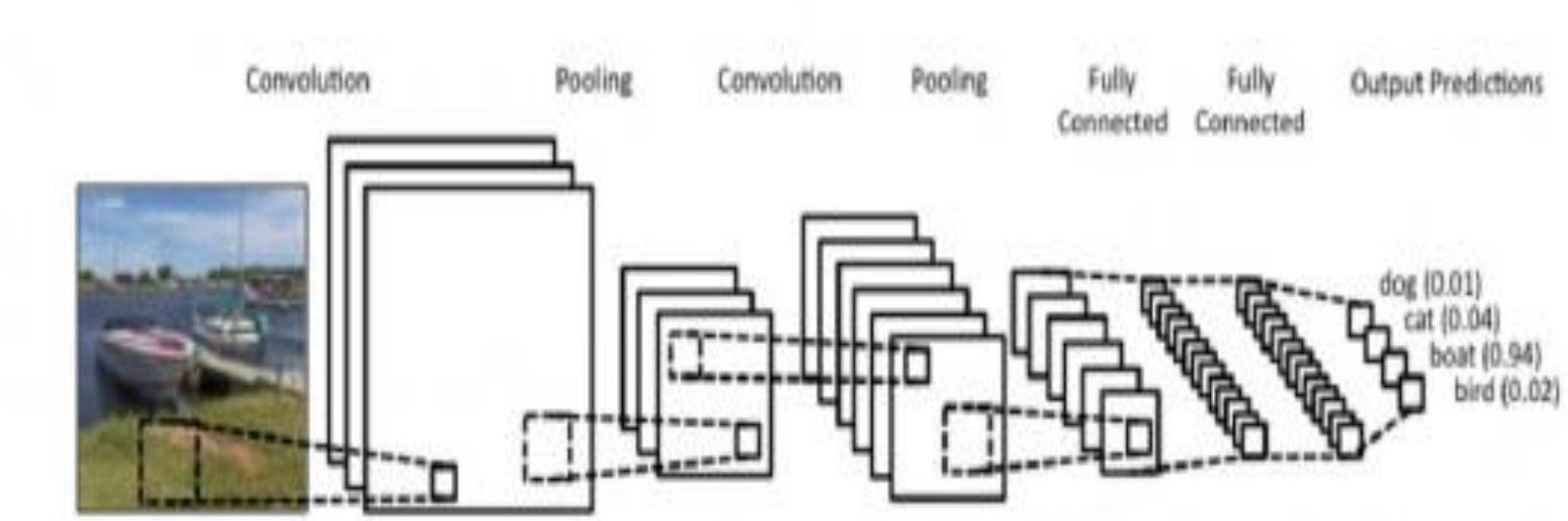
CNN 실습

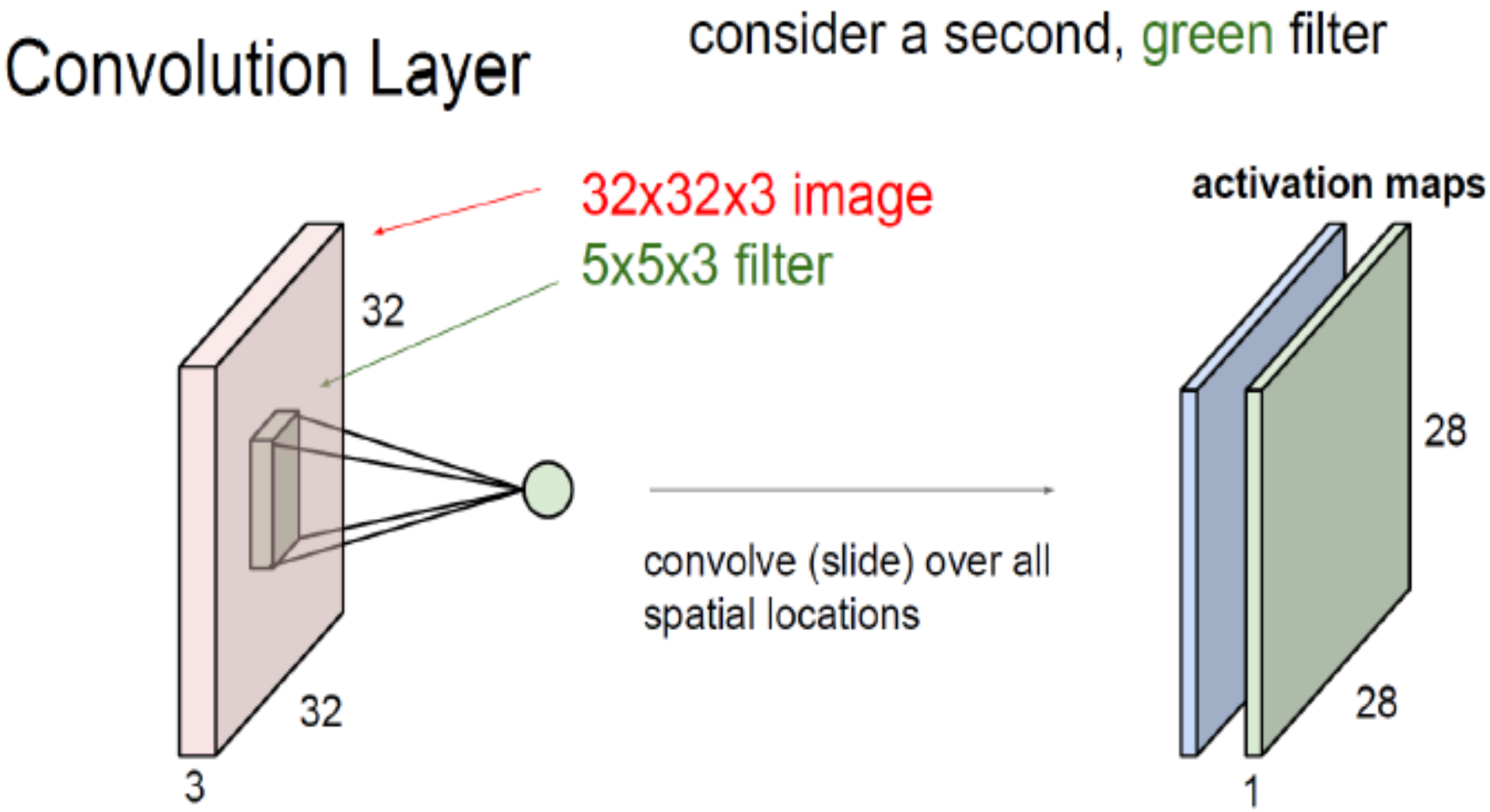
CNN recap

- 일반적으로 CNN은 합성곱층+풀링층+전결합층의 조합으로 구성된다.
- 합성곱층과 풀링층은 특성추출의 역할을 한다.
- 전결합층은 분류의 역할을 한다.



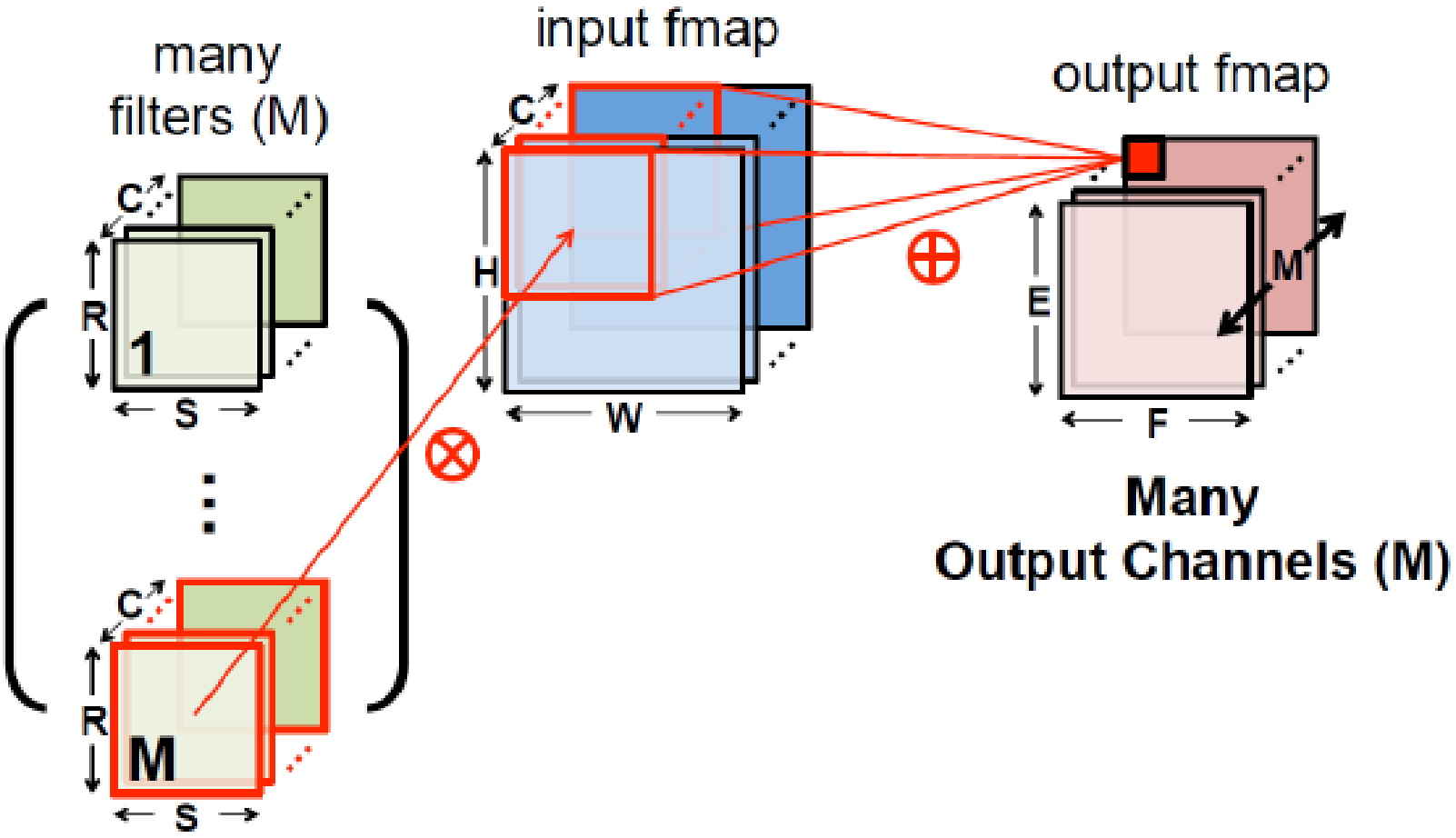
2D CNN

- 이미지 -> 필터 -> 특성 맵 (활성 맵)



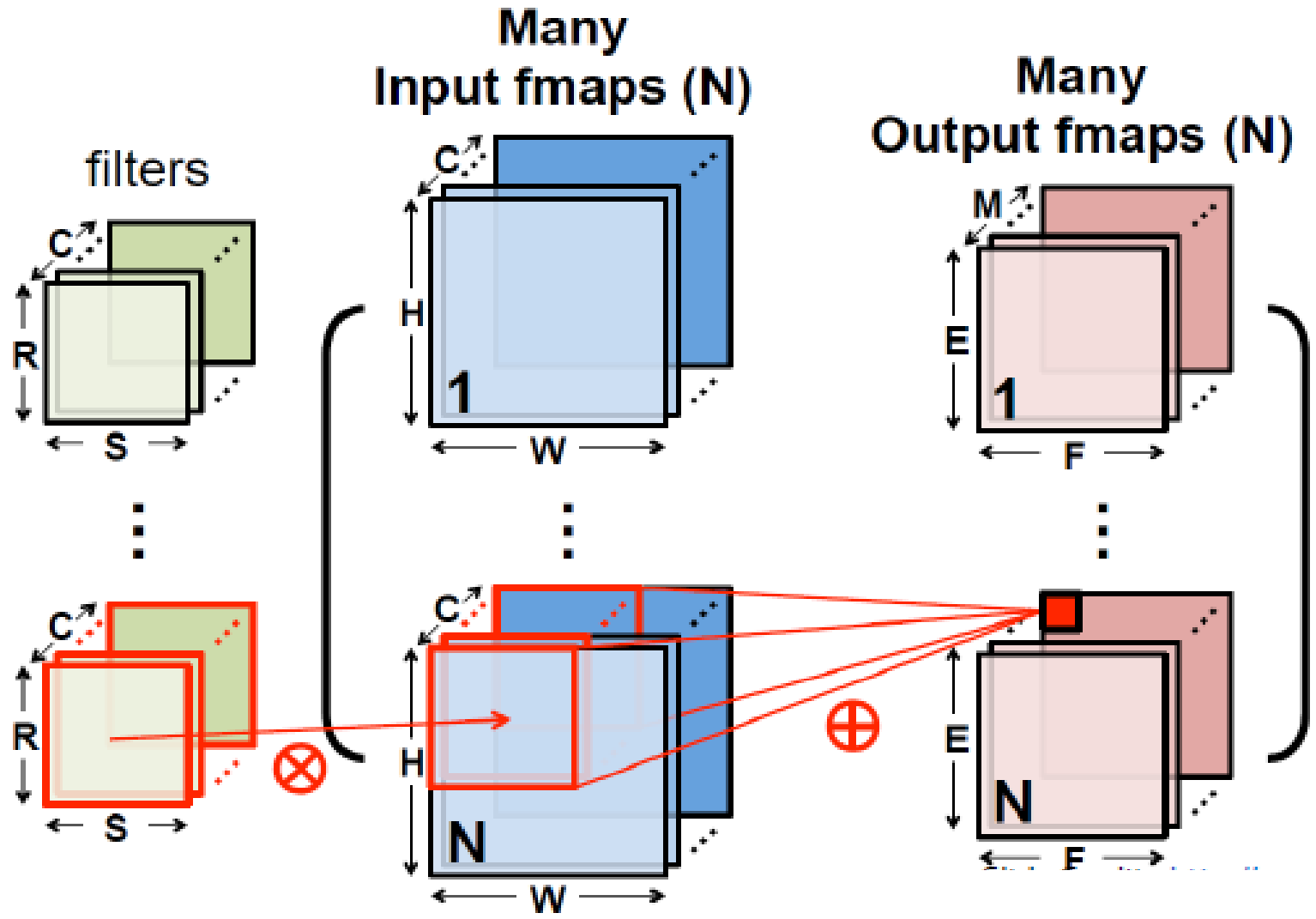
2D 합성곱층

- 이미지 -> 필터 -> 특성 맵 (활성 맵)



2D 합성곱층 – 4D 텐서

- 이미지 -> 필터 -> 특성 맵 (활성 맵)



2D 합성곱층

- tf.keras.layers.Conv2D

```
__init__(
    filters,
    kernel_size,
    strides=(1, 1),
    padding='valid',
    data_format=None,
    dilation_rate=(1, 1),
    activation=None,
    use_bias=True,
    kernel_initializer='glorot_uniform',
    bias_initializer='zeros',
    kernel_regularizer=None,
    bias_regularizer=None,
    activity_regularizer=None,
    kernel_constraint=None,
    bias_constraint=None,
    **kwargs
)
```

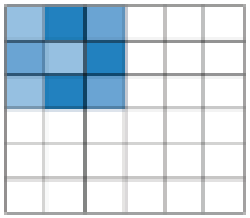
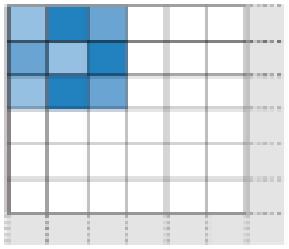
2D 합성곱층

- tf.keras.layers.Conv2D

- `filters` : Integer, the dimensionality of the output space (i.e. the number of output filters in the convolution).
- `kernel_size` : An integer or tuple/list of 2 integers, specifying the height and width of the 2D convolution window. Can be a single integer to specify the same value for all spatial dimensions.
- `strides` : An integer or tuple/list of 2 integers, specifying the strides of the convolution along the height and width. Can be a single integer to specify the same value for all spatial dimensions. Specifying any stride value != 1 is incompatible with specifying any `dilation_rate` value != 1.
- `padding` : one of `"valid"` or `"same"` (case-insensitive).
- `data_format` : A string, one of `channels_last` (default) or `channels_first` . The ordering of the dimensions in the inputs. `channels_last` corresponds to inputs with shape `(batch, height, width, channels)` while `channels_first` corresponds to inputs with shape `(batch, channels, height, width)` . It defaults to the `image_data_format` value found in your Keras config file at `~/.keras/keras.json` . If you never set it, then it will be "channels_last".

2D 합성곱층

- 이미지 -> 필터 -> 특성 맵 (활성 맵)

	Valid	Same
Value	$P = 0$	$P_{\text{start}} = \left\lfloor \frac{S\lceil \frac{I}{S} \rceil - I + F - S}{2} \right\rfloor$ $P_{\text{end}} = \left\lceil \frac{S\lceil \frac{I}{S} \rceil - I + F - S}{2} \right\rceil$
Illustration		
Purpose	- No padding - Drops last convolution if dimensions do not match	- Padding such that feature map size has size $\left\lceil \frac{I}{S} \right\rceil$ - Output size is mathematically convenient - Also called 'half' padding

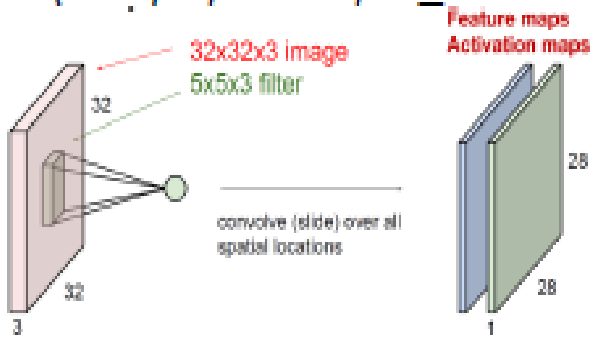
2D 합성곱층

- 이미지 -> 필터 -> 특성 맵 (활성 맵)

- `activation` : Activation function to use. If you don't specify anything, no activation is applied (ie. "linear" activation: `a(x) = x`).
- `use_bias` : Boolean, whether the layer uses a bias vector.
- `kernel_initializer` : Initializer for the `kernel` weights matrix.
- `bias_initializer` : Initializer for the bias vector.
- `kernel_regularizer` : Regularizer function applied to the `kernel` weights matrix.
- `bias_regularizer` : Regularizer function applied to the bias vector.

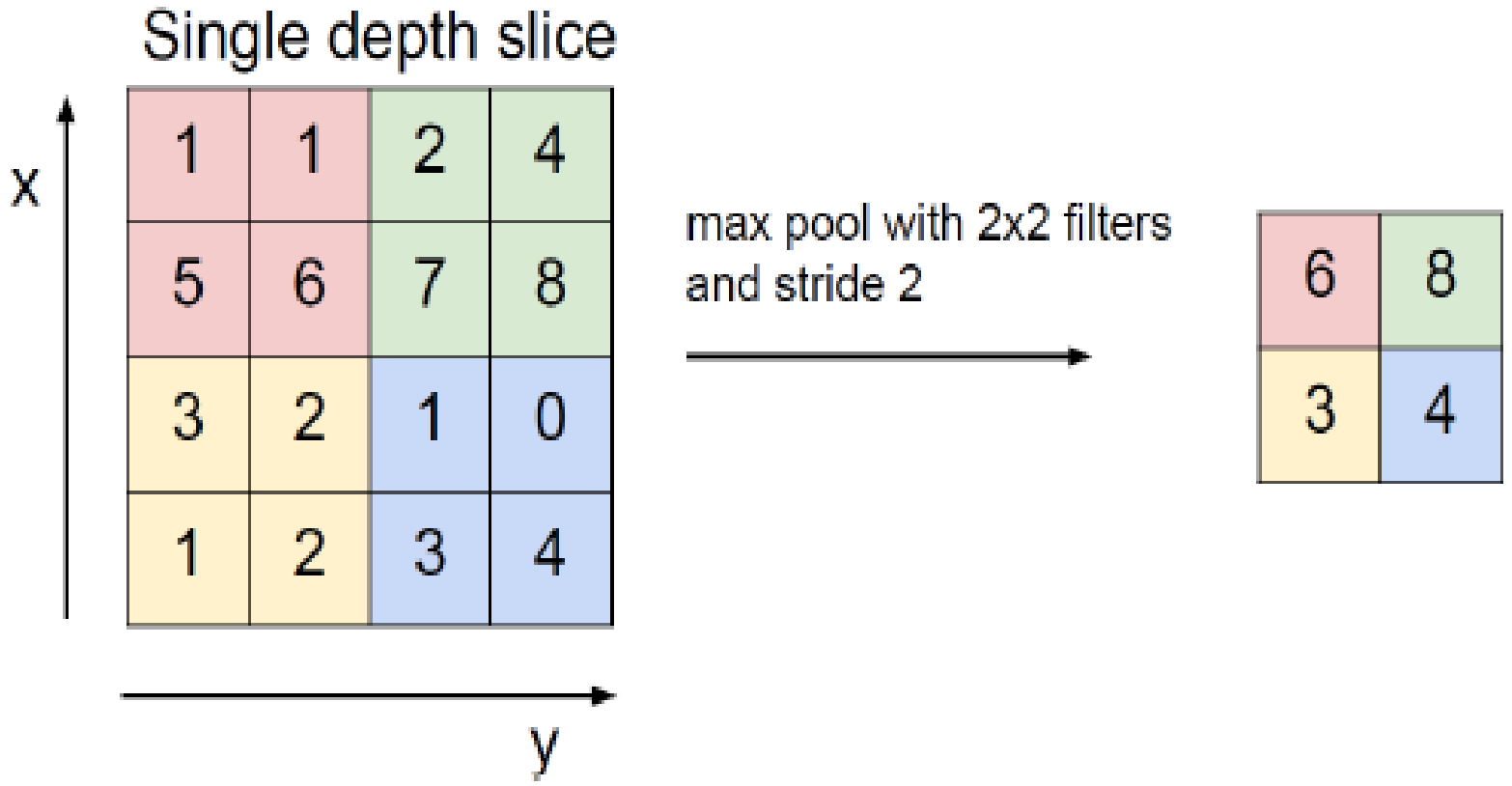
kernel dimension : {height, width, in_channel, out_channel}

Ex) {5, 5, 3, 2}



풀링층

- 최대 풀링 또는 평균 풀링



풀링층

- tf.keras.layers.MaxPoll2D

```
__init__(
    pool_size=(2, 2),
    strides=None,
    padding='valid',
    data_format=None,
    **kwargs
)
```

풀링층

- tf.keras.layers.MaxPoll2D

- `pool_size` : integer or tuple of 2 integers, factors by which to downscale (vertical, horizontal). (2, 2) will halve the input in both spatial dimension. If only one integer is specified, the same window length will be used for both dimensions.
- `strides` : Integer, tuple of 2 integers, or None. Strides values. If None, it will default to `pool_size` .
- `padding` : One of `"valid"` or `"same"` (case-insensitive).
- `data_format` : A string, one of `channels_last` (default) or `channels_first` . The ordering of the dimensions in the inputs. `channels_last` corresponds to inputs with shape `(batch, height, width, channels)` while `channels_first` corresponds to inputs with shape `(batch, channels, height, width)` . It defaults to the `image_data_format` value found in your Keras config file at `~/.keras/keras.json` . If you never set it, then it will be "channels_last".

텐서플로우 2

- 이미지 분류 (Classification)

https://www.tensorflow.org/tutorials/quickstart/beginner

https://www.tensorflow.org/tutorials/quickstart/advanced

이미지 분할

- 이미지 분할 경연대회

- PASCAL VOC segmentation
  - 10K images, 20 classes + bgnd

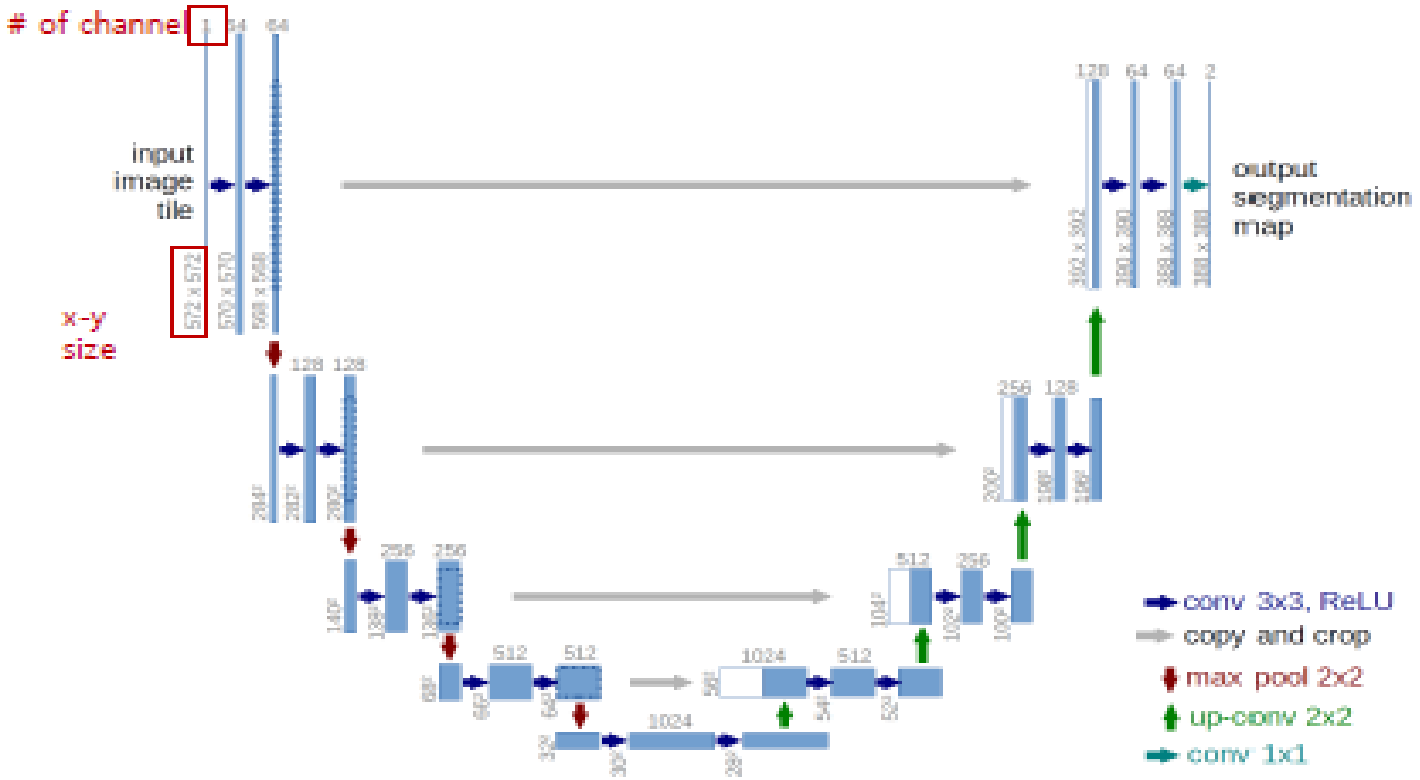
PASCAL2
Pattern Analysis, Statistical Modelling and Computational Learning

- MS COCO
  - 100K images, 80 classes + bgnd

Microsoft COCO
Common Objects in Context

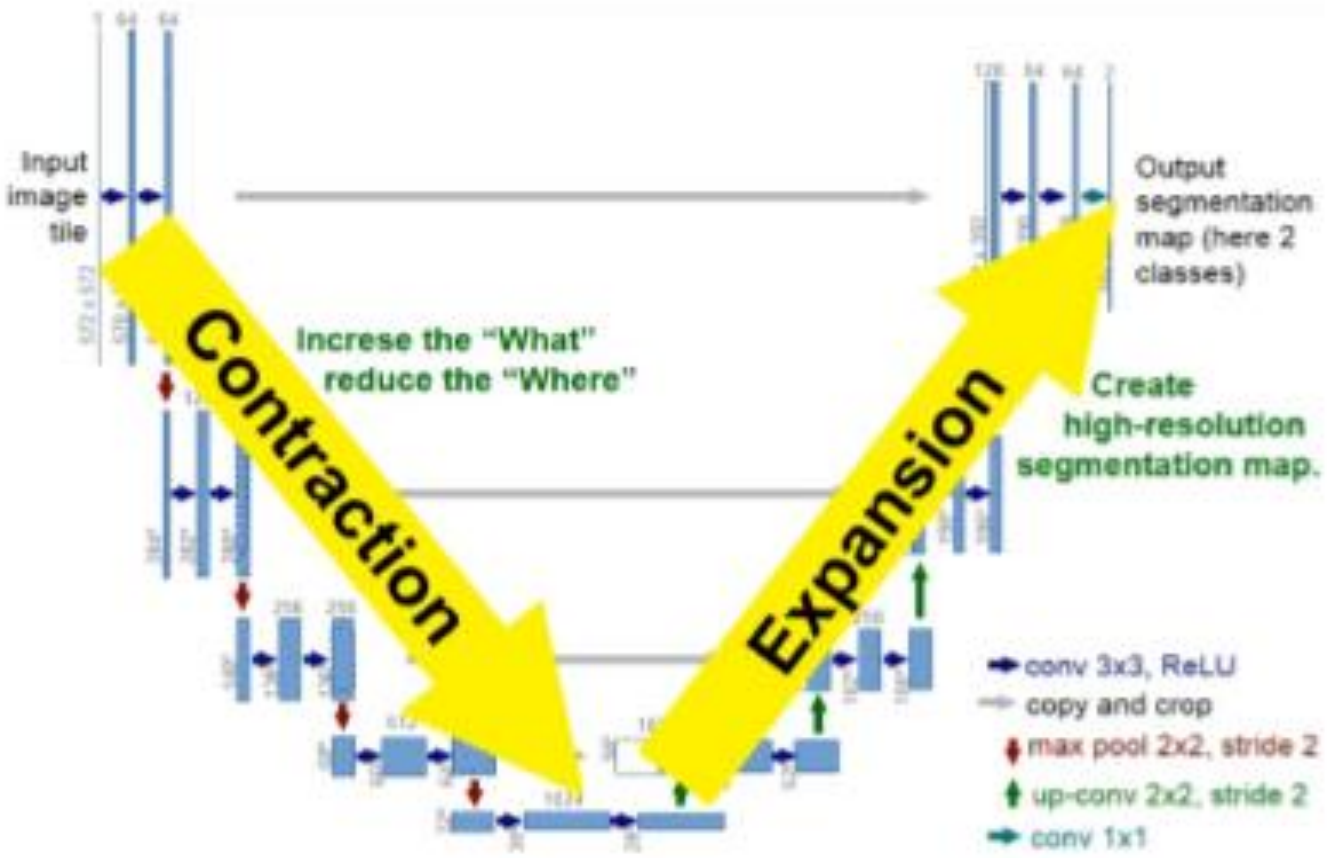
이미지 분할

- 유넷 구조 (U-Net Architecture)



이미지 분할

- 유넷 구조 (U-Net Architecture)

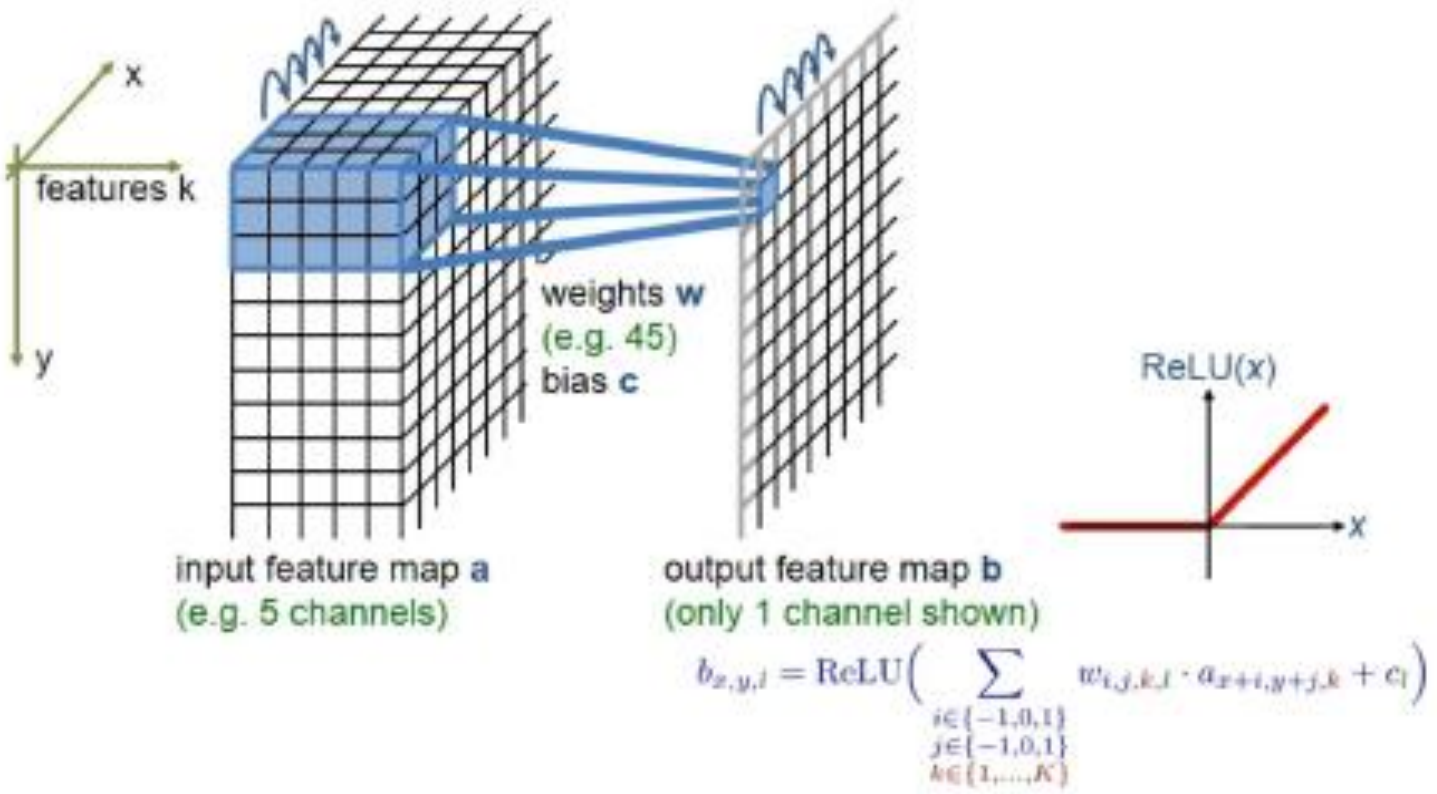


이미지 분할

- 유넷 구조 (U-Net Architecture)

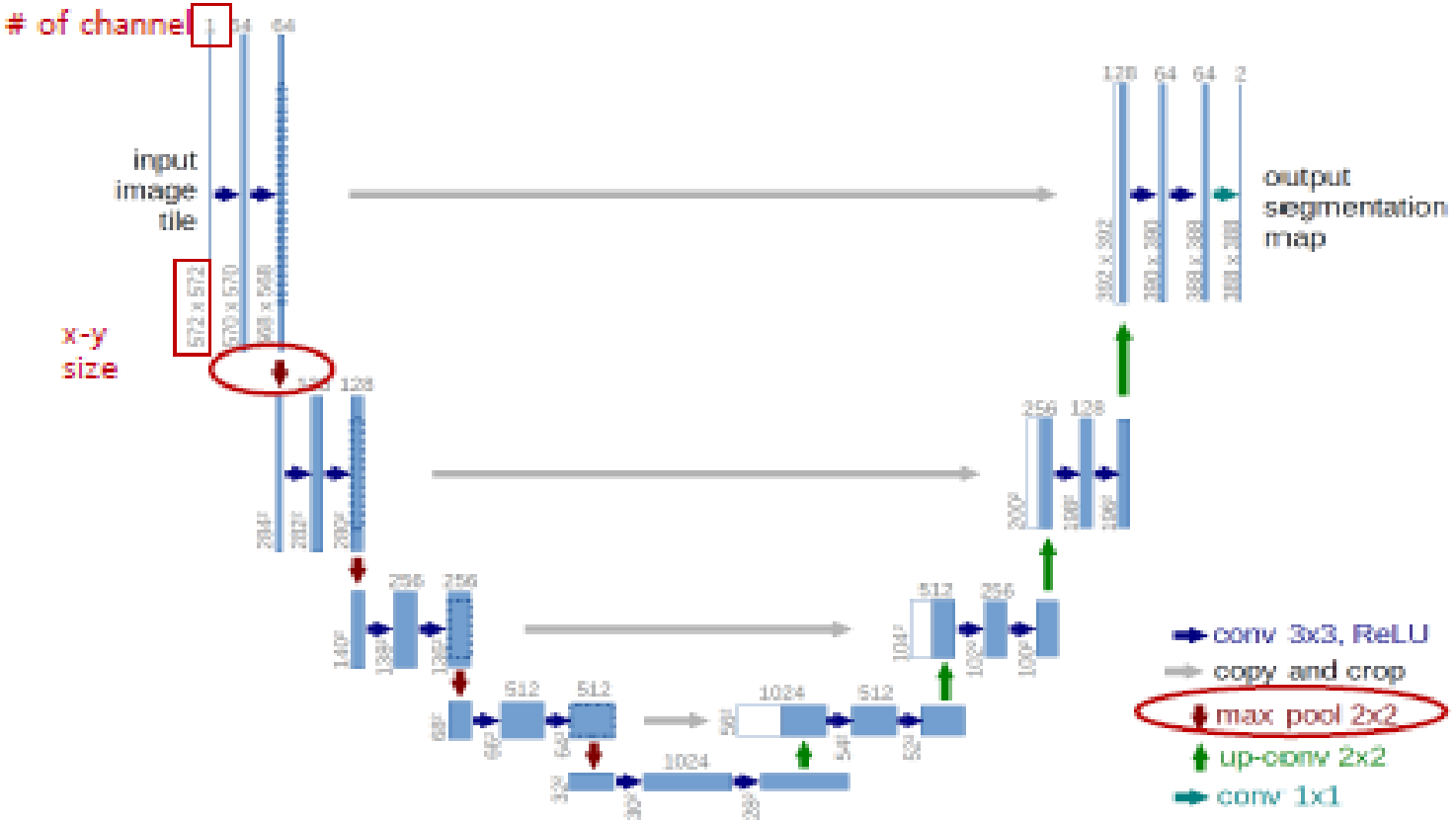
이미지 분할

- 3x3 합성곱 + ReLU



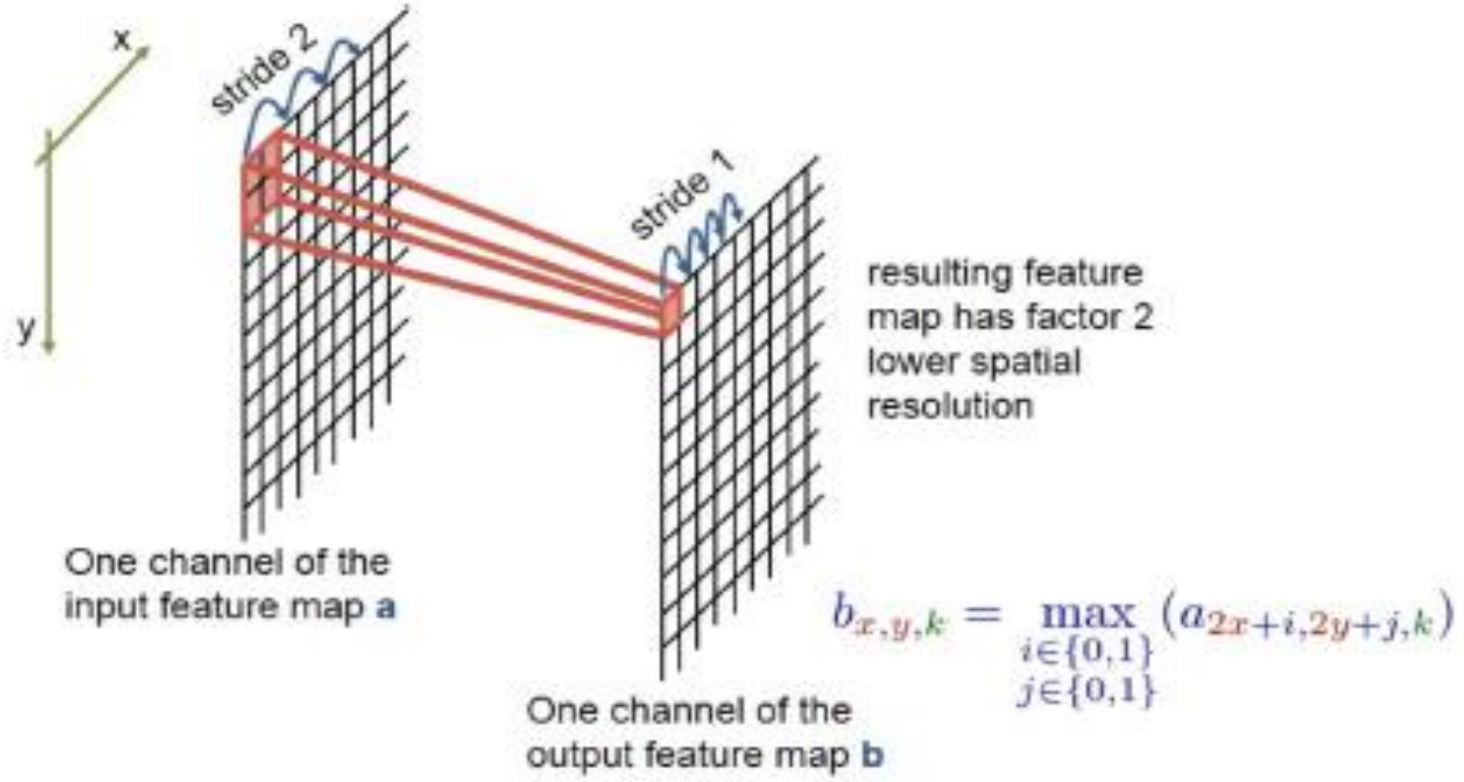
이미지 분할

- 유넷 구조 (U-Net Architecture)



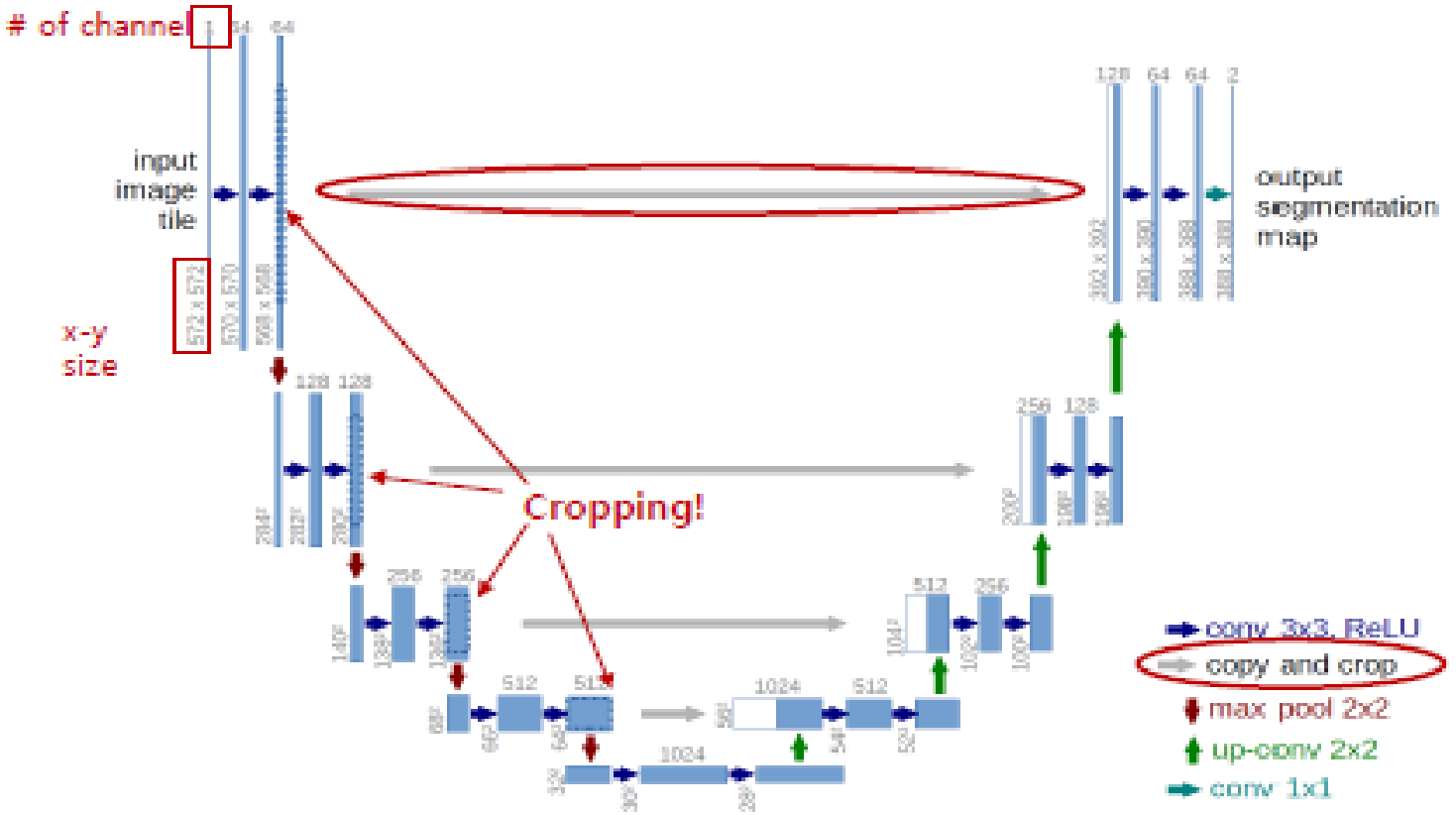
이미지 분할

- 2x2 최대 풀링 (Max Pooling)



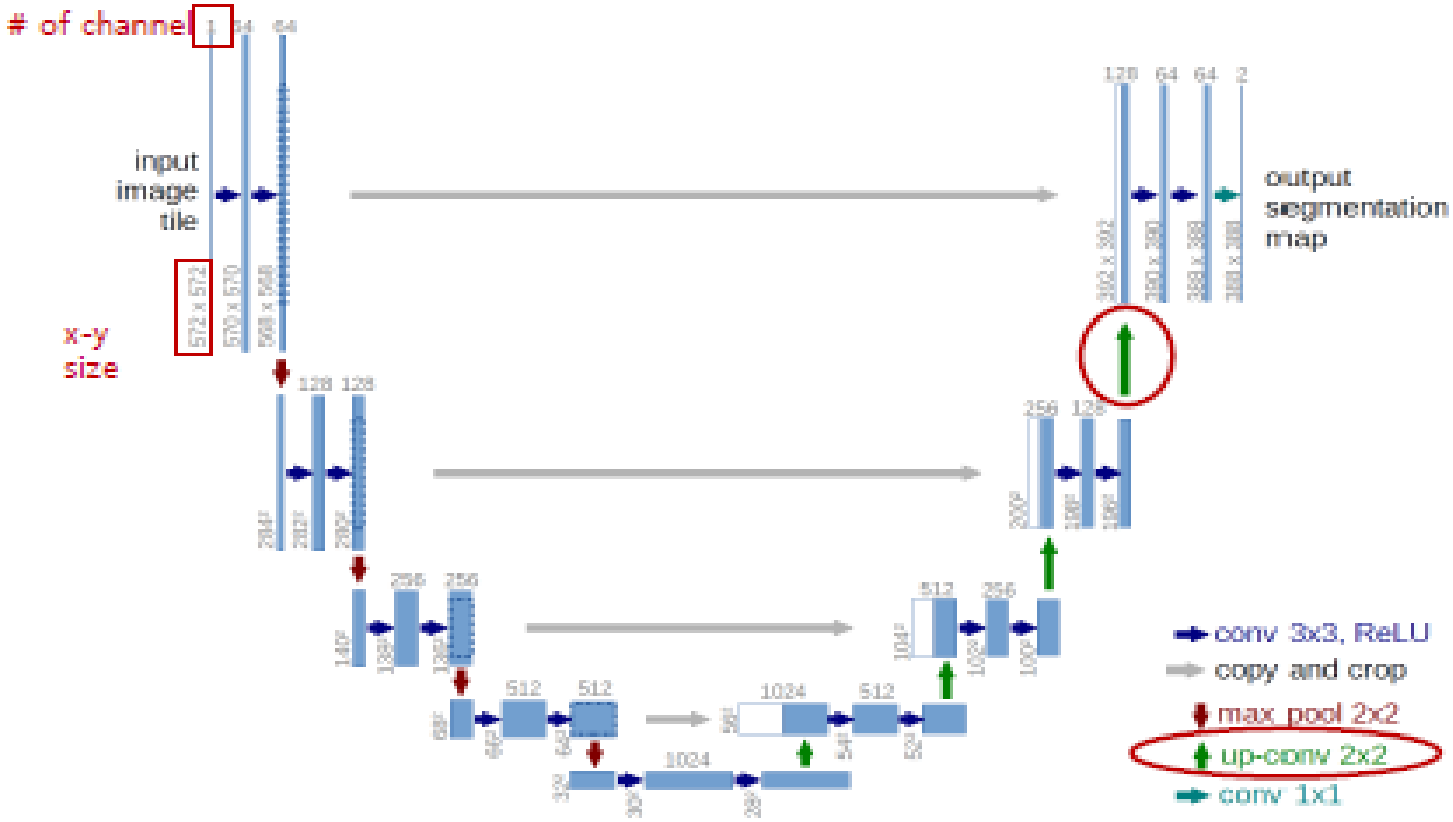
이미지 분할

- 유넷 구조 (U-Net Architecture)



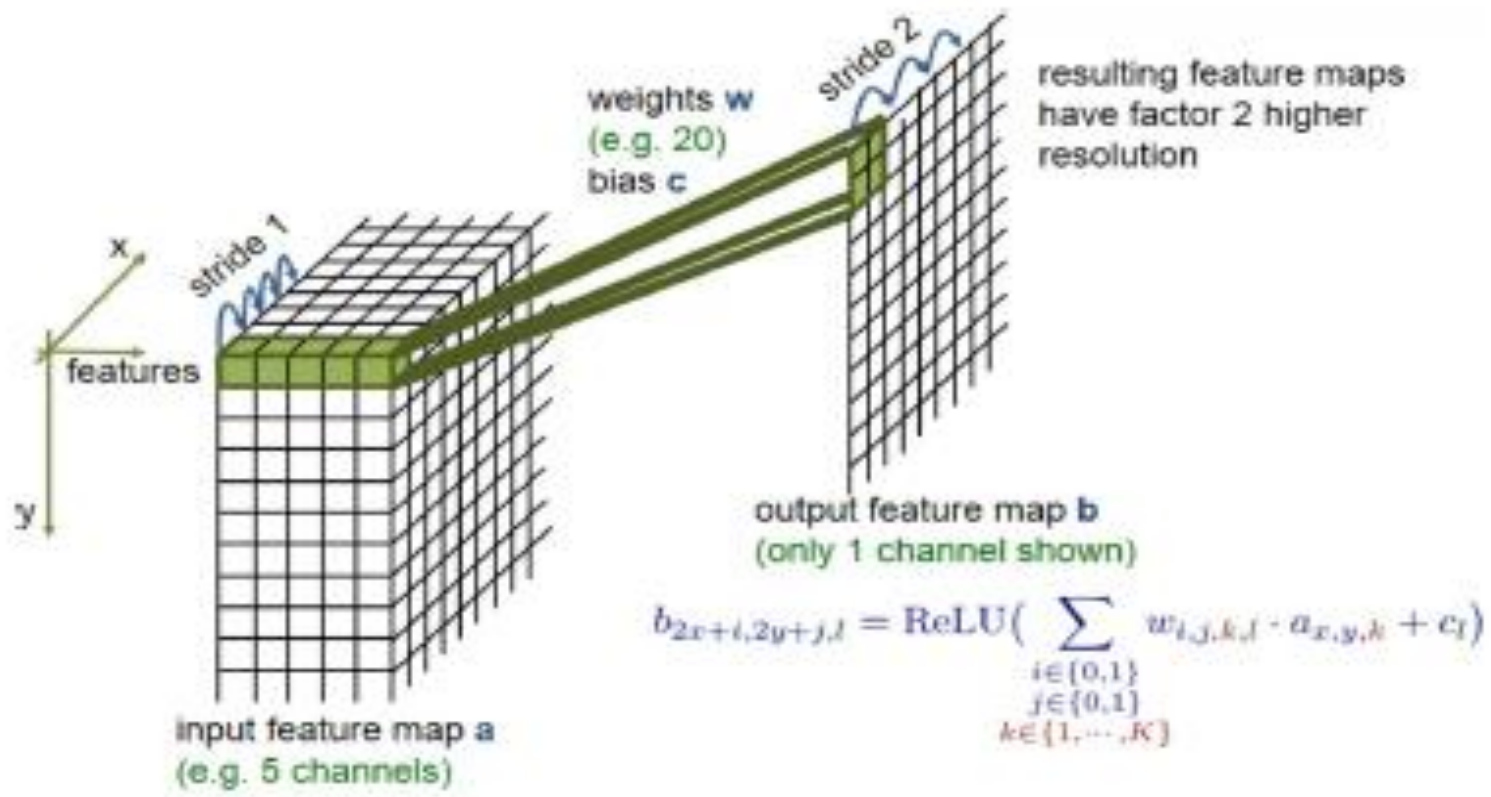
이미지 분할

- 유넷 구조 (U-Net Architecture)



의미론적 분할

- 2x2 업 합성곱 (Up-convolution)



텐서플로우 2

- 이미지 분할 (Segmentation)

https://www.tensorflow.org/tutorials/images/segmentation