### U-Net 과 이미지 분할

2024.07.18. **서울의대 본과** 2**학년** MVL **조성재** 



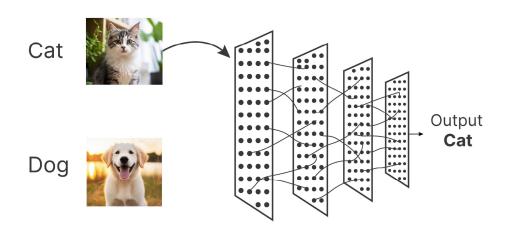
### CONTENTS

- 이미지 분할(Segmentation)이란?
- U-Net 이전의 이미지 분할
- U-Net 이란?
- U-Net 으로 할 수 있는 것들



# 이미지 분할이란?

### **Classification vs. Segmentation**





## 이미지 분할이란?

#### **Classification vs. Segmentation**



### U-Net 이전의 이미지 분할

Ciresan et al. 은 2012년 픽셀별로 CNN을 태워서 이미지 분할 작업을 하는 방법을 고안함.

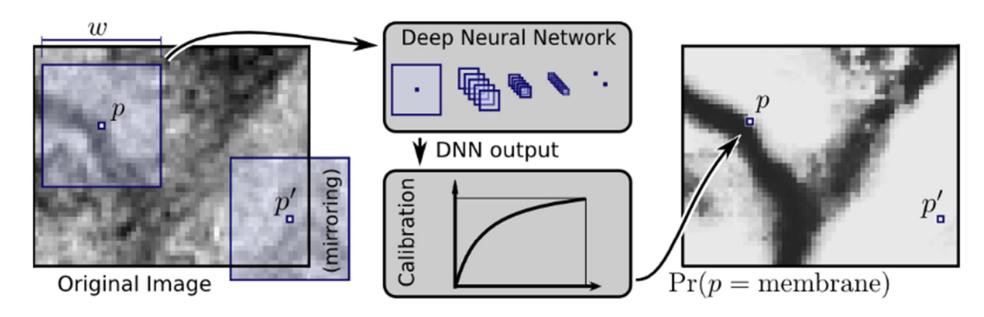
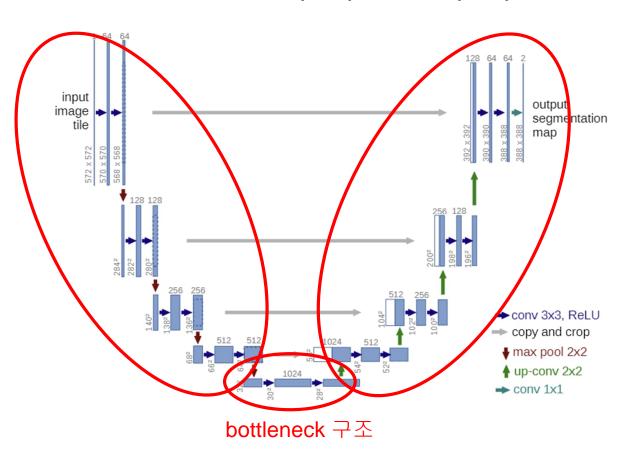


Figure 2: Overview of our approach (see text).

#### 2015년에 등장한 **Encoder** (압축), **Decoder**(팽창) 구조를 가지는 신경망



#### 참고) 일반적인 CNN(AlexNet, 2012)

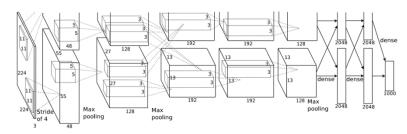
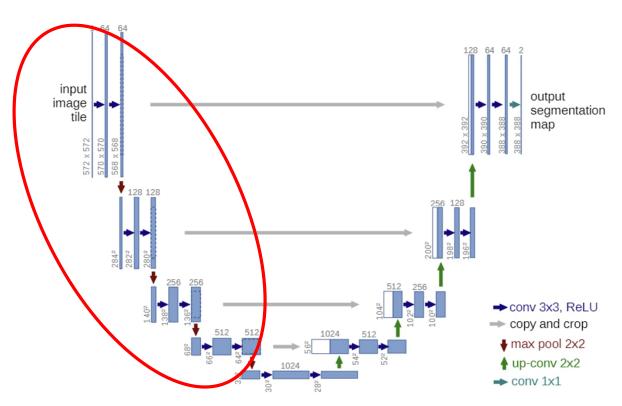


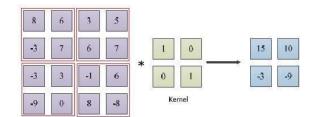
Figure 2: An illustration of the architecture of our CNN, explicitly showing the delineation of responsibilities between the two GPUs. One GPU runs the layer-parts at the top of the figure while the other runs the layer-parts at the bottom. The GPUs communicate only at certain layers. The network's input is 150,528-dimensional, and the number of neurons in the network's remaining layers is given by 253,440–186,624–64,896–64,896–43,264–4096–1000.

#### 2015년에 등장한 Encoder (압축), Decoder(팽창) 구조를 가지는 신경망



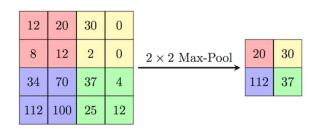
Encoding(=downsampling, latent space로 변환)

#### Convolution

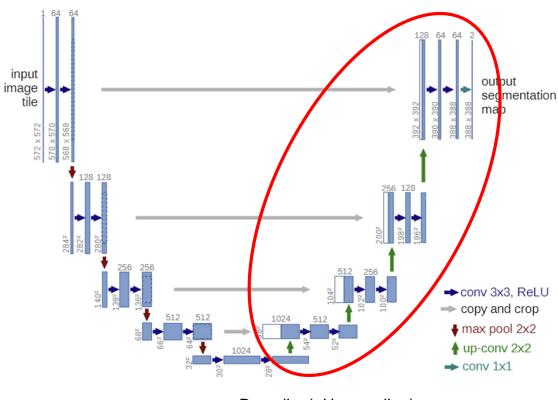


크기 손실을 막기 위해 padding 설정

#### **Max Pooling**

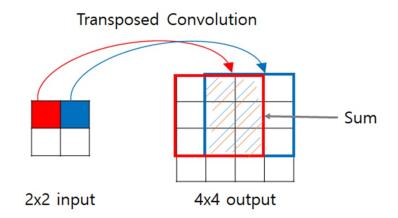


2015년에 등장한 Encoder (압축), Decoder(팽창) 구조를 가지는 신경망

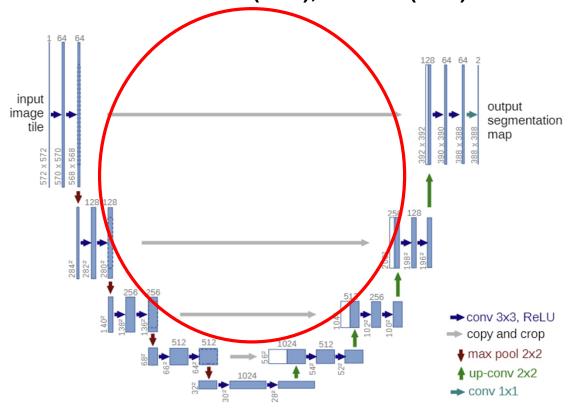


Decoding(=Upsampling)

### Deconvolution(Convolution의 역연산)



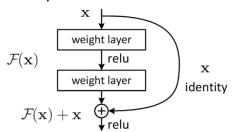
2015년에 등장한 Encoder (압축), Decoder(팽창) 구조를 가지는 신경망



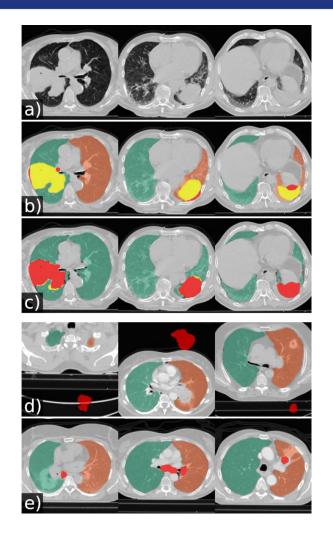
#### **Skip connections**

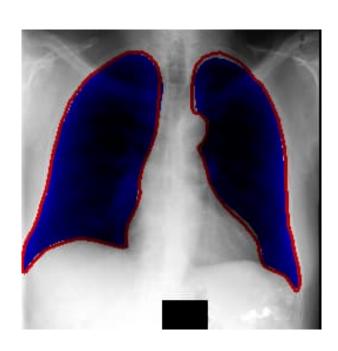
- 고해상도의 이미지 요소를 보관
- Gradient Vanishing 해결
- 경계의 정확한 복원

참고) Residual block



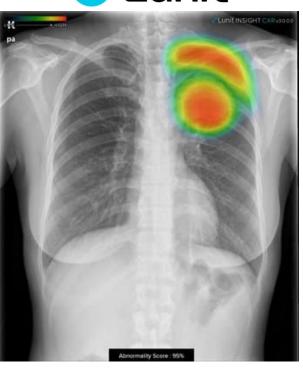
# U-Net으로 할 수 있는 것들





CT, X-Ray lung segmentation





LUNIT insight CXR