法律声明

课程详情请咨询

- 微信公众号：深度之眼
- 客服微信号：deepshare0920

公众号

微 信

图像分割一瞥

导师：余老师

deepshare.net
深度之眼

目录

Image Segmentation

Image Segmentation

图像分割：将图像每一个像素分类

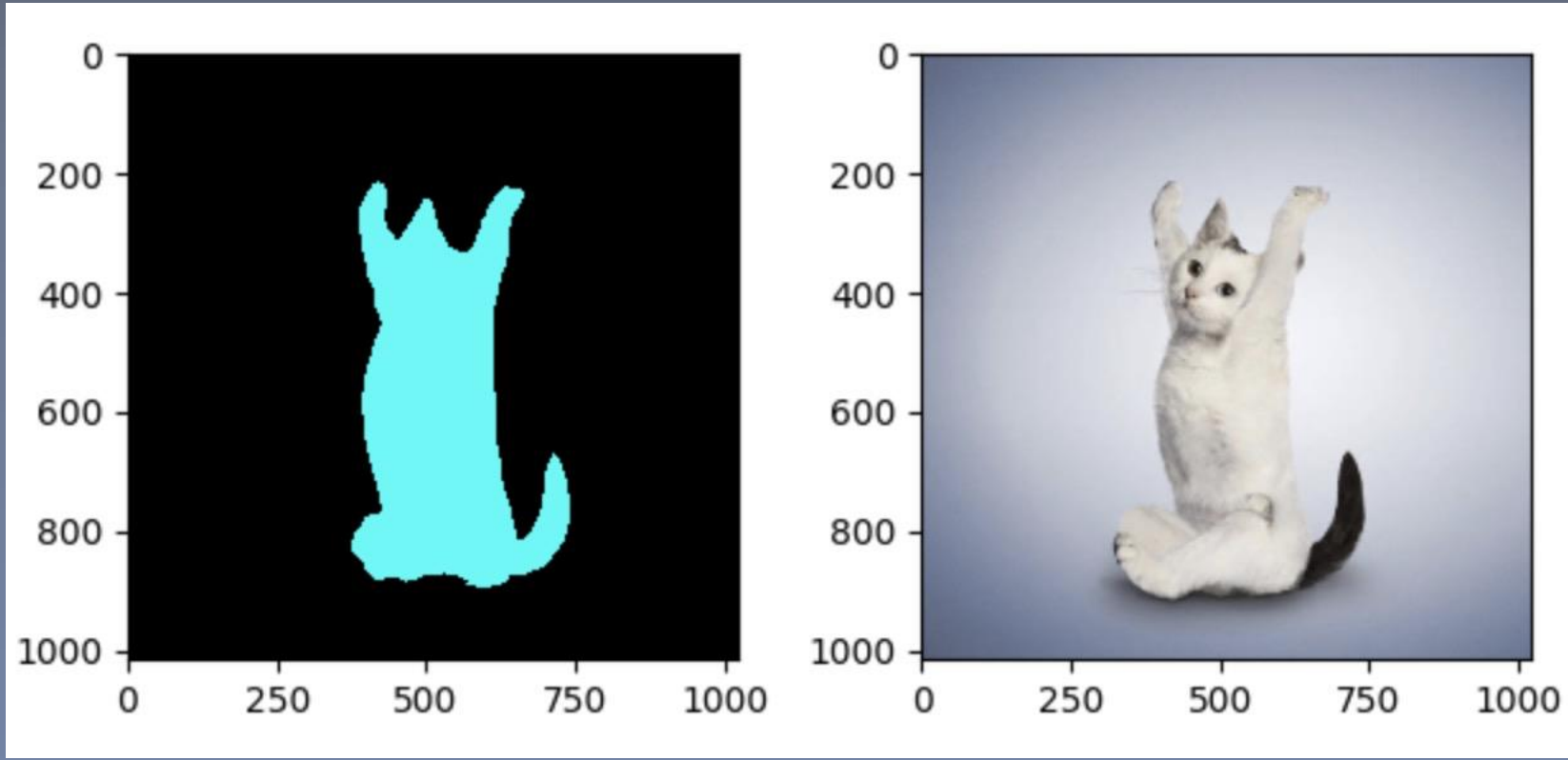


Image Segmentation

Image Segmentation

图像分割分类：

1.**超像素分割**：少量超像素代替大量像素，常用于图像预处理

2.**语义分割**：逐像素分类，无法区分个体

3.**实例分割**：对个体目标进行分割，像素级目标检测

4.**全景分割**：语义分割结合实例分割

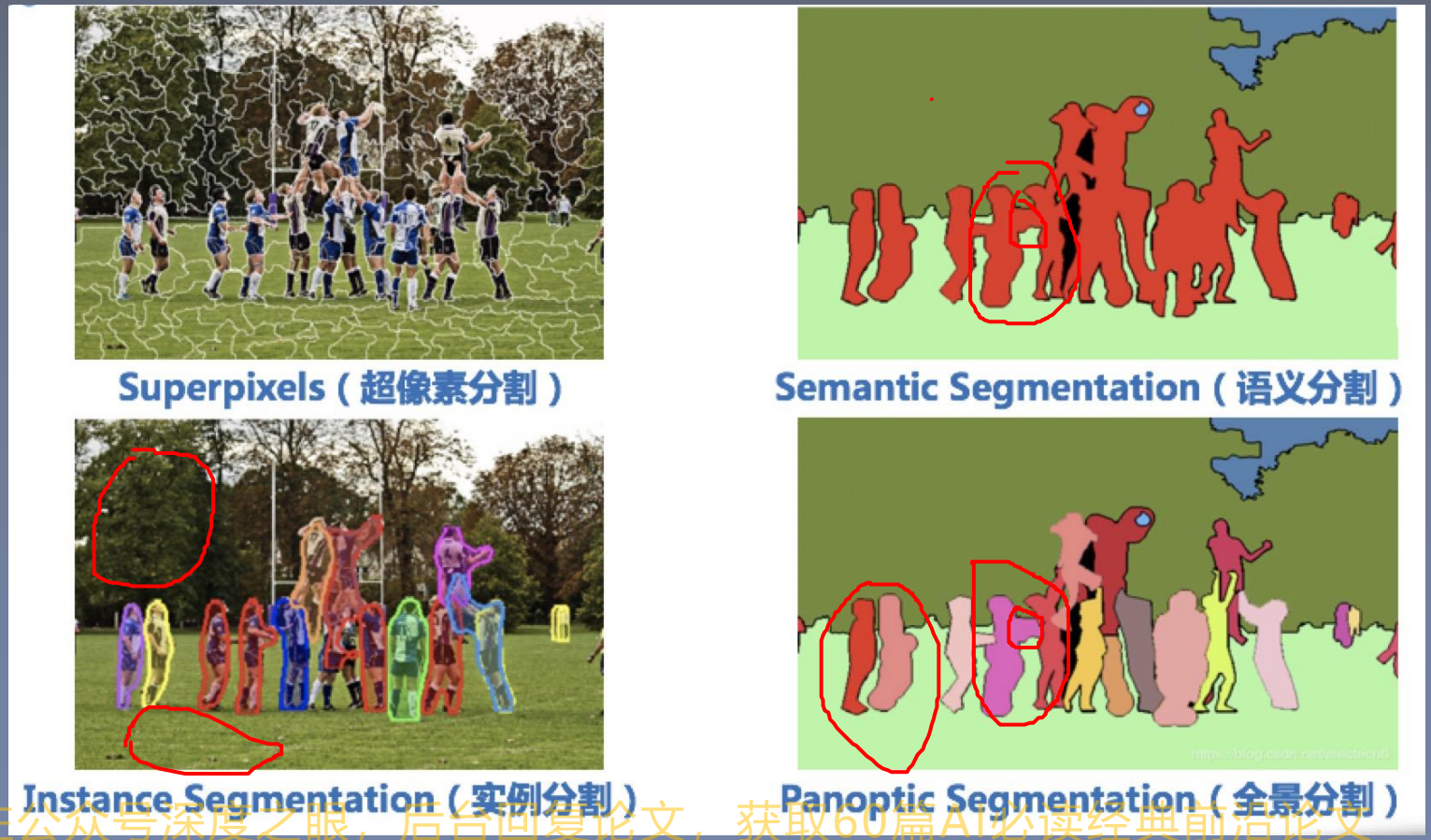


Image Segmentation

Image Segmentation

模型如何完成图像分割?

模型

计算机：3-d 张量
3-d 张量（3， 224， 224）

计算机： 3-d 张量
3-d 张量 （21， 224， 224）

Image Segmentation

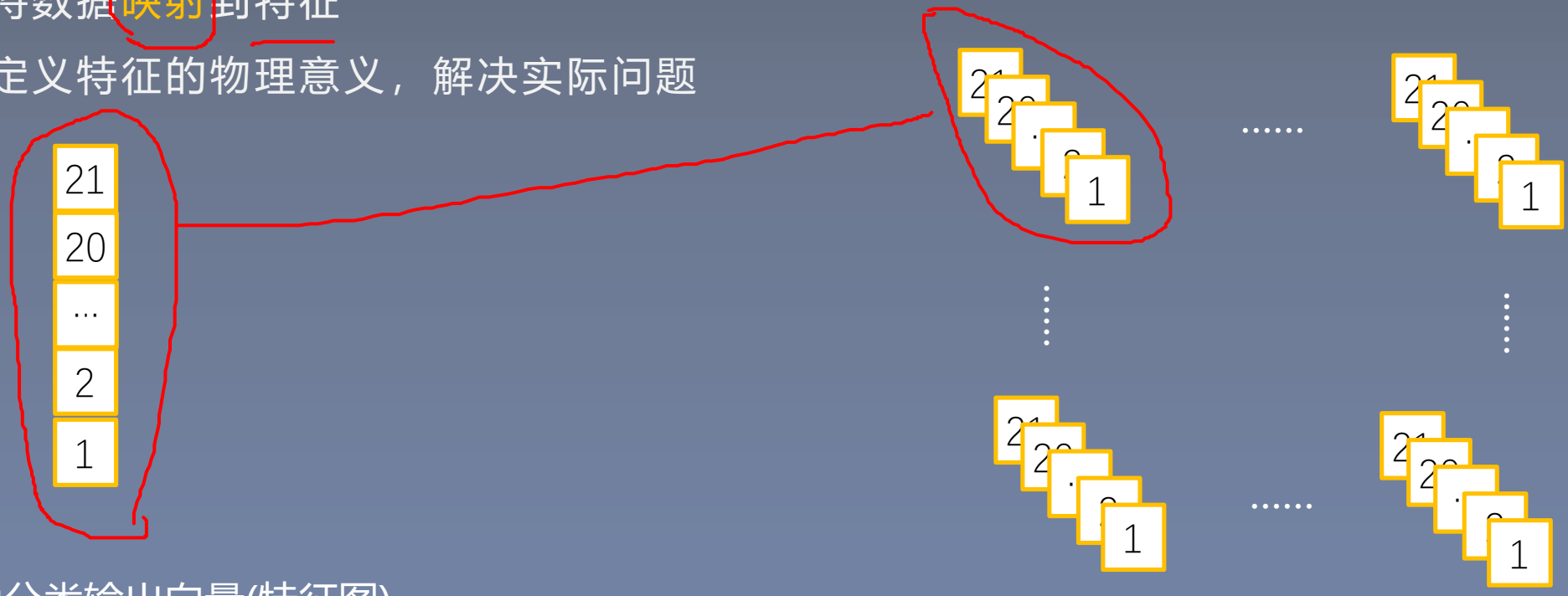
Image Segmentation

模型如何完成图像分割?

答：图像分割由模型与人类配合完成

模型：将数据映射到特征

人类：定义特征的物理意义，解决实际问题



图像分类输出向量(特征图)

图像分割输出特征图

Image Segmentation

PyTorch-Hub——PyTorch模型库，有大量模型供开发者调用

1. torch.hub.load('pytorch/vision', 'deeplabv3_resnet101',pretrained=True)

model = torch.hub.load(github, model, *args, **kwargs)

功能：加载模型

主要参数：

- github：str，项目名，eg：pytorch/vision，<repo_owner/repo_name[:tag_name]>
- model: str，模型名

2. torch.hub.list(github, force_reload=False)

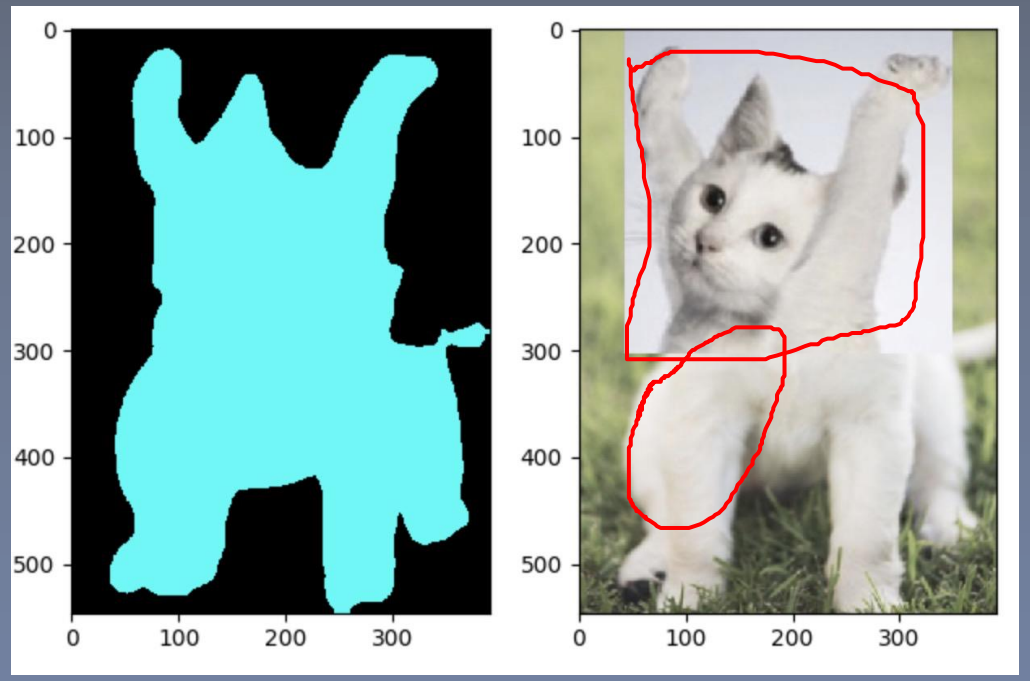
3. torch.hub.help(github, model, force_reload=False)

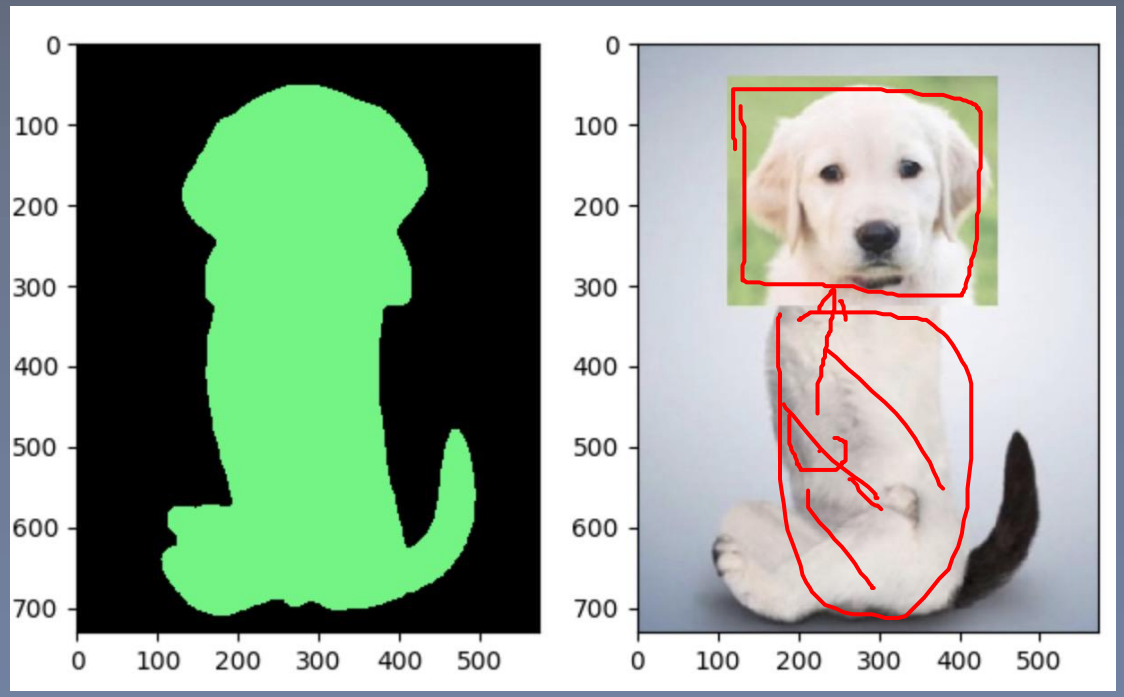
https://pytorch.org/hub

Image Segmentation

Image Segmentation

图像分割的思考





Ps：蓝色为小猫，绿色为小狗

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

最主要贡献：

利用全卷积完成pixelwise prediction

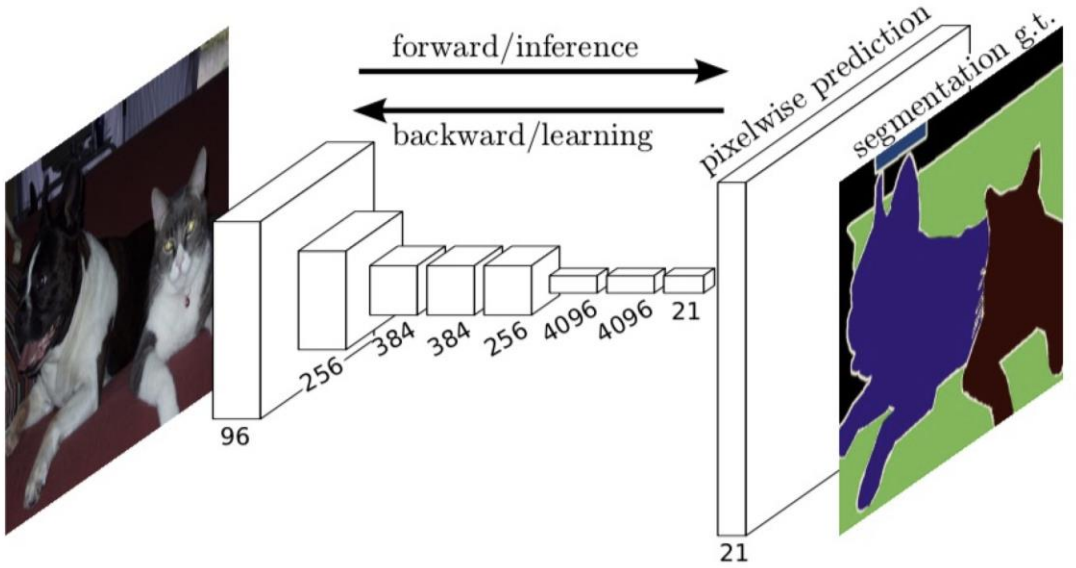


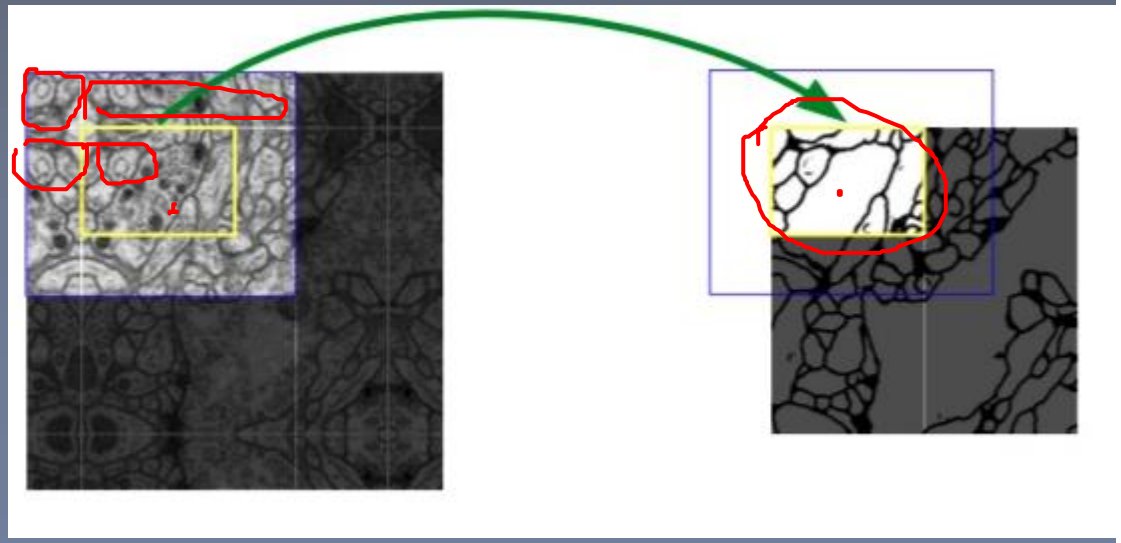
Figure 1. Fully convolutional networks can efficiently learn to make dense predictions for per-pixel tasks like semantic segmentation.

2014《Fully Convolutional Networks for Semantic Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型



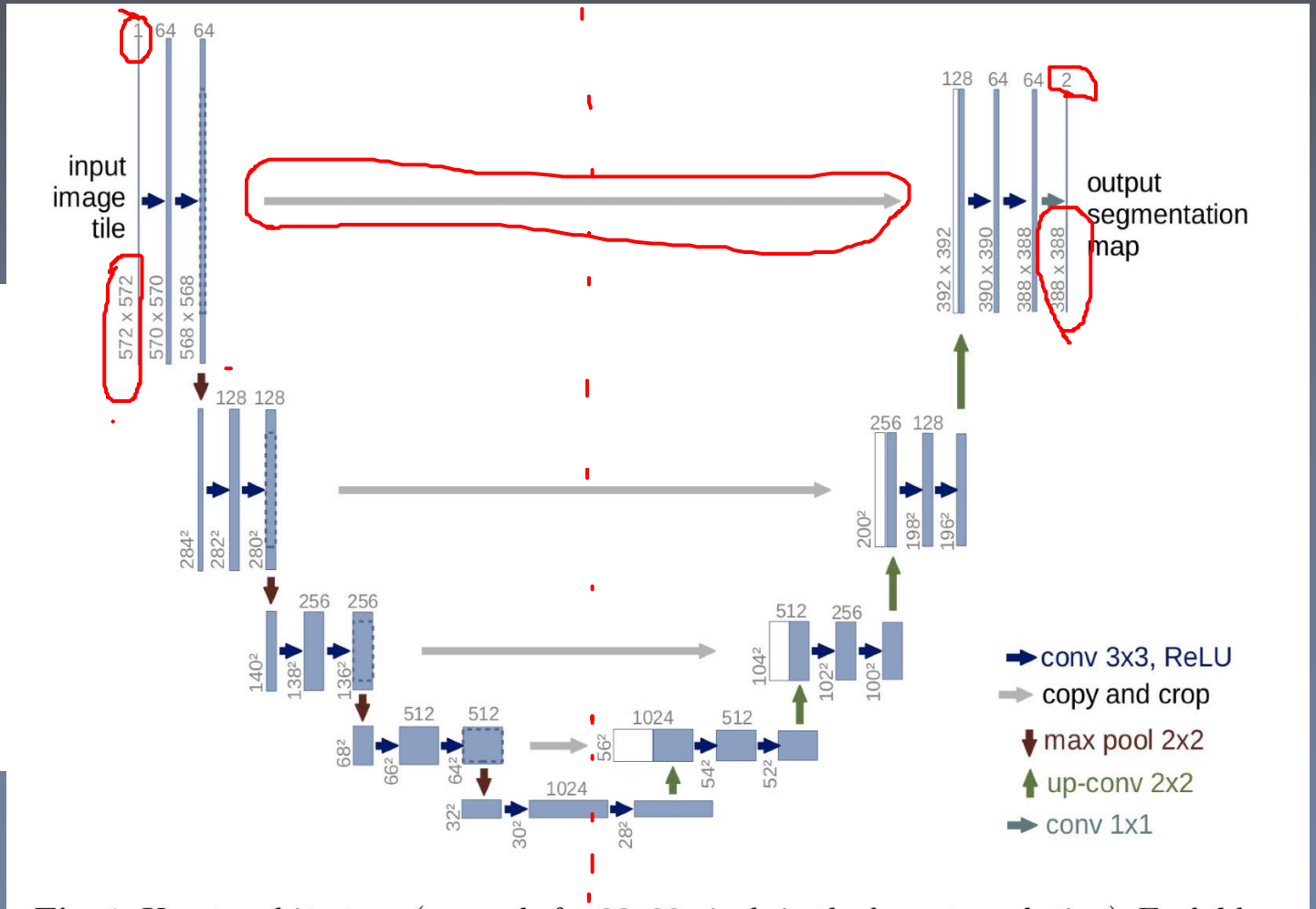


Fig. 1. U-net architecture (example for 32x32 pixels in the lowest resolution). Each blue box corresponds to a multi-channel feature map. The number of channels is denoted on top of the box. The x-y-size is provided at the lower left edge of the box. White boxes represent copied feature maps. The arrows denote the different operations.

《U-Net: Convolutional Networks for Biomedical Image Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V1

主要特点：
1.孔洞卷积：借助孔洞卷积，增大感受野
2. CRF：采用CRF进行mask后处理

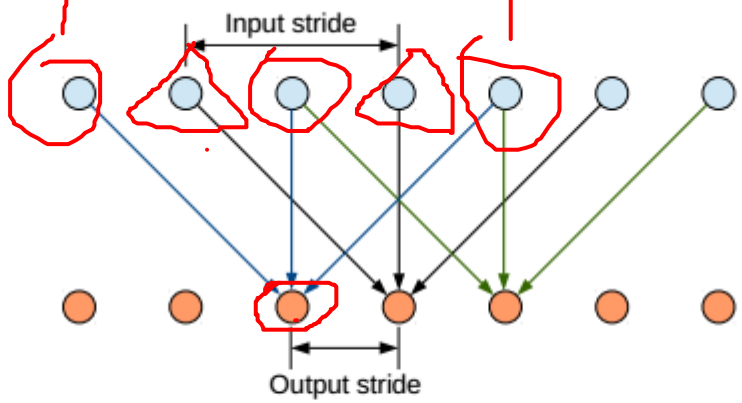


Figure 1: Illustration of the hole algorithm in 1-D, when *kernel_size* = 3, *input_stride* = 2, and *output_stride* = 1.

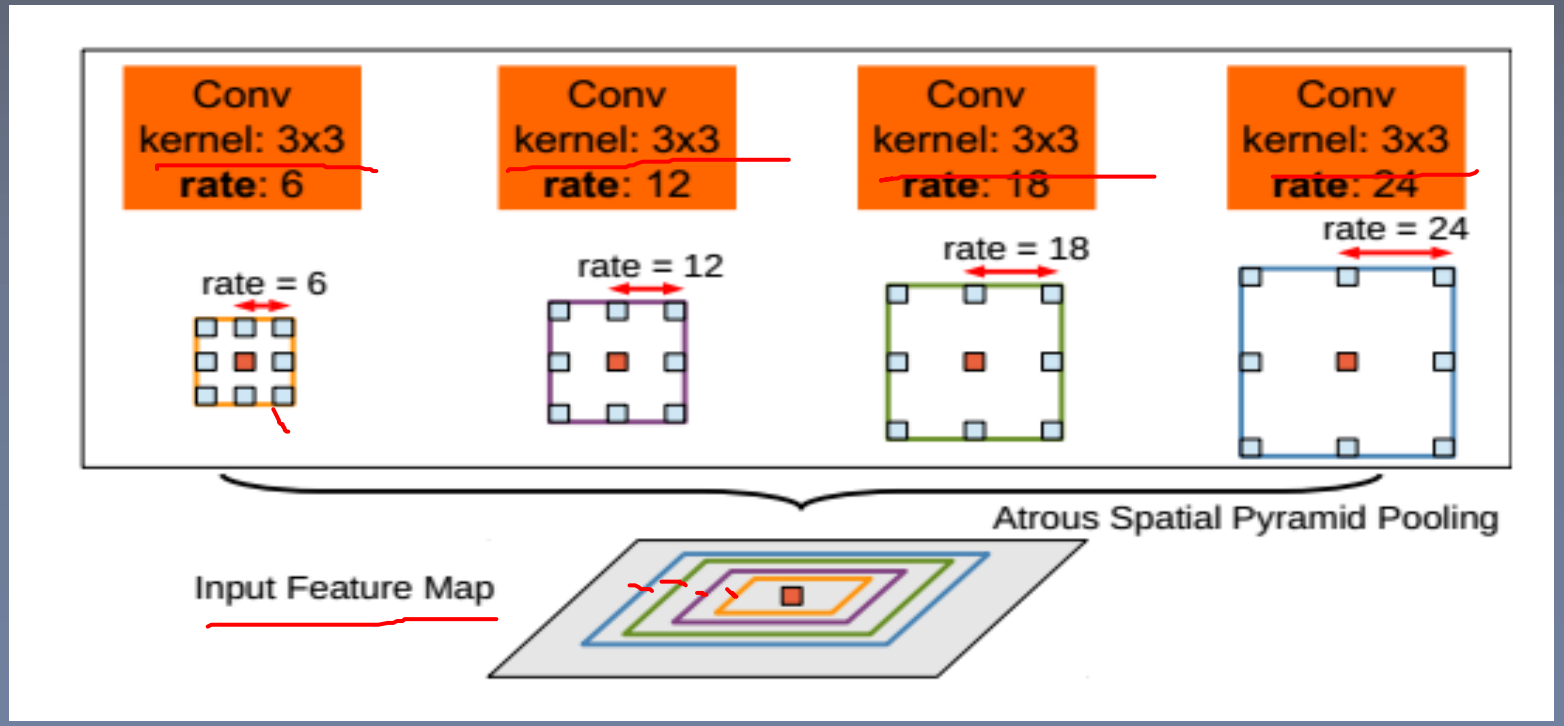
《DeepLabv1 Semantic image segmentation with deep convolutional nets and fully connected CRFs》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V2



主要特点：

1. **ASPP（Atrous spatial pyramid pooling）：解决多尺度问题**

《DeepLab- Semantic Image Segmentation with Deep Convolutional Nets, Atrous Convolution, and Fully Connected CRFs》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V3

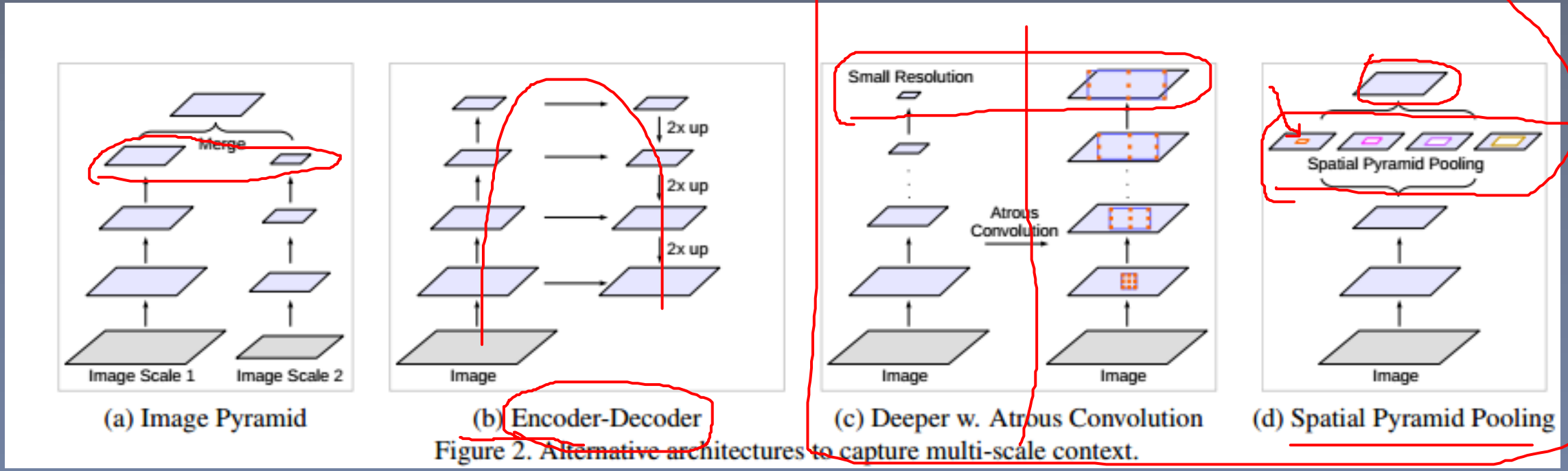


Figure 2. Alternative architectures to capture multi-scale context.

主要特点： 1. 孔洞卷积的串行 2. ASPP的并行

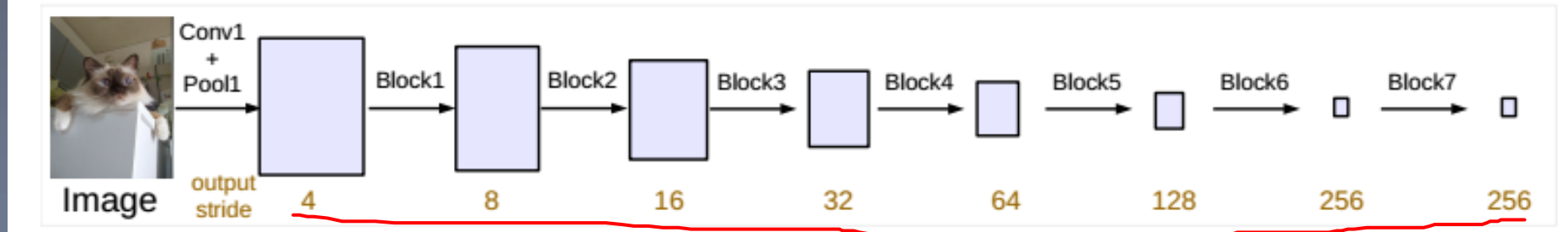
《DeepLabv3- Rethinking Atrous Convolution for Semantic Image Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V3



(a) Going deeper without atrous convolution.

(b) Going deeper with atrous convolution. Atrous convolution with $rate > 1$ is applied after block3 when $output\_stride = 16$.

Figure 3. Cascaded modules without and with atrous convolution.

主要特点： 1. 孔洞卷积的串行 2. ASPP的并行

《DeepLabv3- Rethinking Atrous Convolution for Semantic Image Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V3

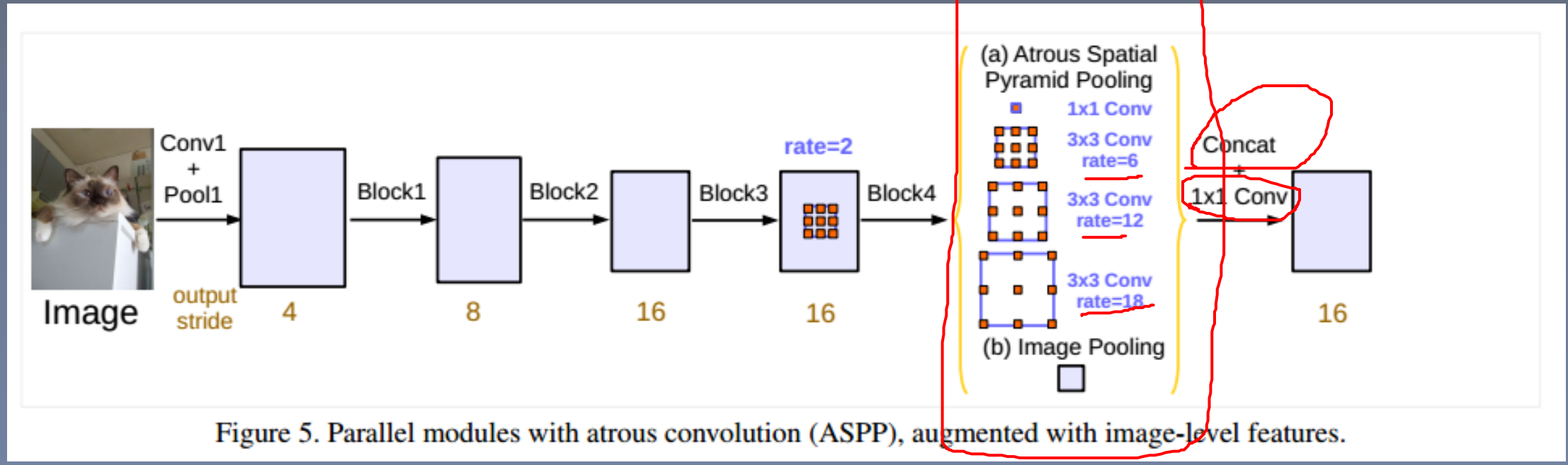


Figure 5. Parallel modules with atrous convolution (ASPP), augmented with image-level features.

主要特点：　1. 孔洞卷积的串行　2. ASPP的并行

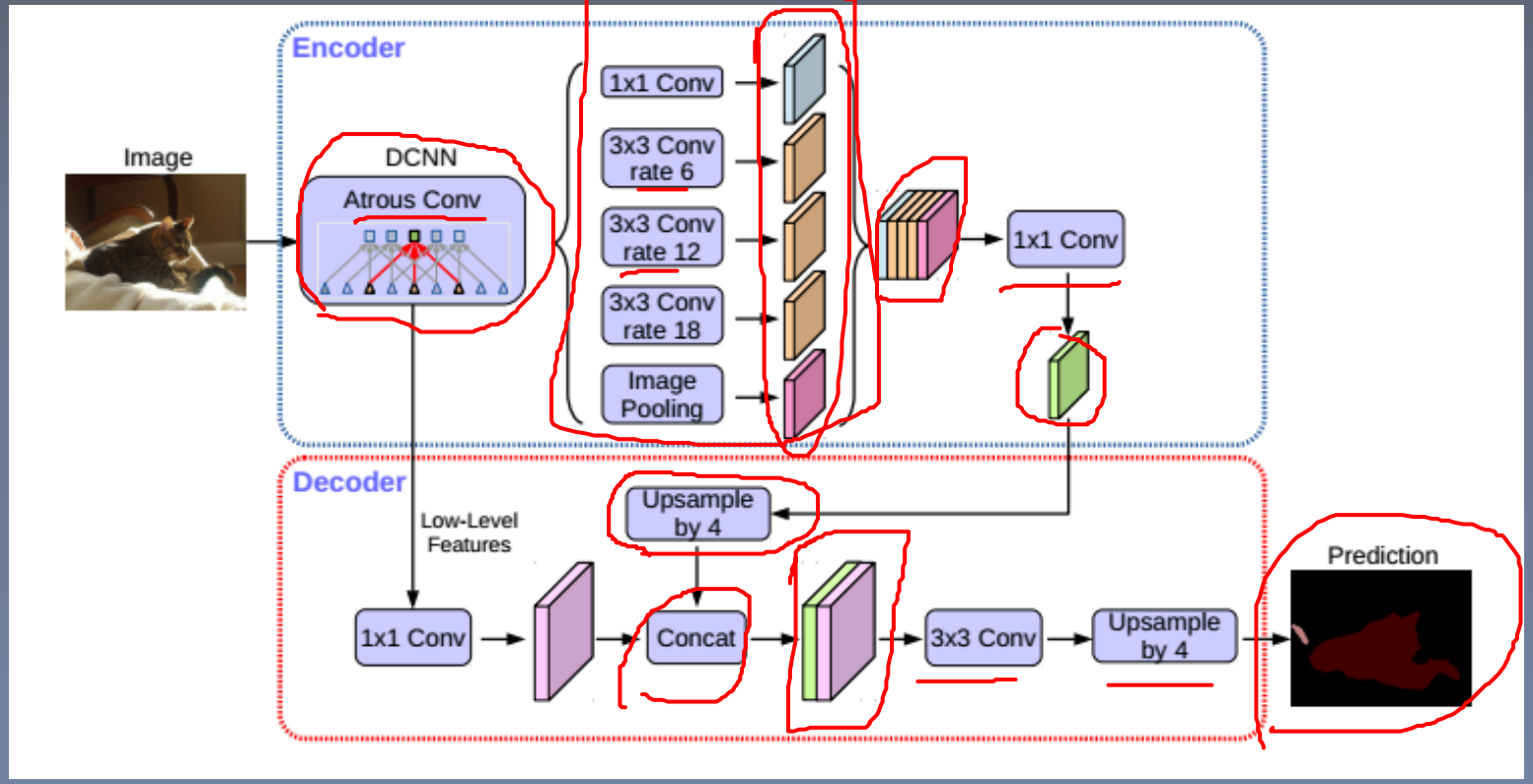
《DeepLabv3- Rethinking Atrous Convolution for Semantic Image Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

DeepLab系列——V3+



主要特点： deeplabv3基础上加上Encoder-Decoder思想

《DeepLabv3- Rethinking Atrous Convolution for Semantic Image Segmentation》

Image Segmentation

Image Segmentation

深度学习中的图像分割模型

《Deep Semantic Segmentation of Natural and Medical Images: A Review》2019

图像分割资源：

https://github.com/shawnbit/unet-family

https://github.com/yassouali/pytorch_segmentation

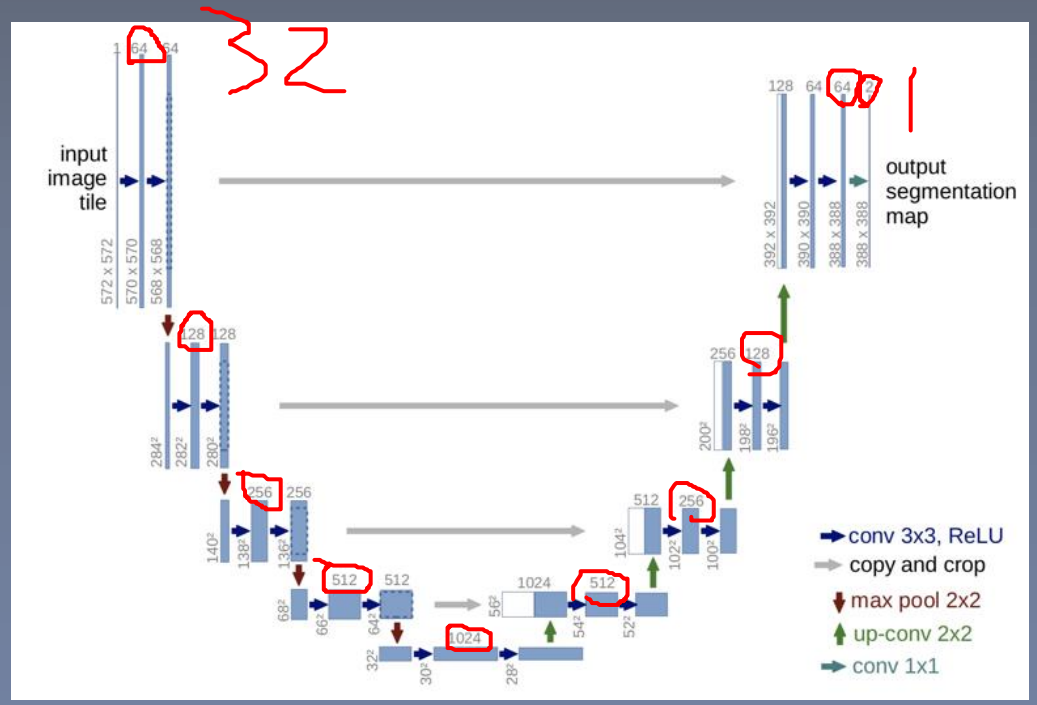
Table 1: A summary of papers for semantic segmentation of natural images applied to PASCAL VOC 2012 dataset.

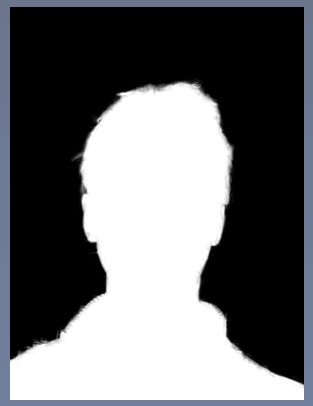
Paper	Type of Improvement	Dataset(s) evaluated on	PASCAL VOC 2012 mean IoU
SegNet (2015) [103]	Architecture	PASCAL VOC, CamVid, SUN RGB-D	59.1%
FCN (2014) [86]	Architecture	PASCAL VOC, NYUDv2, SIFT Flow	62.2%
Luc at al. (2016) [87]	Adversarial Segmentation	PASCAL VOC, Stanford Background	73.3%
Lovász-Softmax Loss (2017) [11]	Loss	PASCAL VOC, Cityscapes	76.44%
Large Kernel Matters (2017) [107]	Architecture	PASCAL VOC, Cityscapes	82.2%
Deep Layer Cascade (2017) [78]	Architecture	PASCAL VOC, Cityscapes	82.7%
TuSimple (2017) [147]	Architecture	PASCAL VOC, KITTI Road Estimation	83.1%
RefineNet (2016) [82]	Architecture	PASCAL VOC, PASCAL Context, Person-Part, NYUDv2, SUN RGB-D, Cityscapes, ADE20K	84.2%
ResNet-38 (2016) [157]	Architecture	PASCAL VOC, PASCAL Context, Cityscapes	84.9%
PSPNet (2016) [171]	Architecture	PASCAL VOC, Cityscapes	85.4%
Auto-DeepLab (2019) [85]	Architecture Search	PASCAL VOC, ADE20K, Cityscapes	85.6%
IDW-CNN (2017) [146]	Architecture	PASCAL VOC	86.3%
SDN+ (2019) [32]	Architecture	PASCAL VOC, CamVid, Gatech	86.6%
DIS (2017) [88]	Architecture	PASCAL VOC	86.8%
DeepLabV3 (2017) [21]	Architecture	PASCAL VOC	86.9%
MSCI (2018) [81]	Architecture	PASCAL VOC, PASCAL Context, NYUDv2, SUN RGB-D	88.0%
DeepLabV3+ (2018) [23]	Architecture	PASCAL VOC, Cityscapes	89.0%

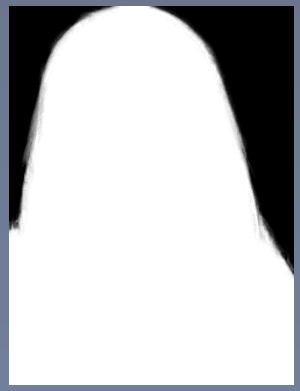
Image Segmentation

Image Segmentation

Unet实现人像抠图(Portrait Matting)







数据来源：https://github.com/PetroWu/AutoPortraitMatting

结 语

在这次课程中，学习了PyTorch中图像分割模型的使用

在下次课程中，我们将会学习

图像目标检测一瞥