DIAGRAM OF TRANSPOSED CONVOLUTION (Using a 2D example)

1. Inpt grid.

$$\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$$

- Inpte feature map 2x2.

2. Stride and zero insertion. Suppose stride = 2.

$$\begin{bmatrix}1 & 0 & 2\\ 0 & 0 & 0\\ 3 & 0 & 4\end{bmatrix}$$

- Expanded inpt after zero insertion

3. Kernel sliding and summing. For example, a 3x3 kernel such as:

$$\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 0\\ 1 & 0 & 1\end{bmatrix}$$

$$\begin{bmatrix}\boxed{1} & \boxed{0} & \boxed{2}\\ 0 & 0 & 0\\ \boxed{3} & 0 & \boxed{4}\end{bmatrix} \times \begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 0\\ 1 & 0 & 1\end{bmatrix} =$$

(each 0 contributes 0)

$$\begin{bmatrix}1 & 0+0 & 1+2+0 & 0+0 & 2\\ 0 & 1+0 & 0+0+0 & 2+0 & 0\\ 1+3 & 0+0+0 & 1+2+3+4+0 & 0+0+0 & 2+4\\ 0 & 3 & 0+0 & 4 & 0\\ 3 & 0 & 3+4 & 0 & 4\end{bmatrix} = \begin{bmatrix}1 & 0 & 3 & 0 & 2\\ 0 & 1 & 0 & 2 & 0\\ 4 & 0 & 10 & 0 & 6\\ 0 & 3 & 0 & 4 & 0\\ 3 & 0 & 7 & 0 & 4\end{bmatrix}$$

4. Padding effect. Suppose padding = 1.

$$\begin{bmatrix}1 & 0 & 3 & 0 & 2\\ 0 & 1 & 0 & 2 & 0\\ 4 & 0 & 10 & 0 & 6\\ 0 & 3 & 0 & 4 & 0\\ 3 & 0 & 7 & 0 & 4\end{bmatrix}$$

Then, we keep the central 3x3 →

$$\begin{bmatrix}1 & 0 & 2\\ 0 & 10 & 0\\ 3 & 0 & 4\end{bmatrix}$$

Formula:

Output size = (Input size − 1) * stride − 2 * padding + kernel size

$$(2-1)*2 - 2*1 + 3 = \boxed{3}$$

= size 3x3