PadhAI: Visualising CNNs

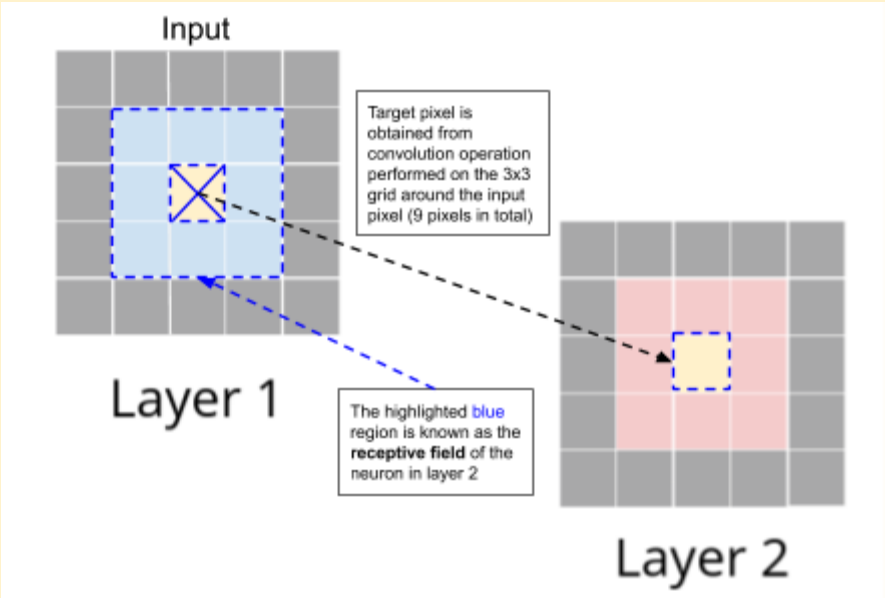
One Fourth Labs

Visualising CNNs

Receptive field of a neuron

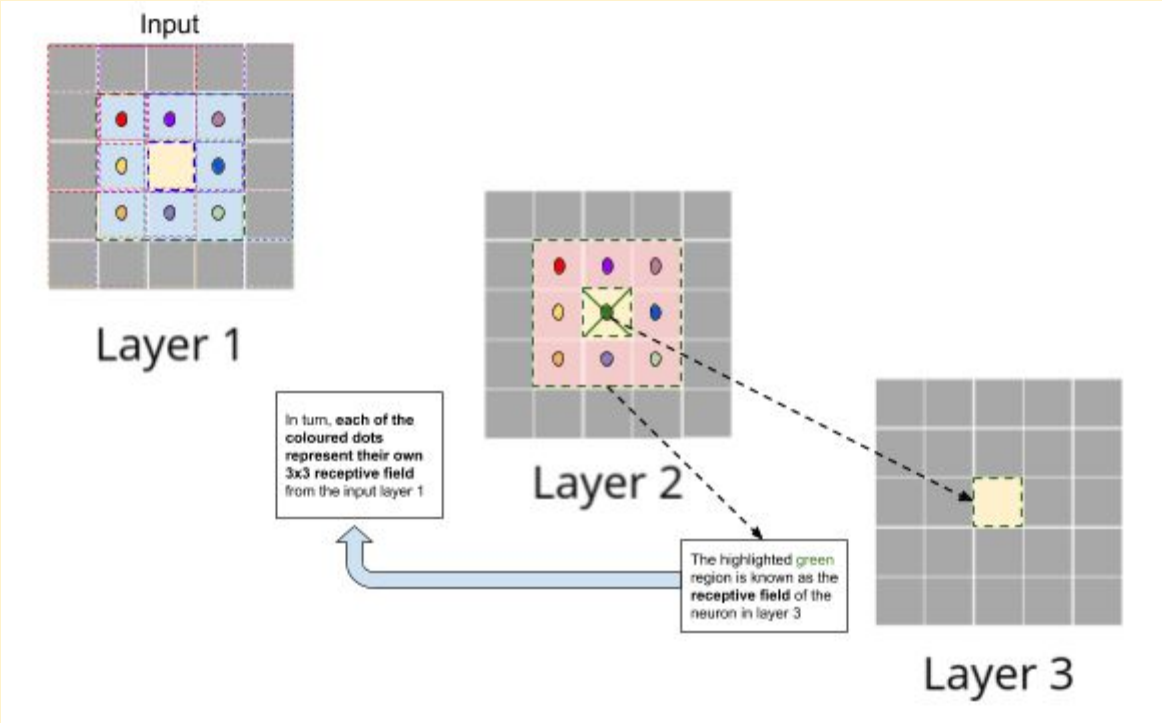
How does the receptive field increase across layers?

1. What does a filter learn? What kind of images cause certain neurons to fire? How good are the hidden representations?
2. To answer these questions, we need to talk about the receptive field.
3. Consider a 3 layered CNN, where in each of the layers, we apply a 3x3 filter

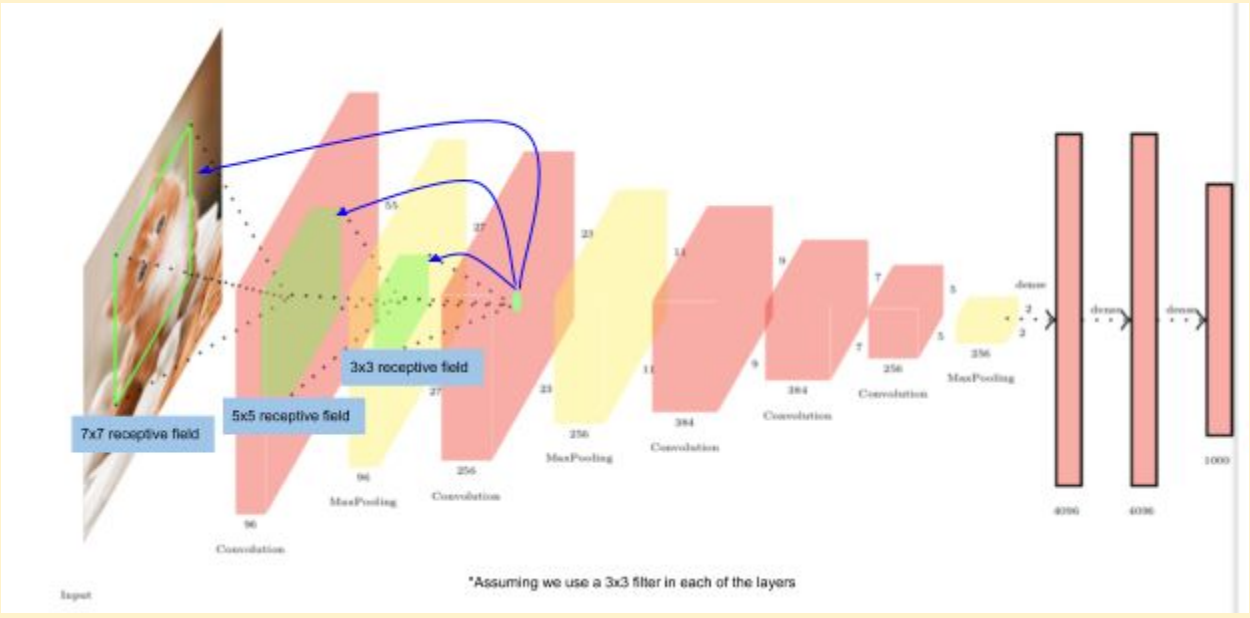


4. The **Receptive Field or Region of influence** of the neuron/pixel in a subsequent layer refers to all the neurons/pixels from the previous that were involved in the convolution operation to produce said output neuron/pixel.

5. Let's look at layer 3, and express the receptive field in terms of layer 1.



6. Thus, we can see that the 3x3 grid in the receptive field of the layer 3 pixel translates to a 5x5 grid receptive field in the input image.
7. We can see a sort of pattern, whereby if we have more layers, the receptive field becomes larger and larger in the input image.
8. If there was another Layer 4 with the same 3x3 filter, it would correspond to a 7x7 receptive field in the input layer.
9. The following diagram illustrates how the receptive field in the input layer is larger and larger as we move down the layers.



10. The increase in receptive field size through the layers increases with a larger filter size.