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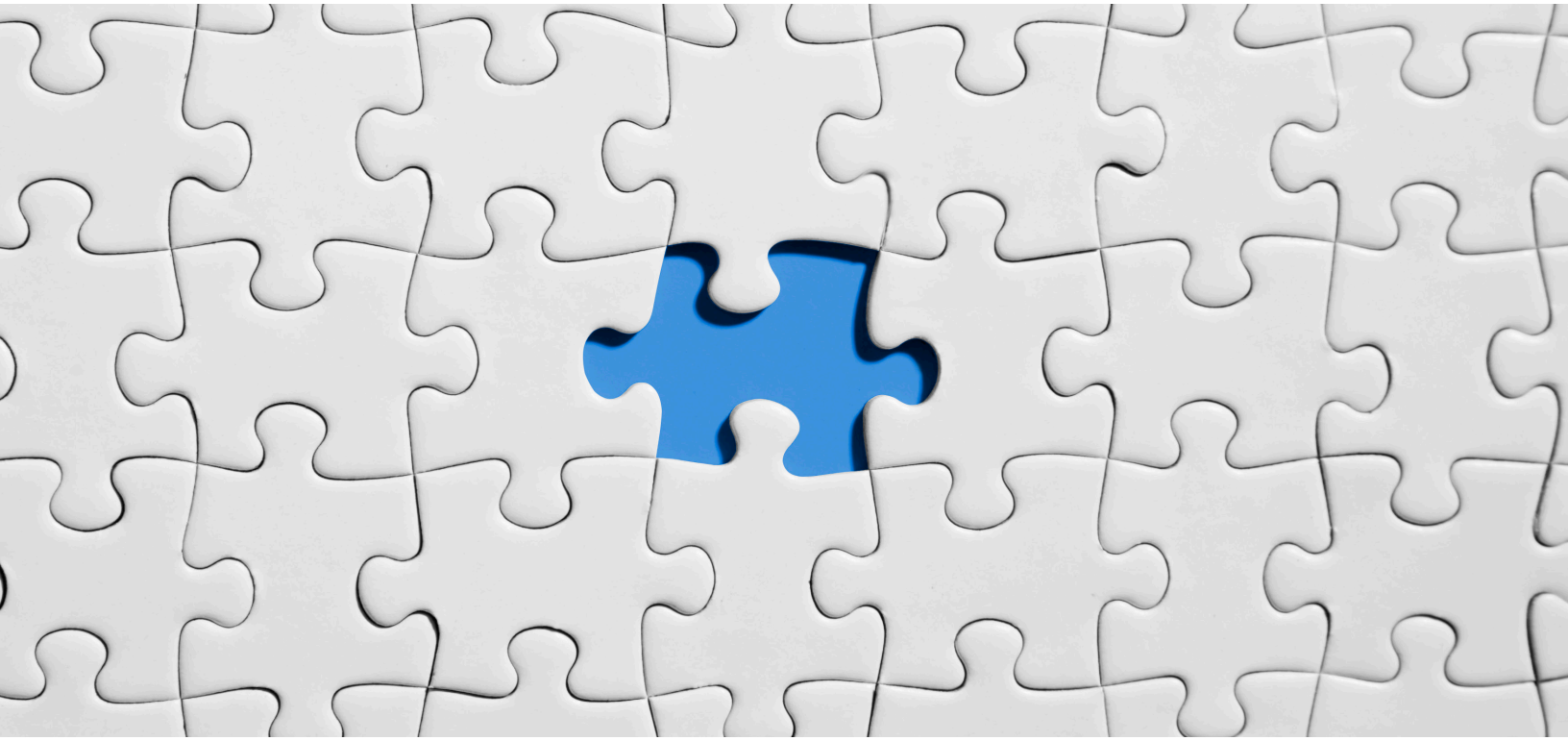
CONVOLUTIONAL NEURAL NETWORK



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Knowledge Sharing Article

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Preview

Convolutional neural network (CNN) is used to understand how Deep Learning identifies objects in a picture.

For example, take the image of a bird. The whole picture is split into three layers; an input layer which have the graphics, a hidden layer with all the points and breaks, and an output layer with the resolution.

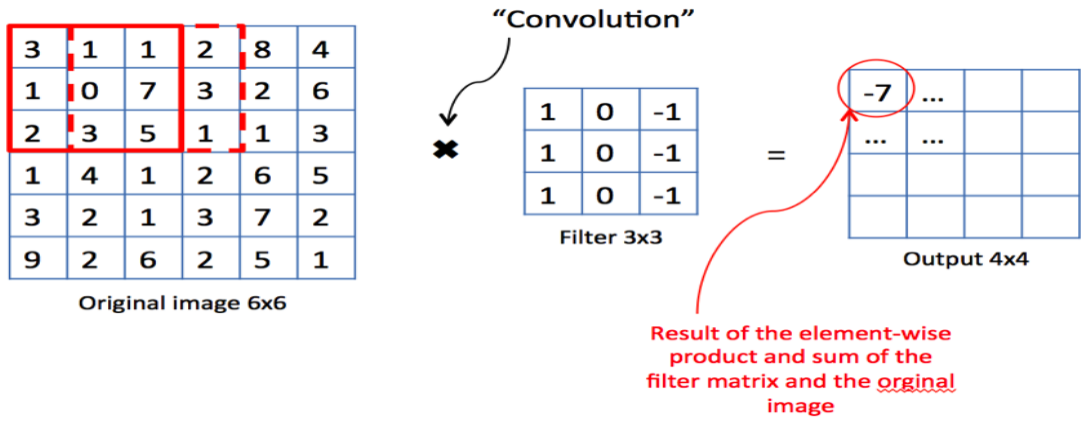
Input layer accepts the pixel of the image in the form of an Array. The entire image is formed as different blocks that are labeled.

Hidden layer carries out the feature extraction by performing certain calculations and manipulation. This is often the part which reorganizes the blocks into multiple ways and data is made to be straightforward for the neural network to read. It uses the matrix filter and performs the convolution operation to detect the patterns within the image. Convolution means to coil or to twist, Here we will coil or twist the information around and use them to make create the graphical image. There are multiple hidden layers – convolutional layer, RelU layer, Pooling Layer, etc. – that perform feature extraction from the image.

Finally, there is the output layer, a totally connected layer that identifies the thing in a picture. These layers help to pool all the blocks and make it a single, meaningful convolutional picture.

Yann LeCun, founder of Convolutional Neural Network, is a director of Facebook AI research group. He built a primary convolutional neural network – LeNet – in 1988 that was used for character recognition tasks like reading ZIP codes, digits which automated the process of sorting mail.

CNN is a feed-forward neural network that is generally used to analyse visual images by processing data with grid like topology and it is also referred to as “ConvNet”. The Convolutional operation is extremely identical in CNN which is not there in many of the Neural networks. In CNN every single image is represented within the sort of arrays of pixel values. If we consider a true image, we have one block which is later divided into multiple blocks and represented within the sort of array and blocks are filled by numbers 0s and 1s where zero is the empty block and 1 is the filled block.



Layers in Convolutional Neural Network

- Convolutional Layer
- ReLU Layer
- Fully Connected Layer
- Pooling Layer

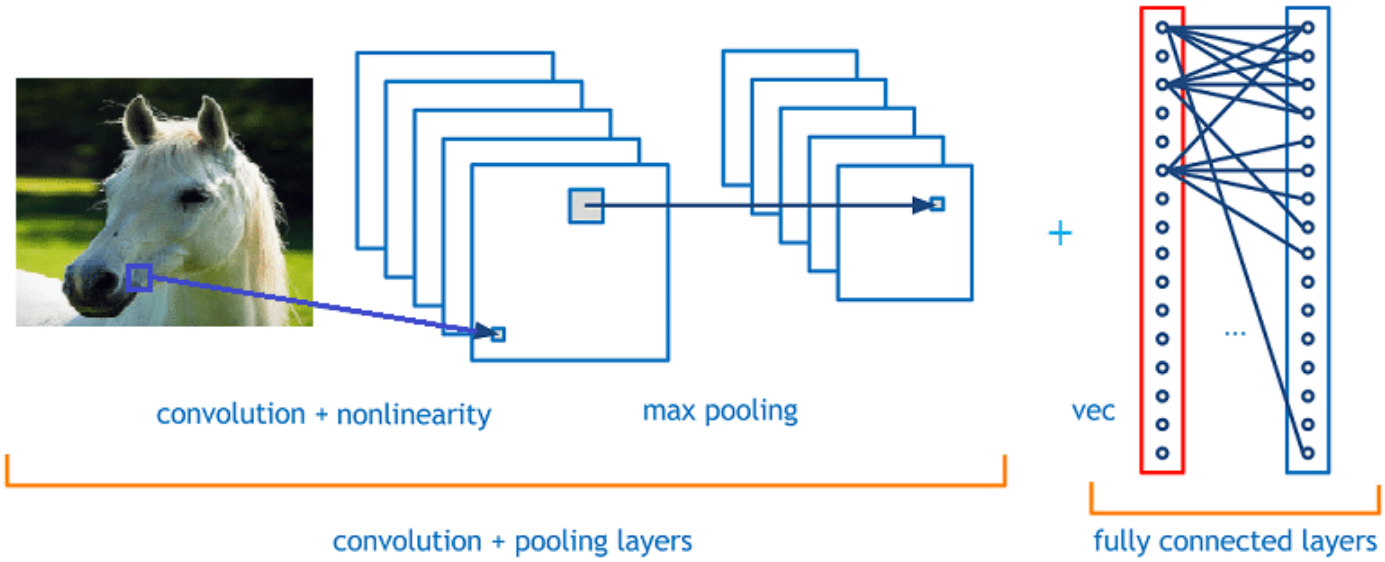
Convolutional Layer, this is often a ventral aspect of processing the image in convolutional neural network. Convolution Layer has several filters that performs convolutional operation. Every image is accounted as a matrix or a pixel value.

Once the Feature maps are extracted, subsequent step is to maneuver them to the ReLU layer. First it performs the element level operation. So each of those maps coming in with the negative pixels are then made it to Zero. This reduces the non-linearity. This feature features a value for negative and positive. The output takes of these filtered features and we end up with the rectifies future map with a true image. The true image is scanned in multiple convolutions and ReLU layers for locating featured.

The Rectified feature map now taken to pooling layer, Pooling is a Down sampling operation that reduces the Dimensionality of the feature map. Here we require the large amount of data to seek out one answer but pooling them all. We will roll in the hay using 2 x 2 features (preferably 4 x 4 and 16 x 16), Then these are made into Matrix and then the mixture and manipulations of the blocks are made to ascertain the featured image. If we are considering the image of a bird, Pooling layer will help us to spot the various part of the pictures like edges, corners, feathers, eyes, beak etc.

Now rather than multiple layers, we have multiple pooling that are going to be running. The images have different dimensions, so of the strange data setups will have 4,5,6 or more dimensions. Now here we are considering 2 dimensions as an example. Now our goal is to convert all the multi-dimensional array into the only array or the vector

Here in pooling Layer we have a feature called Flattering, which helps us in converting all the resultant 2 dimensional arrays from pooled feature map into one long continuous vector. The flattened Matrix from the pooling layer is fed as input to the fully connected layer to classify the image.

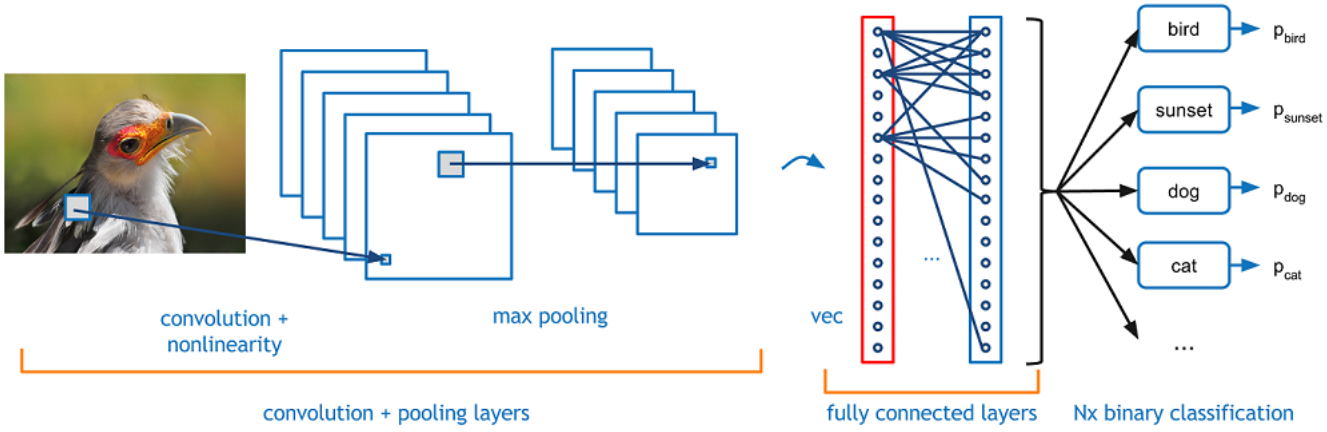


Use Cases of CNN

Convolutional Neural network is a type of neural network which is usually utilized in image processing problems. Since they are useful for these fast growing areas they are kind of really important for the deep learning and AI today.

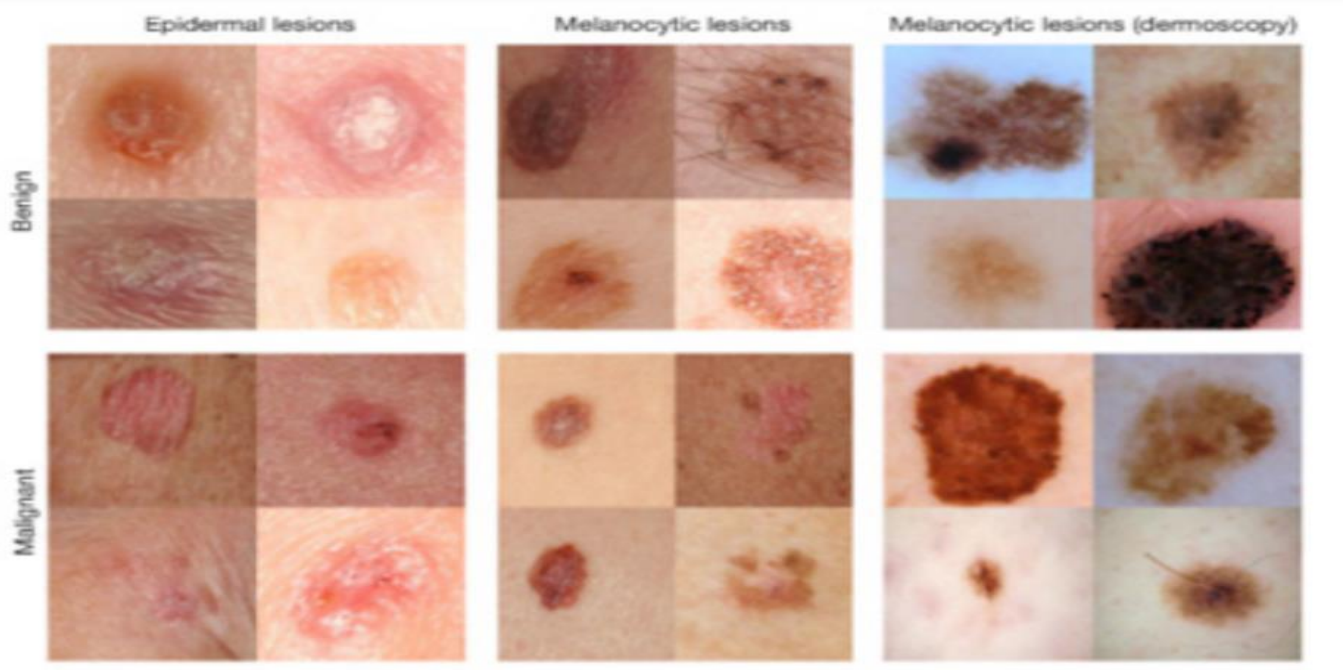
Image Processing

CIFAR-10 data set which is from Canadian institute for advanced Research for classifying images across 10 categories. They are Airplane, Bird, Deer, Frog, Ship, truck, Horse, Dog, Cat, Automobile. Image recognition is completed using the various programming patches and special effects.



Skin Cancer

CNN also has a part in detecting carcinoma. An automatic system which will classify lesions and potential cancer cells could play a task within the diagnostic process and will potentially improve the speed of detection. Such a system was recently devel-oped by researchers at Stanford University. The scientists trained one deep convolutional neural



network (CNN) employing a dataset consisting of 129,450 clinical images, including 2,032 different diseases. Their system was tested against 21 dermatologists on biopsy images of two classifi-cations: keratinocyte carcinomas (the commonest sort of skin cancer) versus benign seborrheic and malignant melanomas (the deadliest skin cancer) versus benign nevi. The developed CNN system demonstrated equal performances compared to the experts in both disciplines. The CNN system, when combined with mobile electric devices with cameras, has the potential to be an important diagnostic tool within the hands of many people, leading to greater diagnostic coverage and earlier detection of potential skin carcinoma cells.

Other than image processing and detection of skin cancer, CNN also has numerous applications. Some of them are in Machine learning, Artificial neural, Breast cancer detection, Skin Lesion, Medical imaging, Melanoma, Radiology, Computer Vision, Dermatology.

References

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