

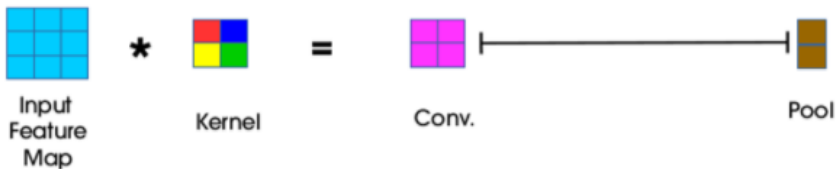
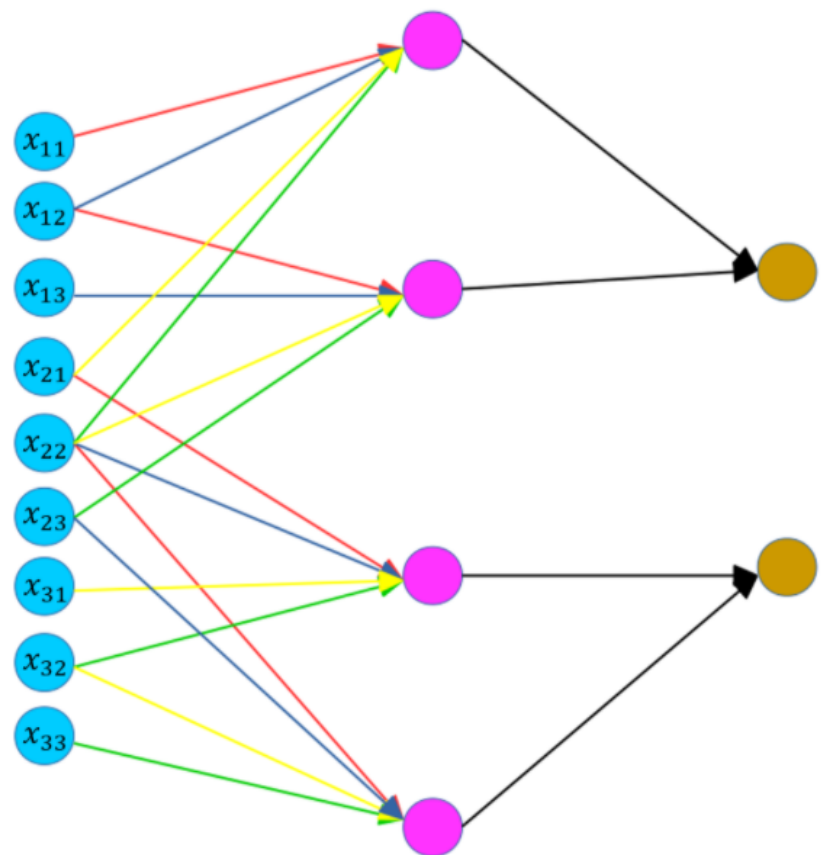
Ch07 Convolution Network

Convolution layer와 Pooling layer의 Backward pass 에 대하여

이미지 출처 및 참고 :

<https://ratsgo.github.io/deep%20learning/2017/04/05/CNNbackprop/>

합성곱



1	1	1	0	0
0	1	1	1	0
0	0	1 _{x1}	1 _{x0}	1 _{x1}
0	0	1 _{x0}	1 _{x1}	0 _{x0}
0	1	1 _{x1}	0 _{x0}	0 _{x1}

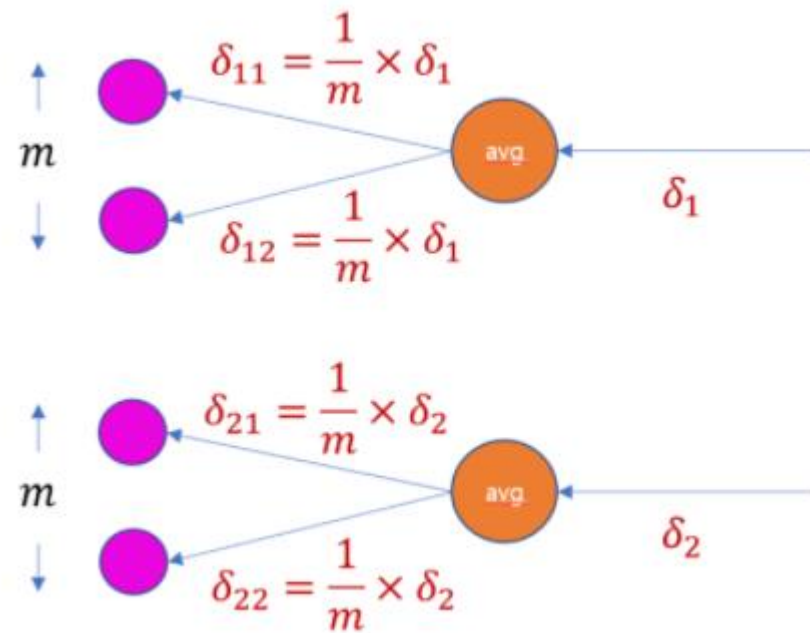
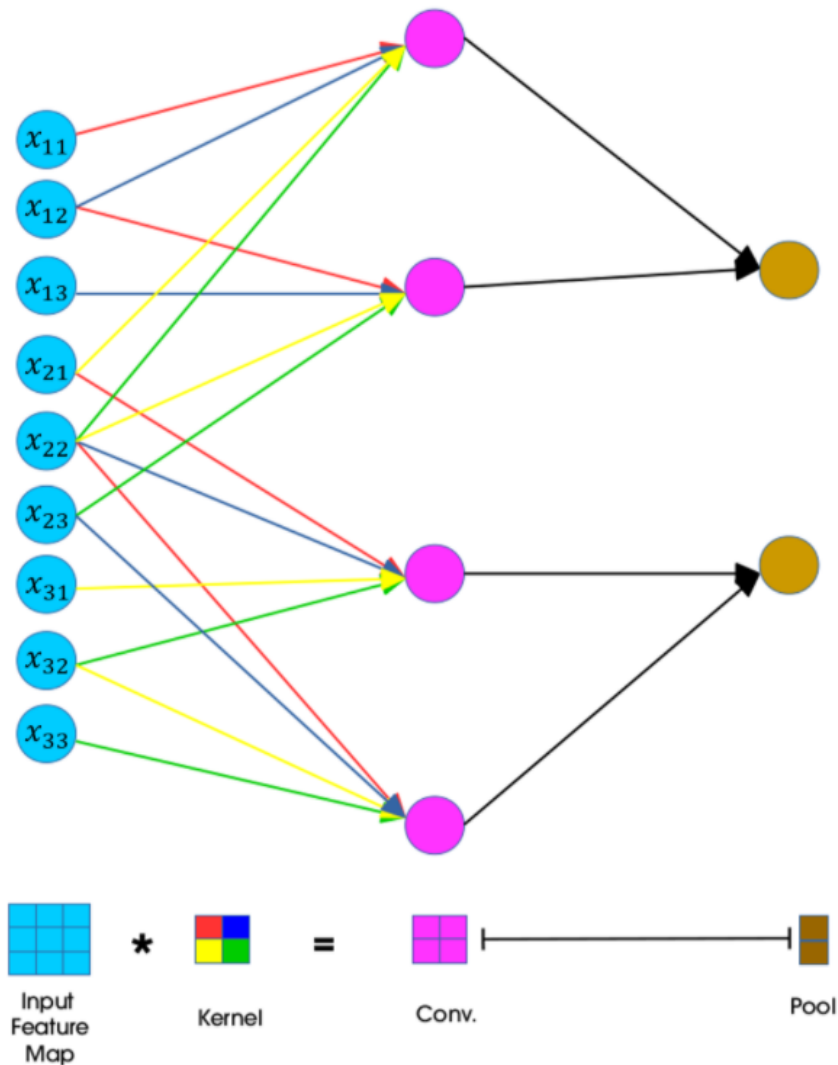
Image

4	3	4
2	4	3
2	3	4

Convolved
Feature

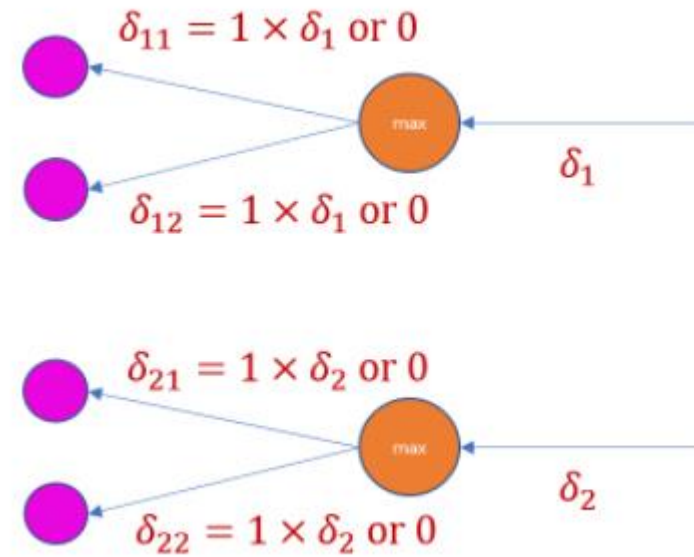
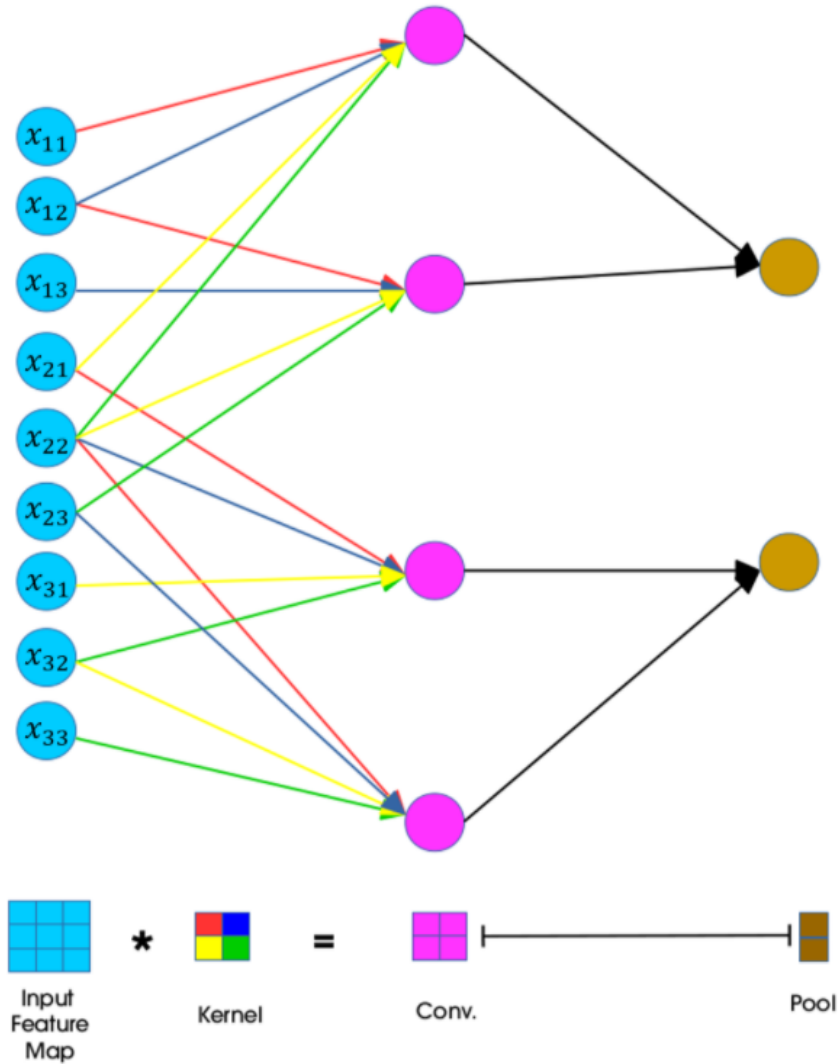
Stride=1, pad=0으로 설정했다고 가정하면,
필터가 입력벡터를 슬라이딩하면서 합성곱 연산을 수행

Backward pass : Average Pooling



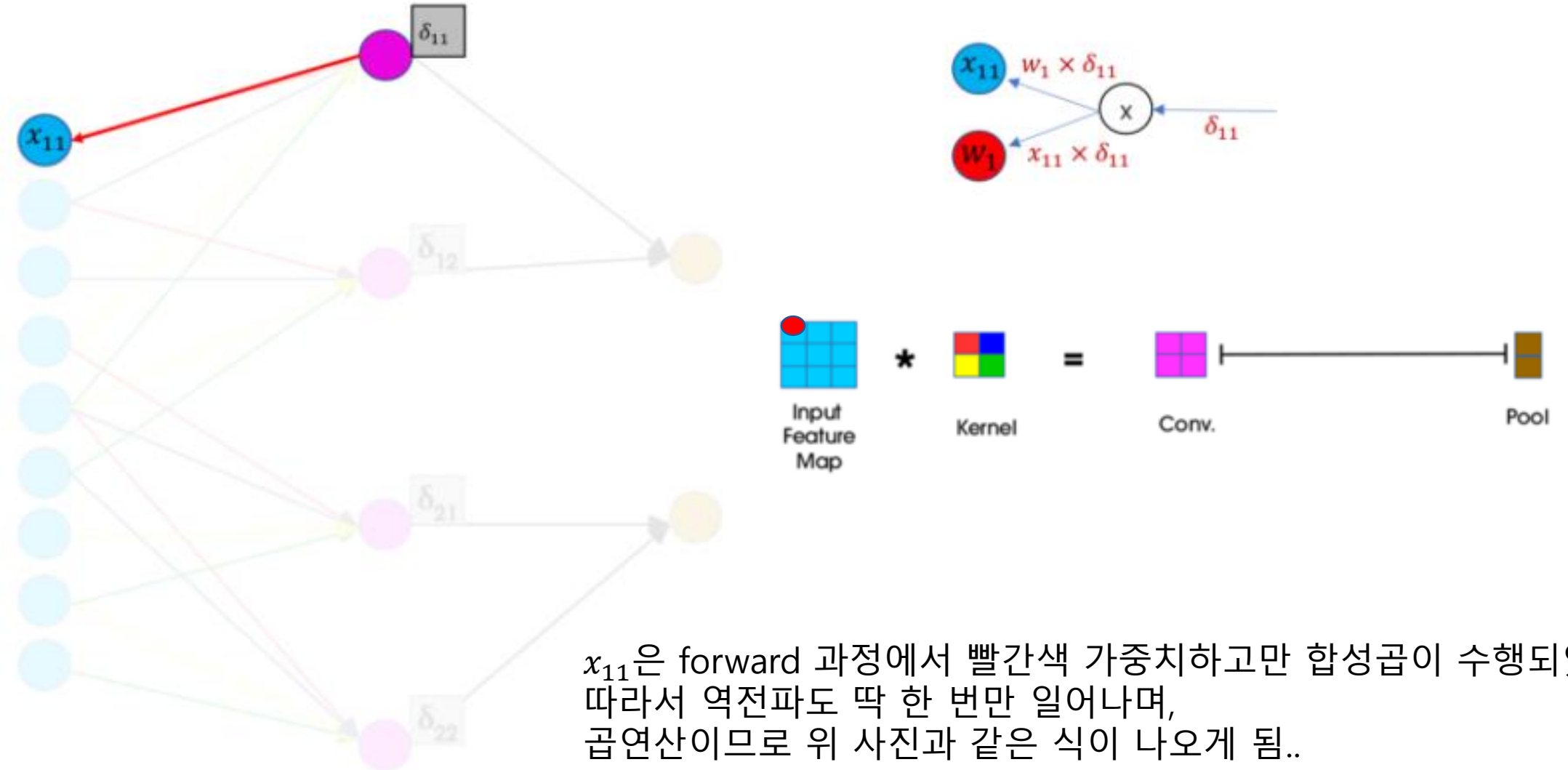
δ_1, δ_2 는 FC에서 전파된 그래디언트라고 가정했을 때, Average Pooling은 avg를 이용했으므로 $1/m$ 을 δ_1, δ_2 에 곱해줌

Backward pass : Max Pooling

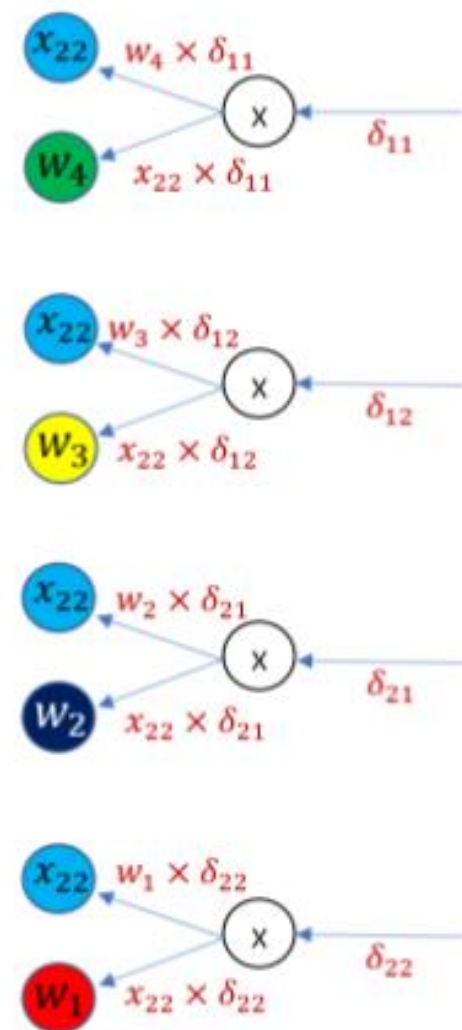
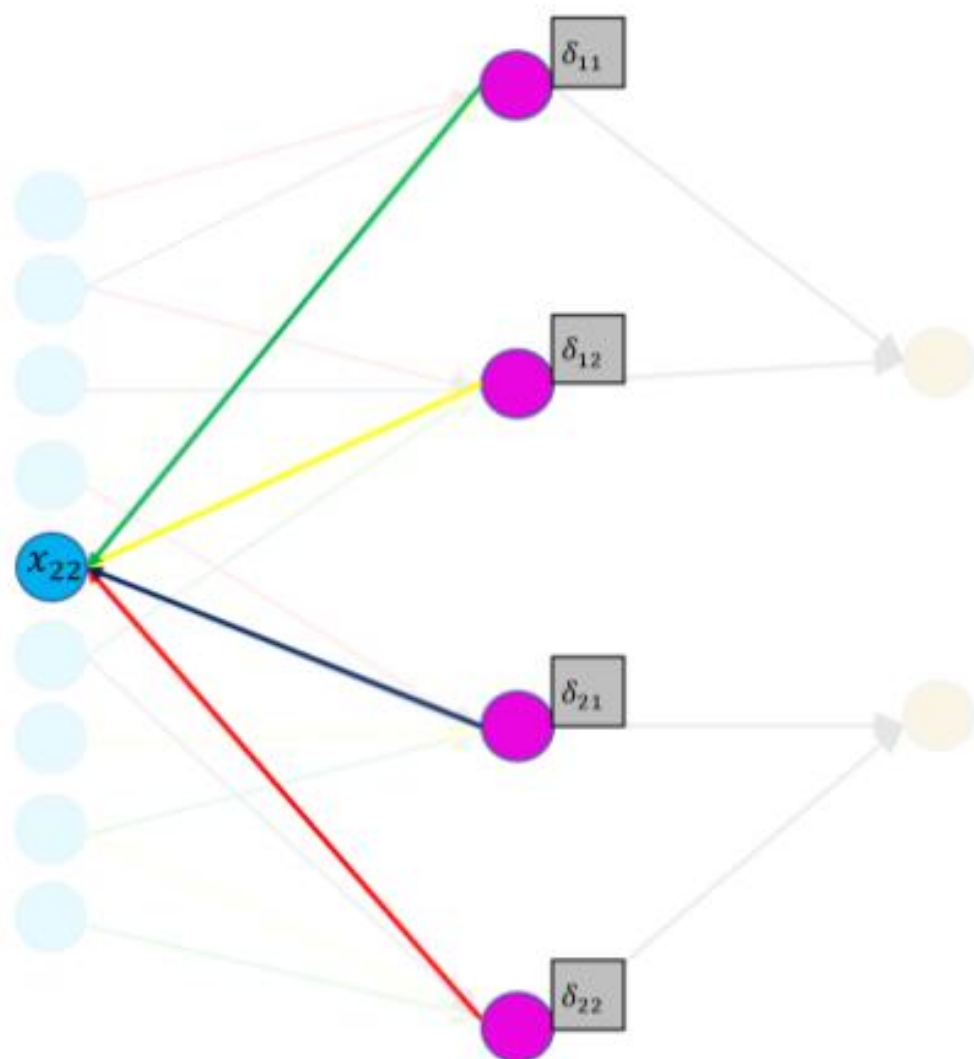


ReLU에서와 마찬가지로
최대값이 속해 있는 요소의 로컬 그래디언트는 1, 나머지는 0으로
 δ_1, δ_2 와 곱함

Backward pass : conv layer

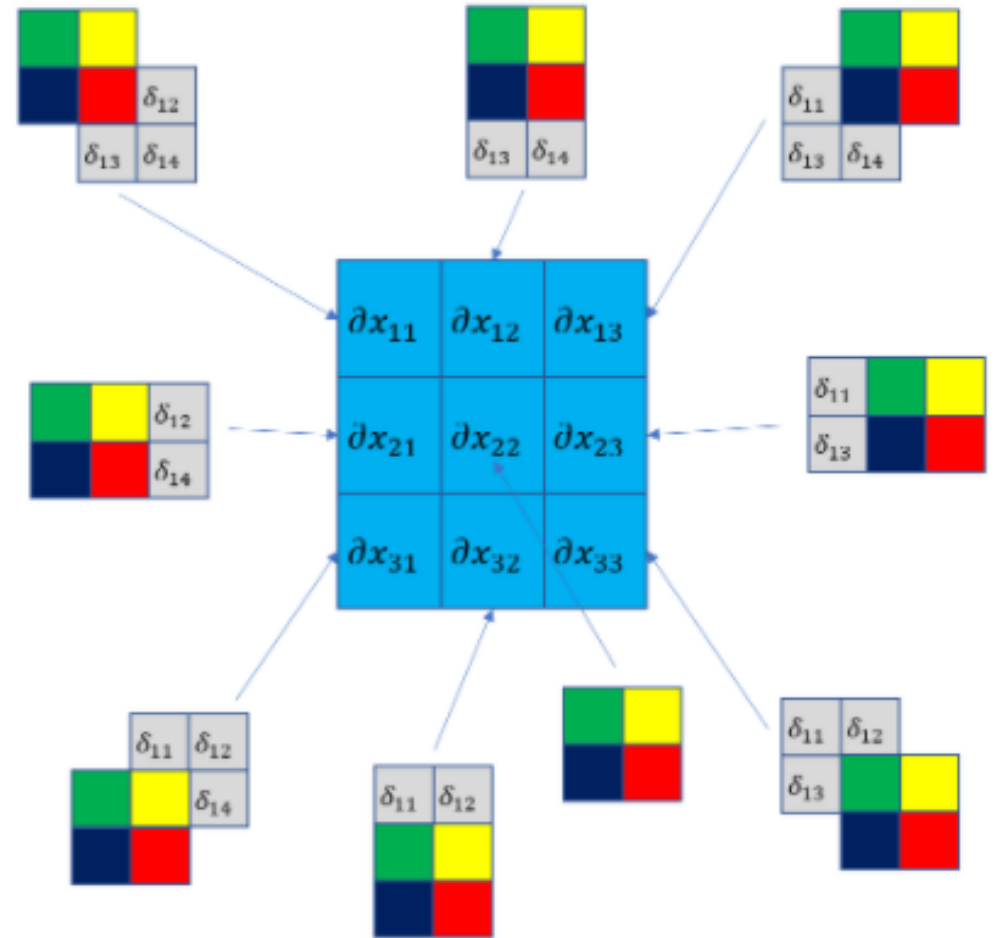
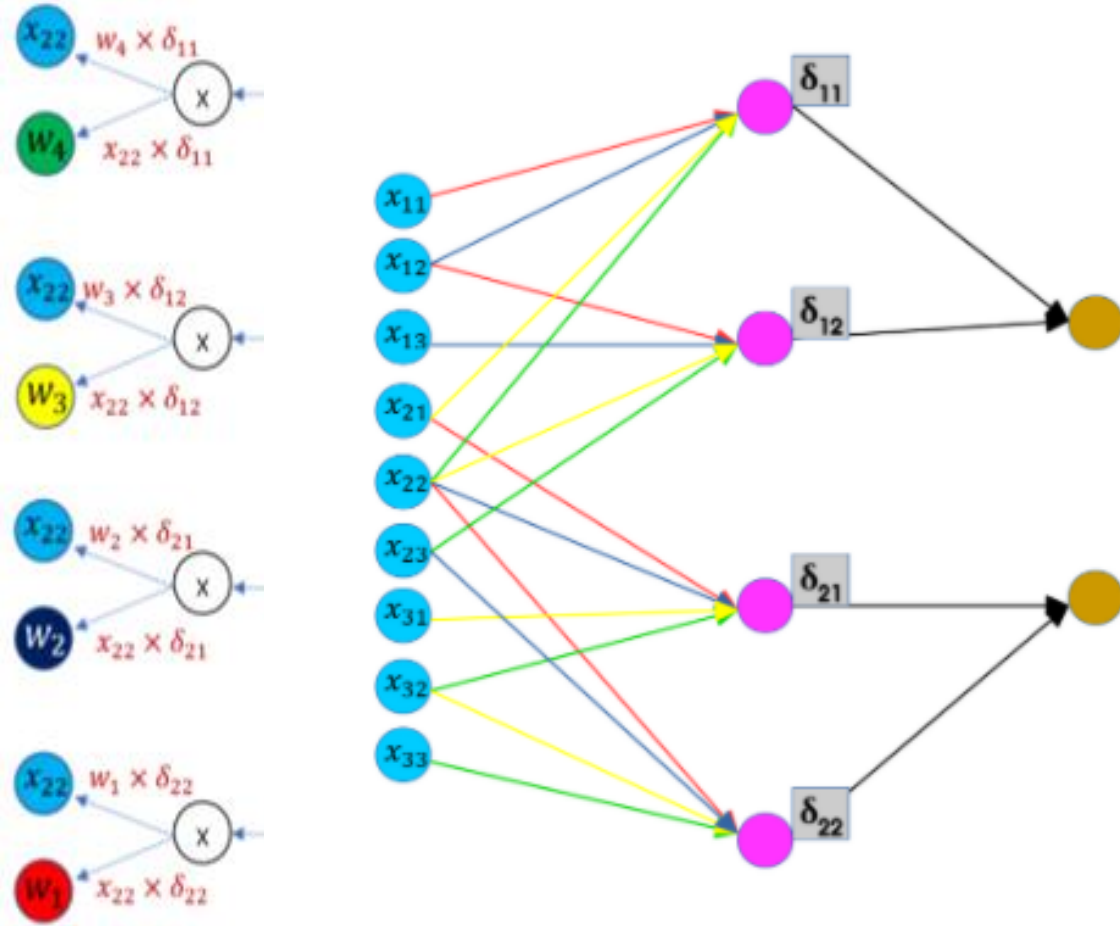


Backward pass : conv layer



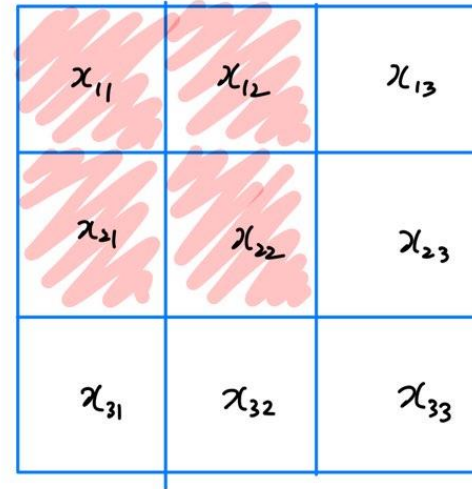
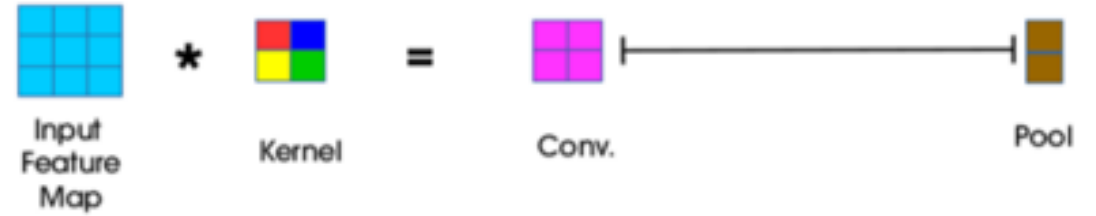
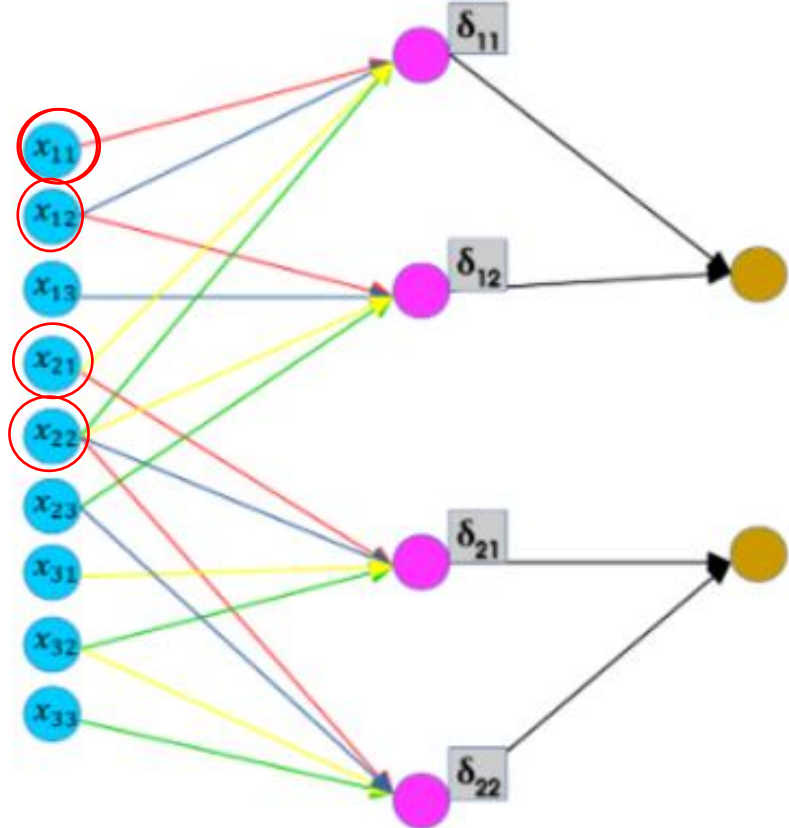
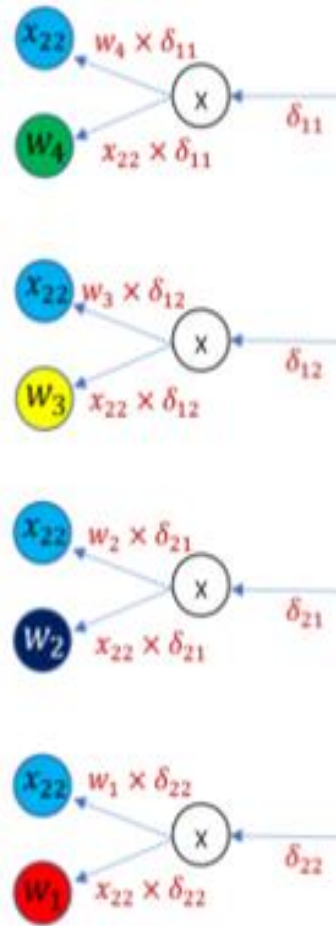
Backward pass : conv layer

기존->



흘러들어온 그래디언트 행렬(2x2 크기)을 conv layer를 만들 때 썼던 필터가 슬라이딩하면서 값을 구하는 것

Backward pass : conv layer->W에 대하여



$$\Rightarrow \partial W_{11} = x_{11} \delta_{11} + x_{12} \delta_{12} + x_{21} \delta_{21} + x_{22} \delta_{22}$$