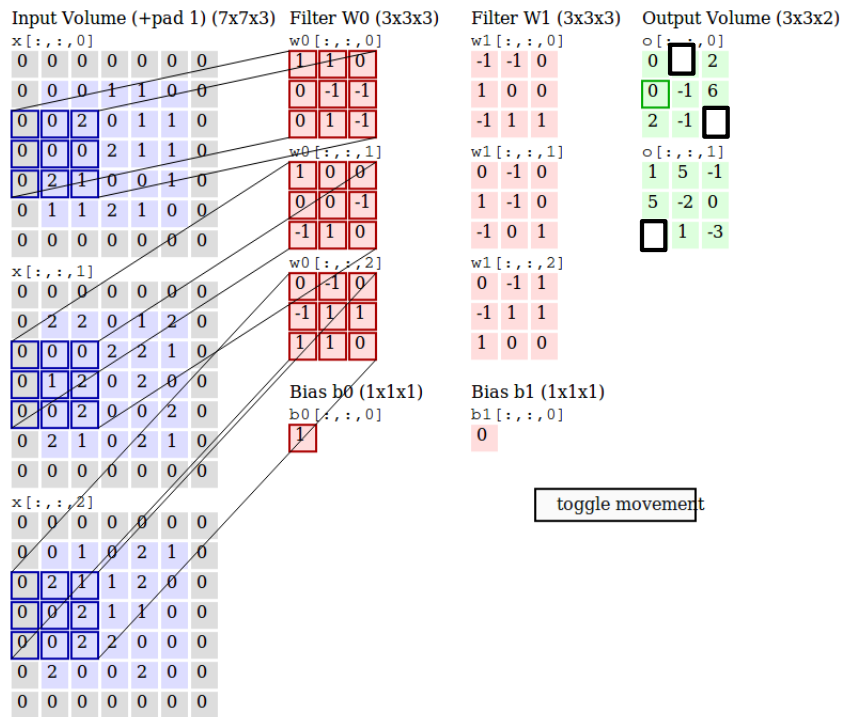


**Lesson 20 (Tensors and Convolution)** Consider the input tensor,  $\mathbf{X}$ , weight tensor,  $\mathbf{W}$ , bias vector,  $\mathbf{b}$ , output tensor,  $\mathbf{Y}$  and the convolution operation shown below. Each element in the output tensor is computed by computing a “local”  $\mathbf{X}$  and  $\mathbf{W}$  tensor dot product plus a bias.



<http://cs231n.github.io/convolutional-networks/>

1. Fill in the table below for the tensors shown above.

tensor	dimension	shape	data type
$\mathbf{X}$			
$\mathbf{W}$			
$\mathbf{b}$			
$\mathbf{Y}$			

2. Fill in the blank spots in output tensor  $\mathbf{Y}$  shown above.
3. Write numpy code for computing the output tensor  $\mathbf{Y}$  shown above. Use the skeleton code contained in the file

TensorsAndConvolution-skeleton.ipynb