CONVOLUTIONAL NEURAL NETWORKS

EXPLAINED

SWIPE →

What are CNNs?

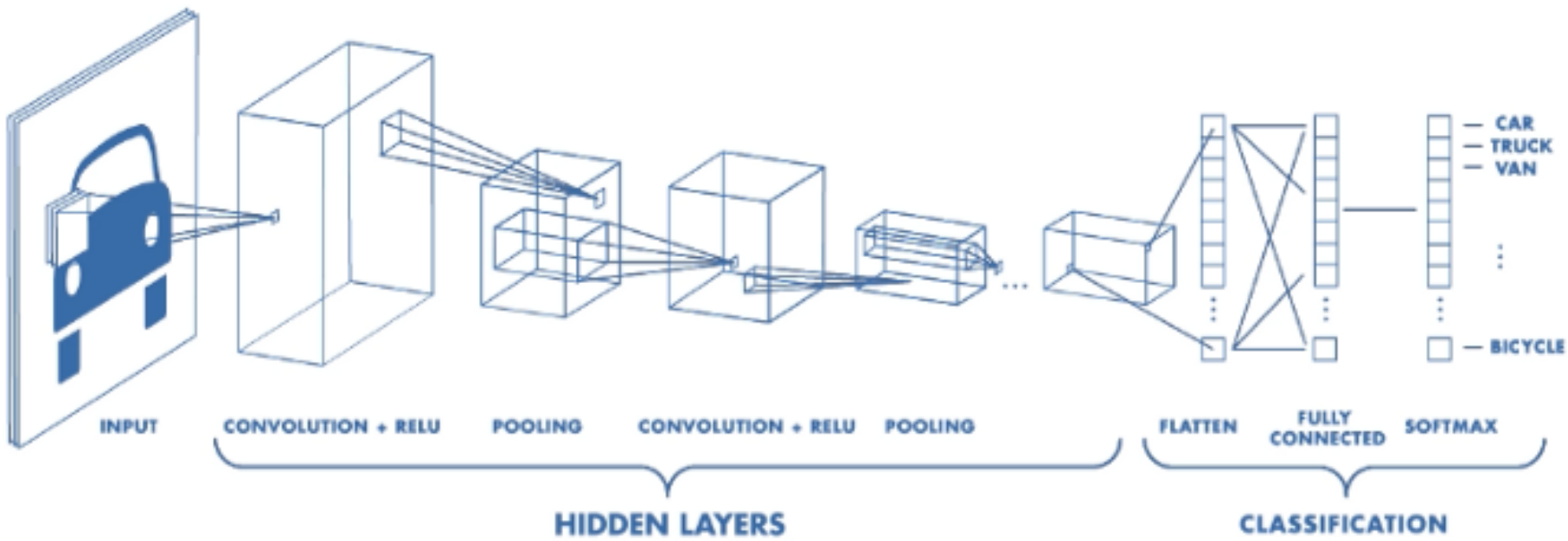
Class of neural networks that specializes in processing data that has a grid-like topology, such as an image

The layers are arranged in such a way so that they detect simpler patterns first (lines, curves, etc.) and more complex patterns (faces, objects, etc.) further along.

By using a CNN, one can enable sight to computers

CNN Architecture

Has three layers: a convolutional layer, a pooling layer, and a fully connected layer



Layer 1: Convolution Layer

The convolution layer is the core building block of the CNN. It carries the main portion of the network's computational load

If we have an input of size W x W x D and Dout number of kernels with a spatial size of F with stride S and amount of padding P, then the size of output volume can be determined by the following formula:

$$W_{out} = \frac{W - F + 2P}{S} + 1$$

Layer 2: Pooling Layer

The pooling layer replaces the output of the network at certain locations by deriving a summary statistic of the nearby outputs.

If we have an activation map of size W x W x D, a pooling kernel of spatial size F, and stride S, then the size of output volume can be determined by the following formula:

$$W_{out} = \frac{W - F}{S} + 1$$

Layer 3: Fully Connected Layer

Neurons in this layer have full connectivity with all neurons in the preceding and succeeding layer as seen in regular FCNN. This is why it can be computed as usual by a matrix multiplication followed by a bias effect.

Non-Linearity Layers:

- Sigmoid,
- Tanh,
- ReLU

Applications of CNN

Object detection models deployed in autonomous vehicles, facial detection, and more

Semantic segmentation

CNNs are used with recurrent neural networks to write captions for images and videos

Data-Driven Science

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