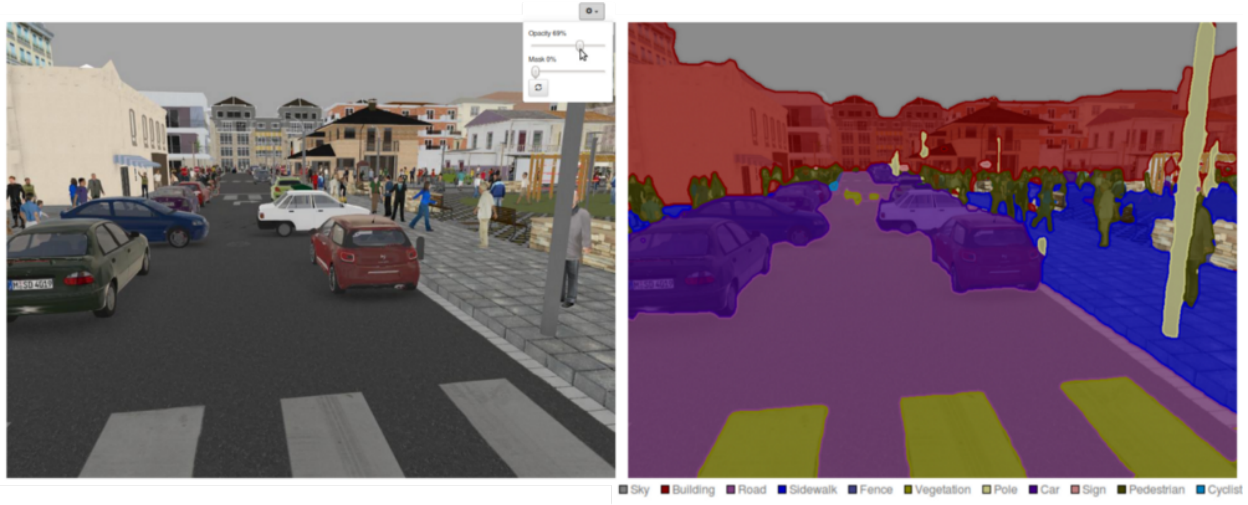
Advanced topics

1) Image segmentation
2) Image denoising
3) Image detection
4) Pre-training and fine tunning.
5) Working with sequences

1) Image segmentation



- Classification: Predict one label per image.
- Detection: Predict boxes where objects are and label them
- Segmentation: Predict one label per pixel

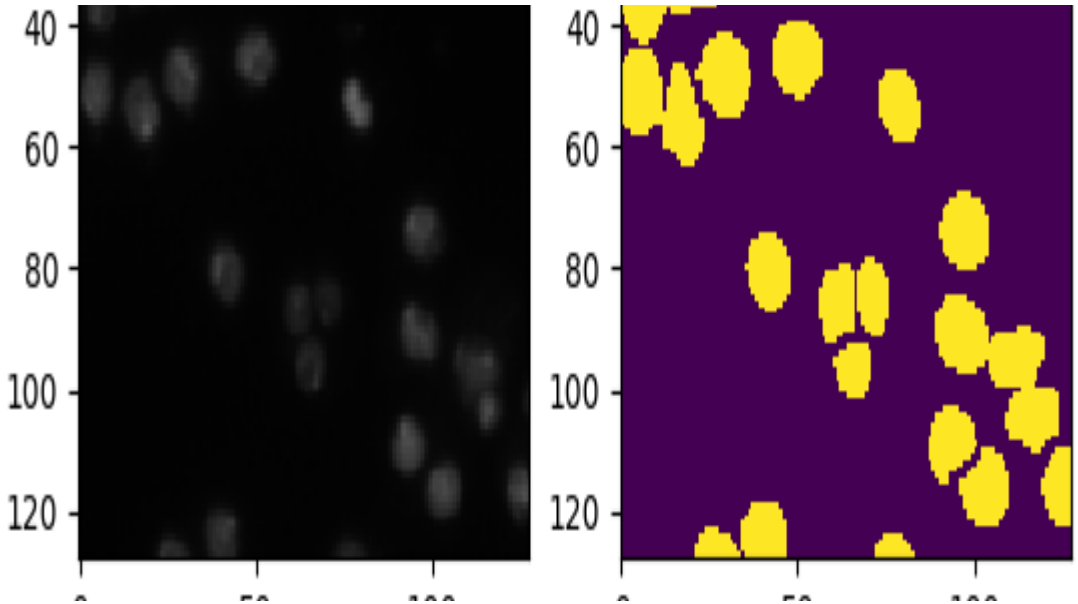
  - We need images and human curated masks to perform segmentation → difficult to collect big datasets

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$

Typical evaluation metrics: IoU

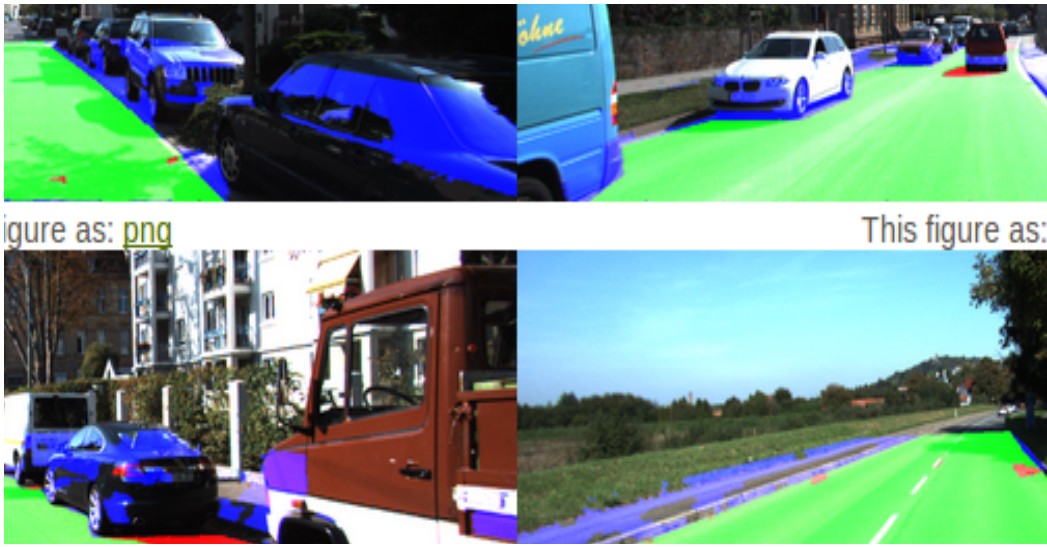
1) Image segmentation: Example

https://www.kaggle.com/c/data-science-bowl-2018



x_train

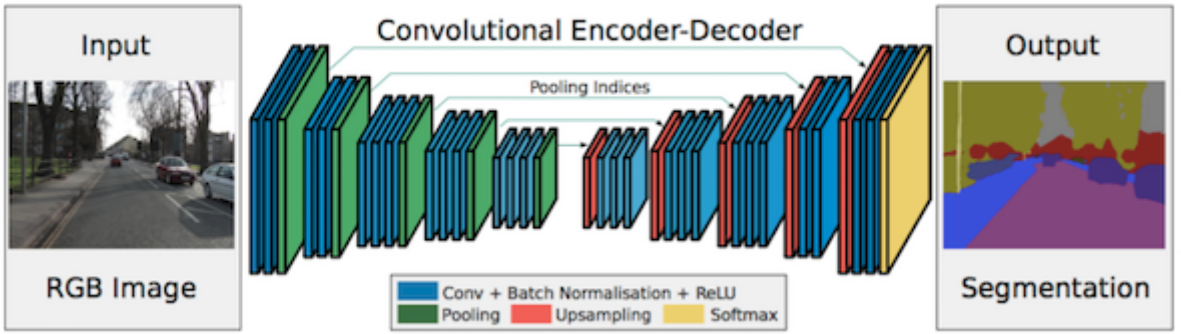
y_train



http://www.cvlibs.net/datasets/kitti/eval_road_detail.php?result=3748e213cf8e0100b7a26198114b3cdc7caa3aff

1) Image segmentation

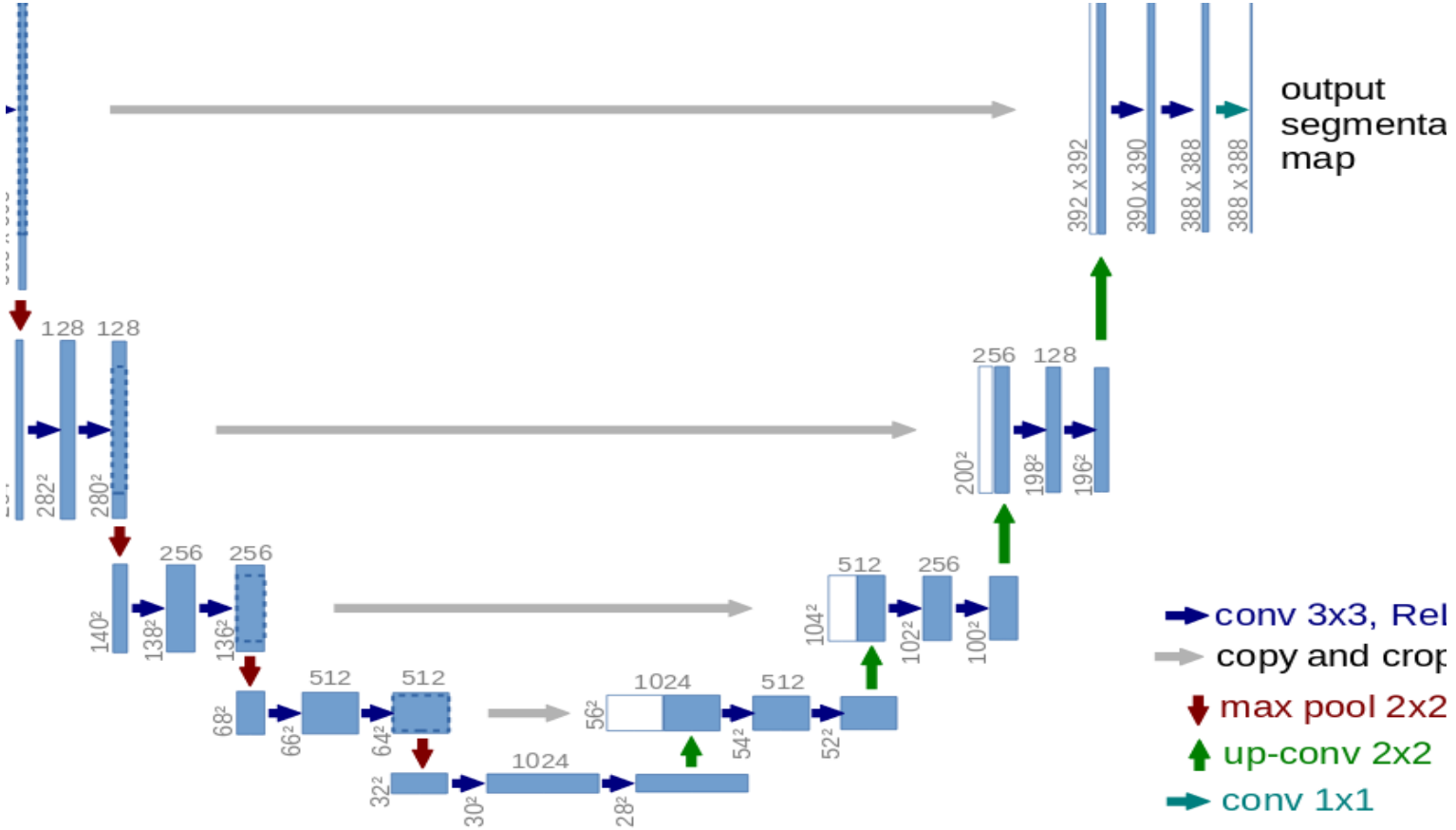
Approaches: generally they have one encoder part and one decoder part, first part is usually pre-trained to perform classification



1) Image segmentation

One of the most popular architectures: U-Net

https://arxiv.org/pdf/1505.04597.pdf



net architecture (example for 32x32 pixels in the lowest resolution). Each
ponds to a multi-channel feature map. The number of channels is de
he box. The x-y-size is provided at the lower left edge of the box. V
esent copied feature maps. The arrows denote the different operations.

1) Image segmentation

One of the most popular architectures: U-Net

https://arxiv.org/pdf/1505.04597.pdf

My example: ./3_advanced_topics/code_segmentation/e1_nuclei_segm.py

2) Image denoising