

## BS6207 Homework 3

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### 1. Result for each function

No.	Function	Formula
1	MaxPool2d	$h_{xy}^l = \max_{i=0,\dots,s,j=0,\dots,s} \mathbf{h}_{(x+i)(y+j)}^{l-1}$
2	AvgPool2d	$z_c = \mathbf{F}_{sq}(\mathbf{u}_c) = \frac{1}{H \times W} \sum_{i=1}^H \sum_{j=1}^W u_c(i, j)$
3	Conv2d	$\text{out}(N_i, C_{\text{out}_j}) = \text{bias}(C_{\text{out}_j}) + \sum_{k=0}^{C_{\text{in}}-1} \text{weight}(C_{\text{out}_j}, k) \star \text{input}(N_i, k)$
4	ConvTranspose2d	Gradient of Conv2d with respect to its input, also known as a deconvolution
5	Flatten	Flattening a zero-dimensional tensor will return a one-dimensional view
6	Sigmoid	$S(x) = \frac{1}{1 + e^{-x}}$
7	Roi Pooling	Single feature mapping for all the proposals generated by RPN in a single pass
8	Batch Normalization	$\hat{x}^{(k)} = \frac{x^{(k)} - \mathbb{E}[x^{(k)}]_{\mathcal{B}}}{\sqrt{\text{Var}[x^{(k)}]_{\mathcal{B}}}}$
9	Cross Entropy	$\text{loss}(x, \text{class}) = -\log\left(\frac{\exp(x[\text{class}])}{\sum_j \exp(x[j])}\right) = -x[\text{class}] + \log\left(\sum_j \exp(x[j])\right)$
10	MSE Loss	$\text{MSE} = \frac{1}{N} \sum_{i=1}^N (y_i - \hat{y}_i)^2$

Using all the functions as listed, my torch\_out and my\_out for every function gives the same values of precision of up to 4 decimal places.