Introduction to Neural Networks

Transposed convolution

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October 23, 2023©

Inverse convolution

- Given that

$$G = I \star K$$

- Is this possible?

$$I = G \star K^{-1}$$

Inverse convolution

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- Is this possible?
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- In theory, but it is not practical, it involves the computation of a inverse matrix.
- Therefore we will apply a transposed convolution instead.

Transposed convolution

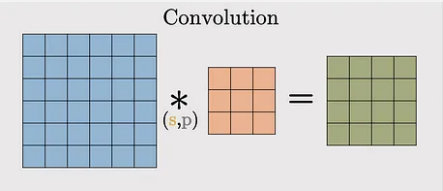
- Reverse the dimension of the convolution operation, upsampling

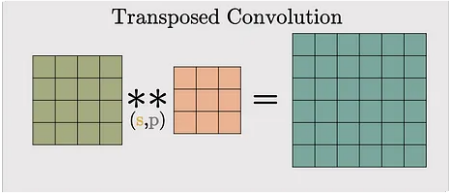
$$G = I \star K$$

$$T = G \star\star K$$

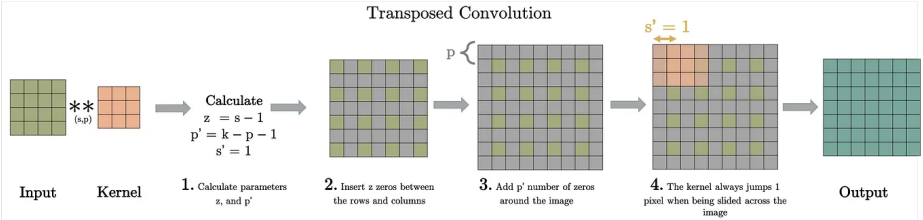
$$|T| = |I|$$

- Transposed convolution doesn't reverse the standard convolution by values





Transposed convolution



1. Calculate parameters z and p':

$$z = s - 1 \tag{1}$$

$$p' = K_w - p - 1 \tag{2}$$

2. Between each row and columns of the input, G, insert z number of zeros.
3. Pad the modified input image with p' number of zeros
4. Perform a convolution with stride, $s' = 1$

References

- Dumoulin, Vincent, and Francesco Visin. "A guide to convolution arithmetic for deep learning." arXiv preprint arXiv:1603.07285 (2016).
- Aqeel Anwar, What is Transposed Convolutional Layer?, https://towardsdatascience.com/what-is-transposed-convolutional-layer, Consultado: Abril 2023.