CNN

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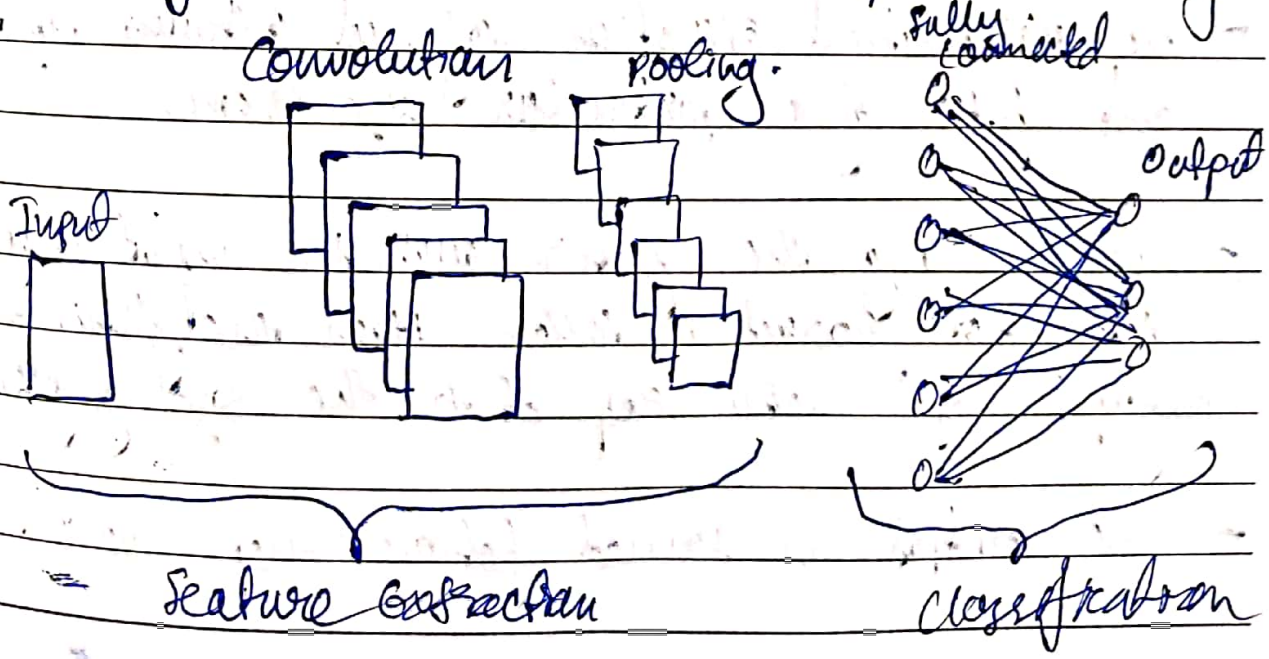
- It is a class of Deep Neural Networks that recognize and classify particular features from images and are widely used for analyzing visual images.

Architecture.

2 Main Parts to a CNN Architecture.

1) Feature Extraction - A convolutional tool that separates and identifies various features of image for analysis.

2) A fully connected layer that utilizes the output from the convolution process and predict the class of the image based on the features extracted in previous stages.



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Convolution Layers :

Mainly 3 layers that make up the CNN.

1) Convolutional layer
2) Pooling layers.
3) Fully connected layer.

these 3 layers stacked the CNN architecture is formed.

Along with these 3 there are 2 important parameters.

1) Dropout layer
2) Activation function :

1) Convolutional Layer -

- It is first layer used to extract various features from the input images.
- the Mathematical operation performed between input layer and filter of a particular size MxM.
- By sliding the filter over the input image, the dot product is taken btwn the filter and the parts of input image with respect to the size of filter (MxM).
- the output is termed feature map which

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gives info about image such as the corners and edges.

2) Pooling Layer:

- This layer decrease the size of the convolved feature map to reduce the computational cost.

- It is performed by decreasing the connection btwn layers and independently operates on each feature map, depending on the method used.

Max Pooling: Largest element is taken from feature map

Average: Calculated the avg of the elements in predefined size image section.

Sum pooling: The total sum of the element in the predefined section is computed in it.

3) Fully Connected Layer

- It consist of the weight and biases along with neurons.
- Used to connect the neurons between 2 different layers.

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- These layers are usually placed before the output layer and form last few layers of CNN architecture.

- The input image from previous layers are flattened and fed to FC layer.

- The flattened vector undergoes few more FC layers where the mathematical functions operations usually take place.

- In this stage classification process begins to take place.

4) Dropout :

- When features are connected in FC layer it can cause overfitting in training dataset.

- Dropout layer helps where in a few neurons are dropped from the neural network during training process which results in reduced size of the model.

- On passing 0.3, 30% of the nodes are dropped out randomly from the neural network.

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5) Activation functions :-

- Used to learn and approximate any kind of continuous and complex relationship between variables of the network.

- It decides which info of the model should fire in the forward direction and which ones should not at the end of the network.

VGG Net Architecture

- Visual Geometry Group, is a standard deep CNN architecture with multiple layers. ~~Three~~ deep

- The "deep" refers to the no. of layers.
  eg: VGG-16 or VGG-19.
  consisting of 16 or 19 convolutional layers

- Developed to increase the depth of such CNN to increase the model performance.

- The architecture is on the basis of ground-breaking object recognition models.

- Also surpasses baselines of many tasks and datasets beyond ImageNet.

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- Most popular image recognition architecture.

VGG16 :-

- This model supports 16 layers.
- Its has top-5 accuracy in ImageNet over 92.7%.
- It replaces the large kernel-sized filters with several 3x3 kernel sized filters one after another, it makes significant improvement over AlexNet.
- It could support 16 layers and can classify images into 1000 object categories, includes keyboard animals, pencil, mouse etc
- The model has input size of 224-by-224.

VGG16 Architecture :-

- It is an extensive network and has a total of around 138 million parameters.
- Its simplicity is what makes the network more appealing.
- Few convolution layer and pooling layer

VGG is very deep convolutional network

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reduces the height and the width.

- Around 64 filters are available that can be double to about 128 and then 256 filters. In last layer, we use 512 filters.

Embedding layer.

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- It represent words in an array, not in form of 0 or 1 but continuous vectors.
- can represent any word in few dimension, mostly based on the number of unique words in our dataset.

steps to convert raw data to embedding.

* Load text data in array.
* Process the data
* Tokenize and Pad convert text to sequence and using the tokenizer and pad them with keras preprocessing and pad sequence method.
* Initialize a model with Embedding layer of dimensions (max_words, representation_dimension, input_size))
  - max_words : It is the no. of unique words in your data.
  - representation_dimension : It is the no. of dimensions in which you want to represent.
  - input_size - size of your padded sequence (maxlen).