1.
$$z_i = \omega_1 x_{i-1} + \omega_2 x_i + \omega_3 x_{i+1}, \qquad (10.3)$$

Equivariant to translation

$$f[t[x]] = t[f[x]]$$

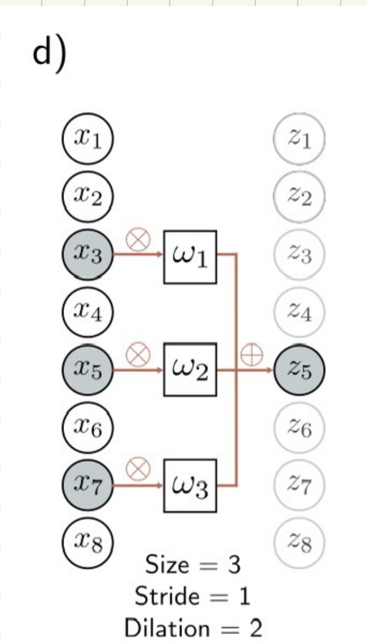
$$z_i = \sum_{j=1}^{3} \omega_j x_{i+j-2}$$

$$t[x_i] = x_{i+t}$$

$$\sum_{j=1}^{3} \omega_j t[x_{i+j-2}] = \sum_{j=1}^{3} \omega_j x_{(i+t)+j-2}$$

$$= \omega_1 x_{(i+t)-1} + \omega_2 x_{(i+t)} + \omega_3 x_{(i+t)+1} = z_{i+t} = t[z_i]$$

3.

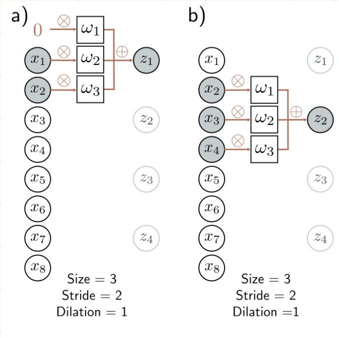


$$z_i = \omega_1 x_{i-2} + \omega_2 x_i + \omega_3 x_{i+2}$$

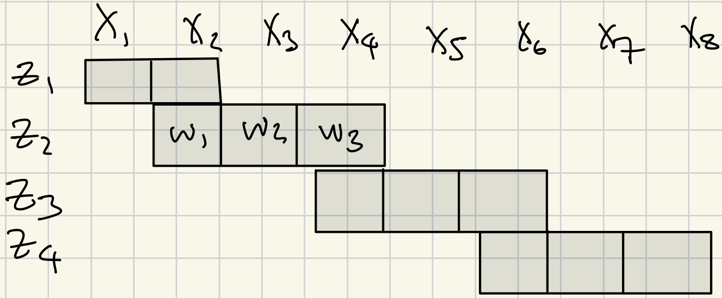
$$= \sum_{j=1}^{3} \omega_j x_{i+2(j-2)}$$

5.

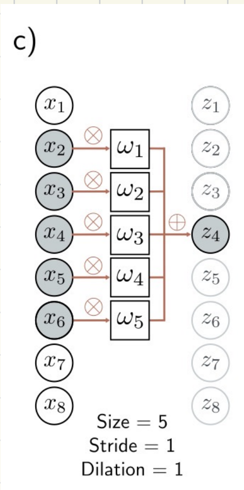
i)



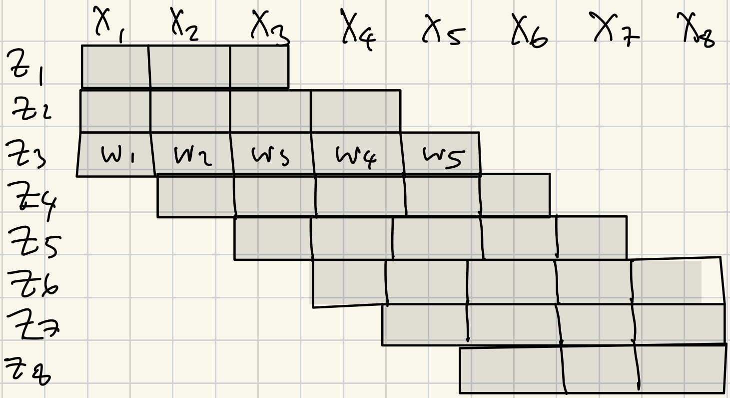
a)
b)
Size = 3
Stride = 2
Dilation = 1
Size = 3
Stride = 2
Dilation =1



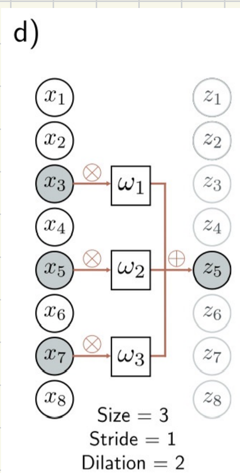
x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8
z_1
z_2
z_3
z_4
w_1 w_2 w_3



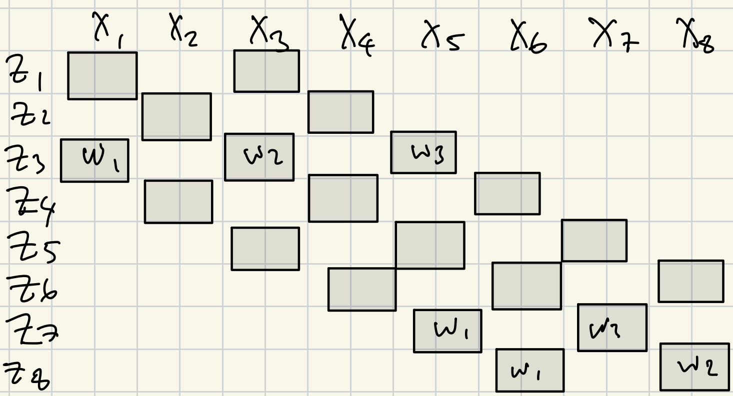
c)
Size = 5
Stride = 1
Dilation = 1



x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8
z_1
z_2
z_3
z_4
z_5
z_6
z_7
z_8
w_1 w_2 w_3 w_4 w_5

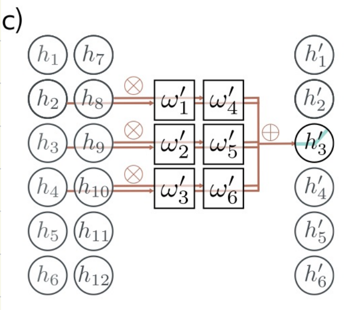


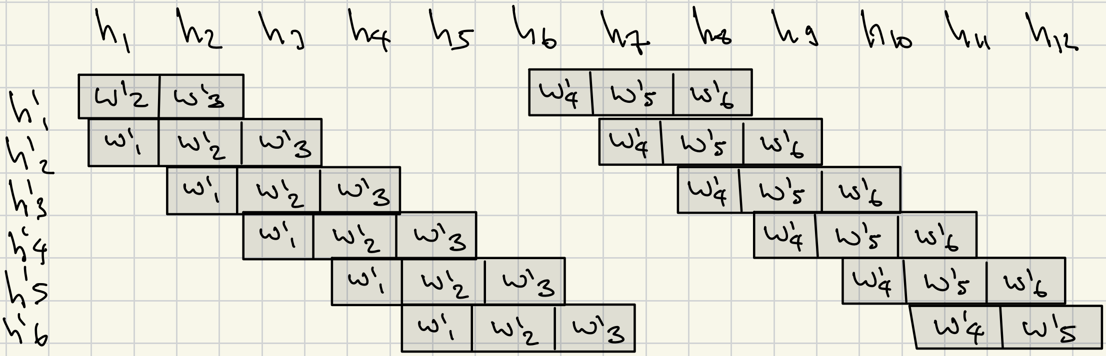
d)
Size = 3
Stride = 1
Dilation = 2



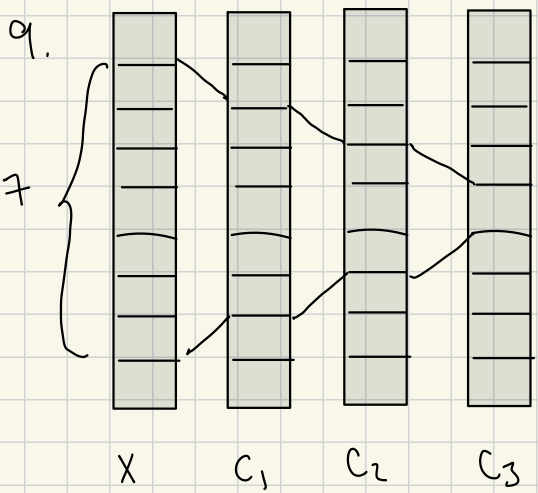
x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8
z_1
z_2
z_3
z_4
z_5
z_6
z_7
z_8
w_1 w_2 w_3
w_1 w_3
w_1 w_2

7.



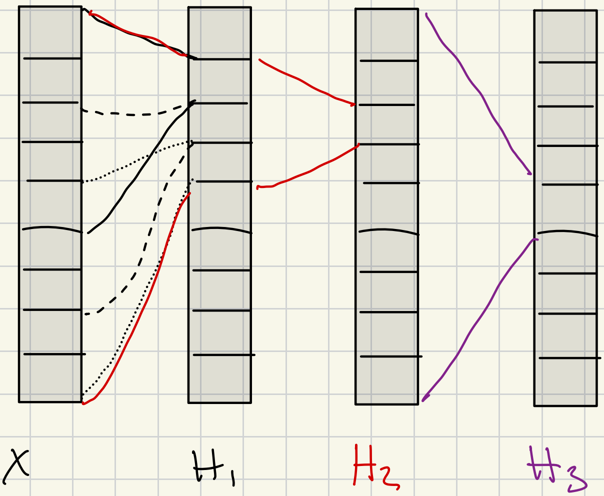


9.



Receptive field = 7

11.



(because of stride 2, this would actually be shifted...)

	H_1	H_2	H_3
Receptive field	5	9	25

Equation $R_l = R_{l-1} + (k_l - 1)\cdot d_l \prod_{j=1}^{l-1} s_j$

receptive field at layer l

kernel size

dilation

stride of layer j

So for H_3, $R_3 = 9 + (5-1)\cdot 2 \cdot 2 = 25$