling refers to any technique that upsamples your image to a higher resolution
- Deconvolution, Unpooling $\subset$ Upsampling
- Deconvolution : reverse convolution, Conv2dTranspose()
- Unpooling : reverse pooling, No API

Unpooling vs Deconvolution

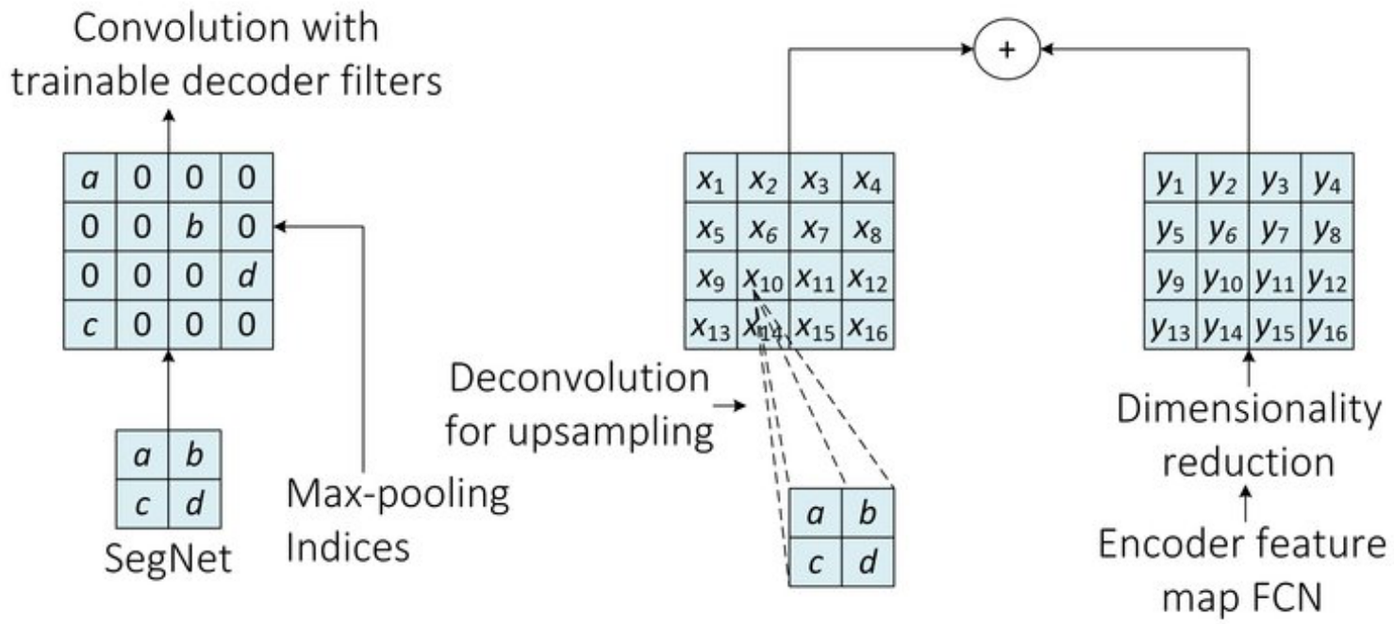




- Unpooling is a method of upsampling
- In Keras, there is no Unpooling API

- Deconvolution is a method of upsampling
- In Keras, Conv2dTranspose() is used

SegNet vs FCN



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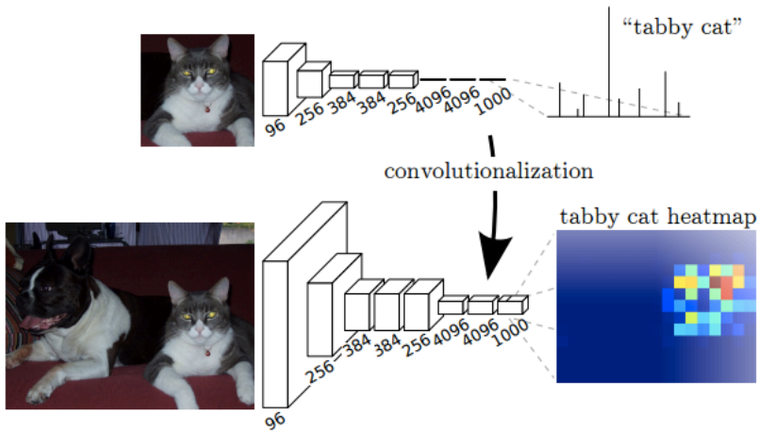
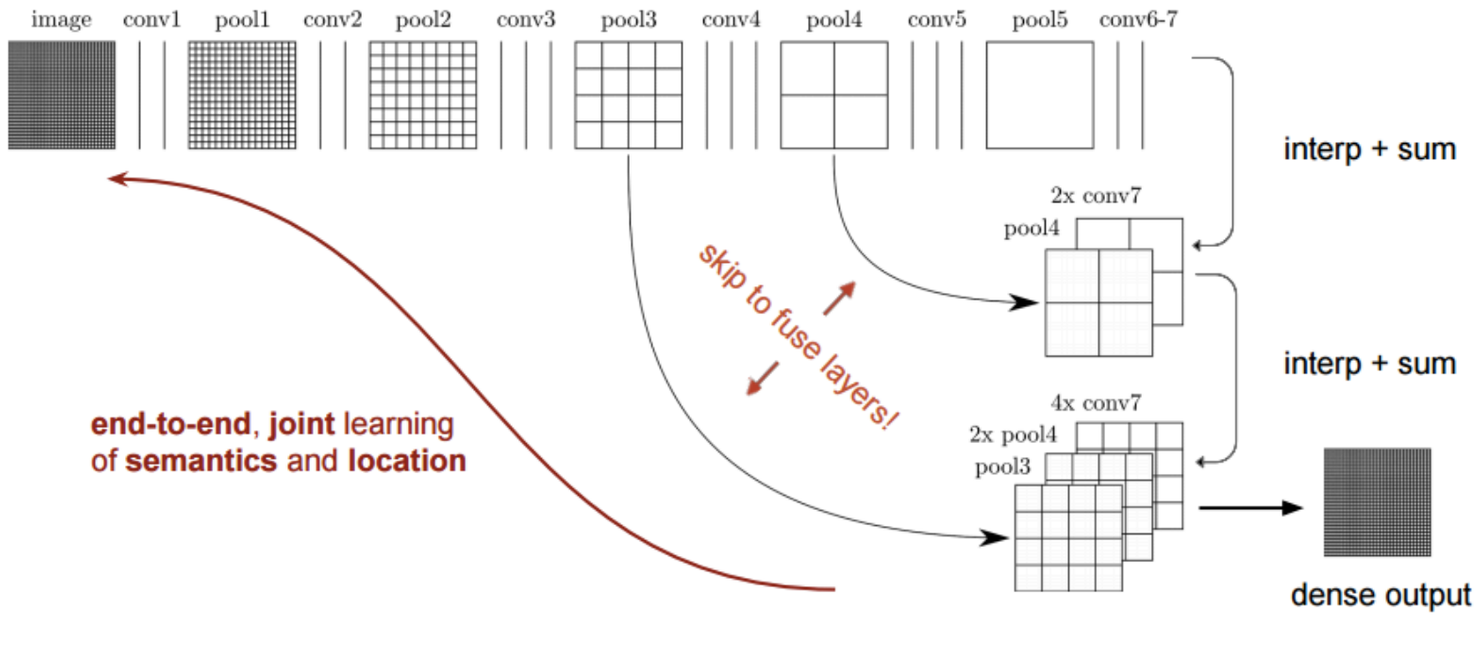
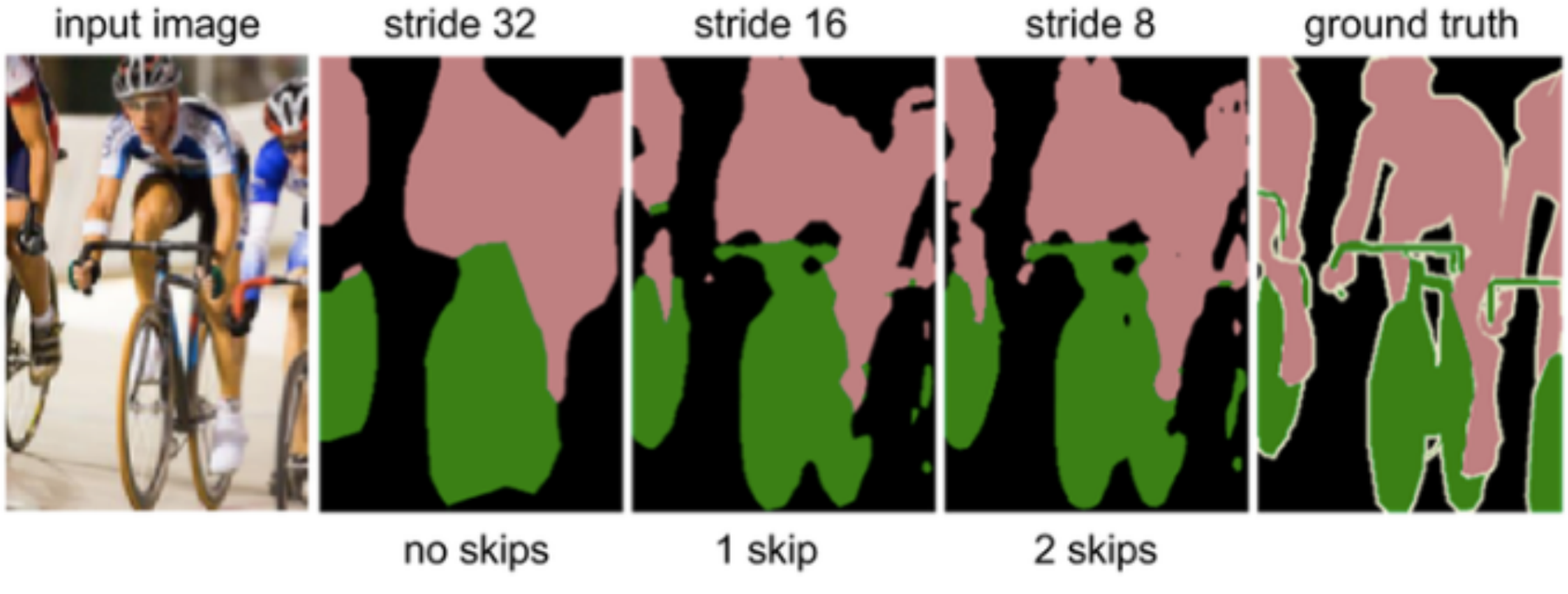
How to upsample?

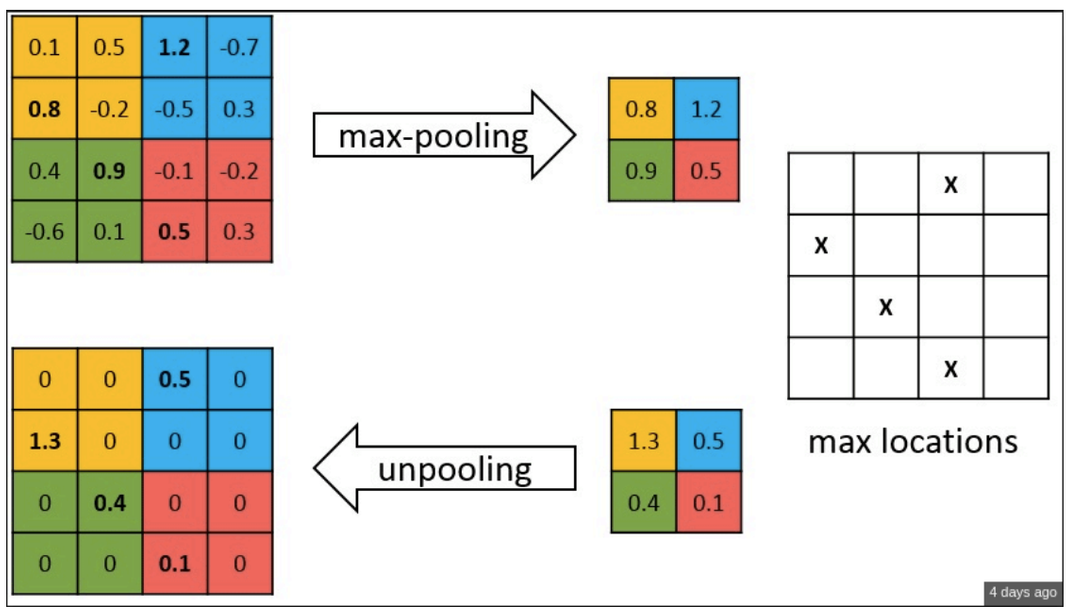
FCN



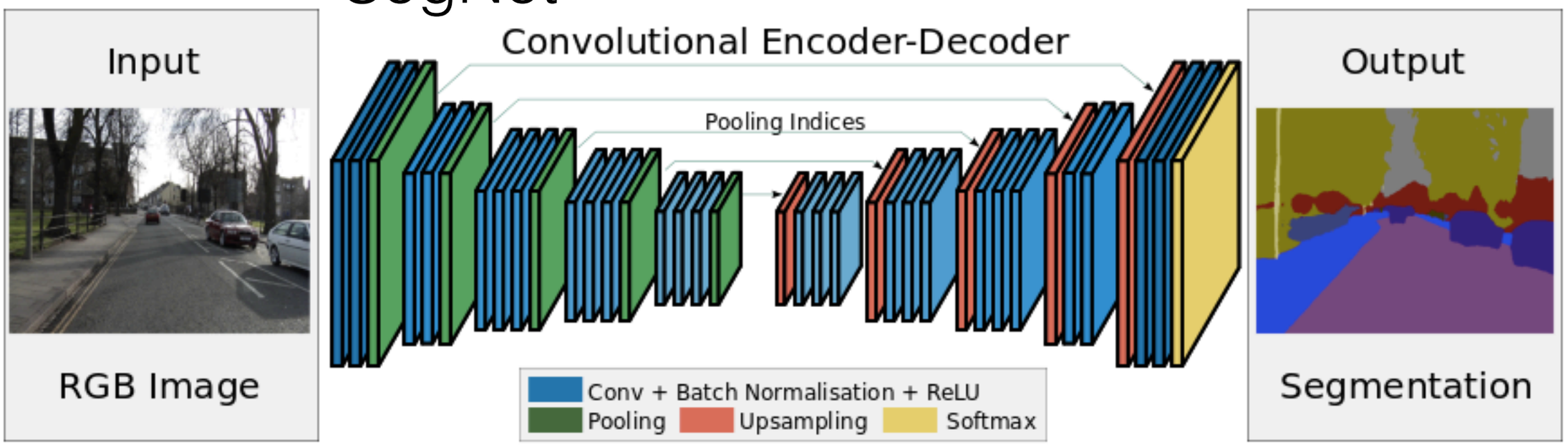




How to upsample?

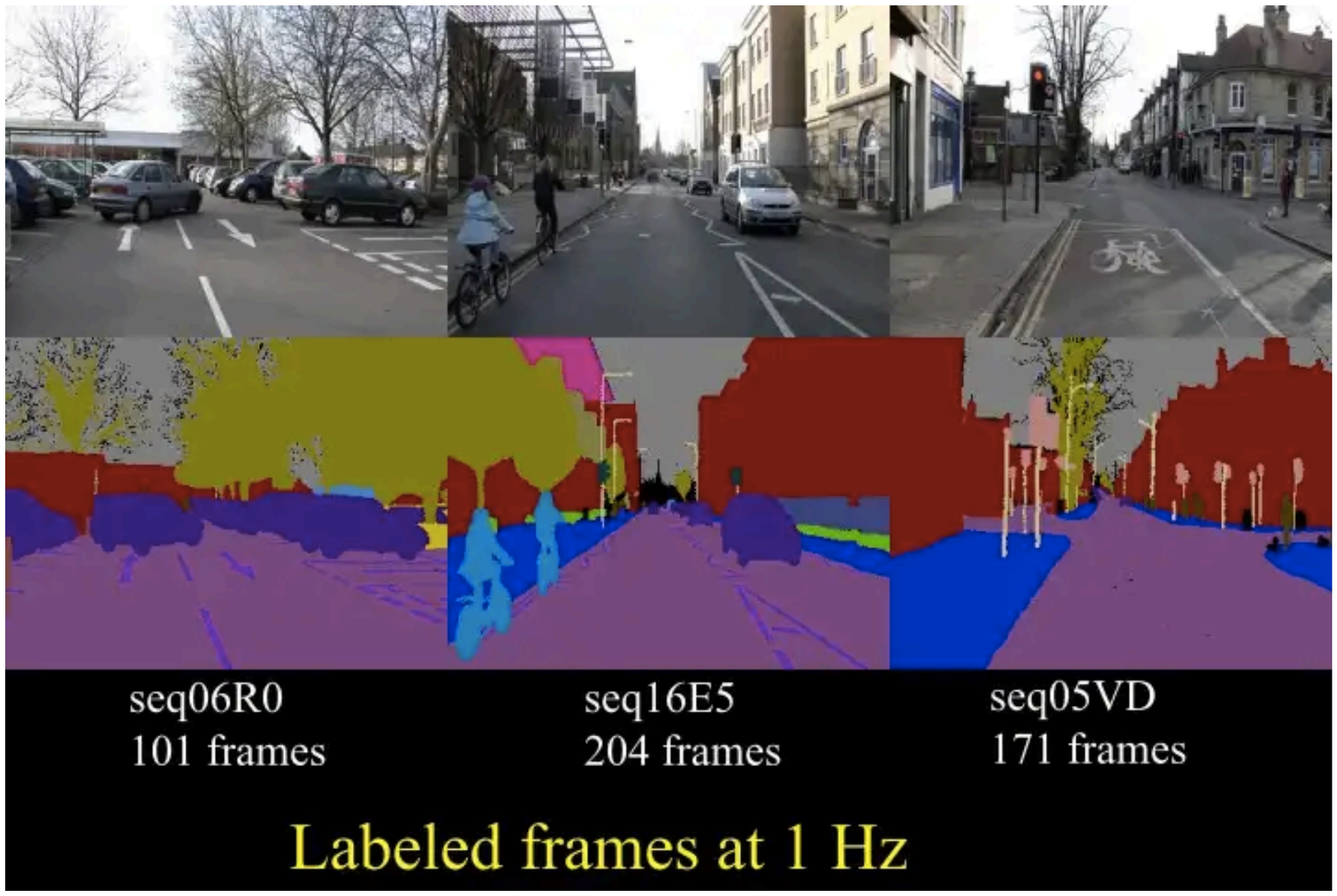


SegNet



CamSeq1 Dataset

- 101 images
- 101 annotated images
- 960 x 720 RGB
- 32 classes



Issues

- 1. 720 > 360 > 180 > 90 > 45 > 22 < 44 < … < 704
- 2. Converting annotated images (height, width, RGB) -> (height, width, class) takes too much time
- 3. Custom Maxpooling layer with indices, Custom Unpooling layer with indices
- 4. PSPNet works way better (Link : https://goo.gl/paUDdb)