Important Terminology for CNNs

- **Convolution**: The process of applying an *image filter* to an input image to produce a new image.

- **Image Filter/Kernel**: A tensor consisting of numerical values. The values in a filter/kernel are multiplied by the values of the input image and summed to produce a single value. Interactive visualization: https://setosa.io/ev/image-kernels/

- **Max Pooling**: The process of taking the maximum value within a defined area of a tensor. The maximum value in each area contributes to a new image, as seen in Figure 1.

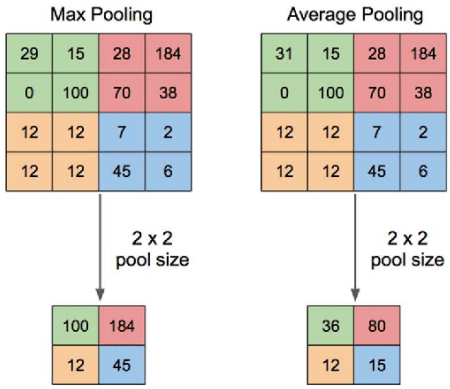

Figure 1: Max & average 2by2 pooling with stride = 2.

- **Activation Function**: A pre-set function f(X) that resides in a neuron, shown in Figure 2. X is the weighted sum of the incoming connections, as shown below [1]:

Equation 1:

$$X = \sum_{1}^{n} x_n w_n + b$$

x is the raw data input.
w is the weight of the connection.
b is the bias.
n is the number of connections.

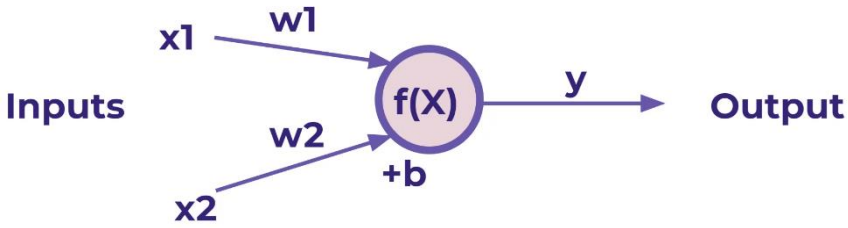

Figure 2: Visualization of activation function inputs and outputs

Some very common activation functions are seen below in Figure 3:

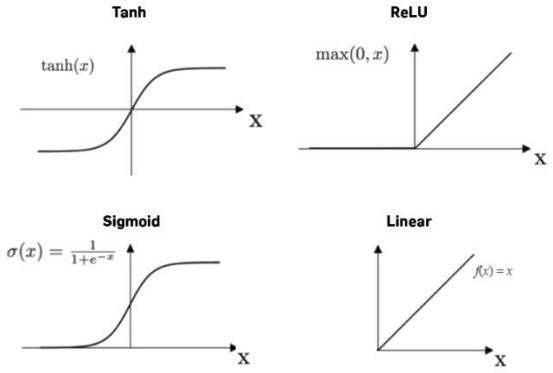

Figure 3: Commonly used activation functions [2]

Citations

[1] A. S. V, "Understanding Activation Functions in Neural Networks," *Medium*, 30-Mar-2017. [Online]. Available: https://medium.com/the-theory-of-everything/understanding-activation-functions-in-neural-networks-9491262884e0. [Accessed: 01-Feb-2021].

[2] "Activation Function," AI Wiki. [Online]. Available: https://docs.paperspace.com/machine-learning/wiki/activation-function. [Accessed: 01-Feb-2021].