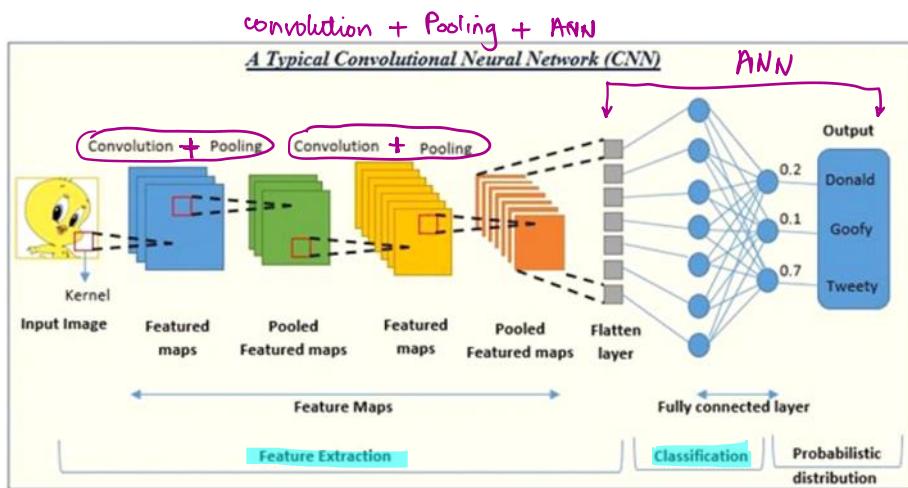
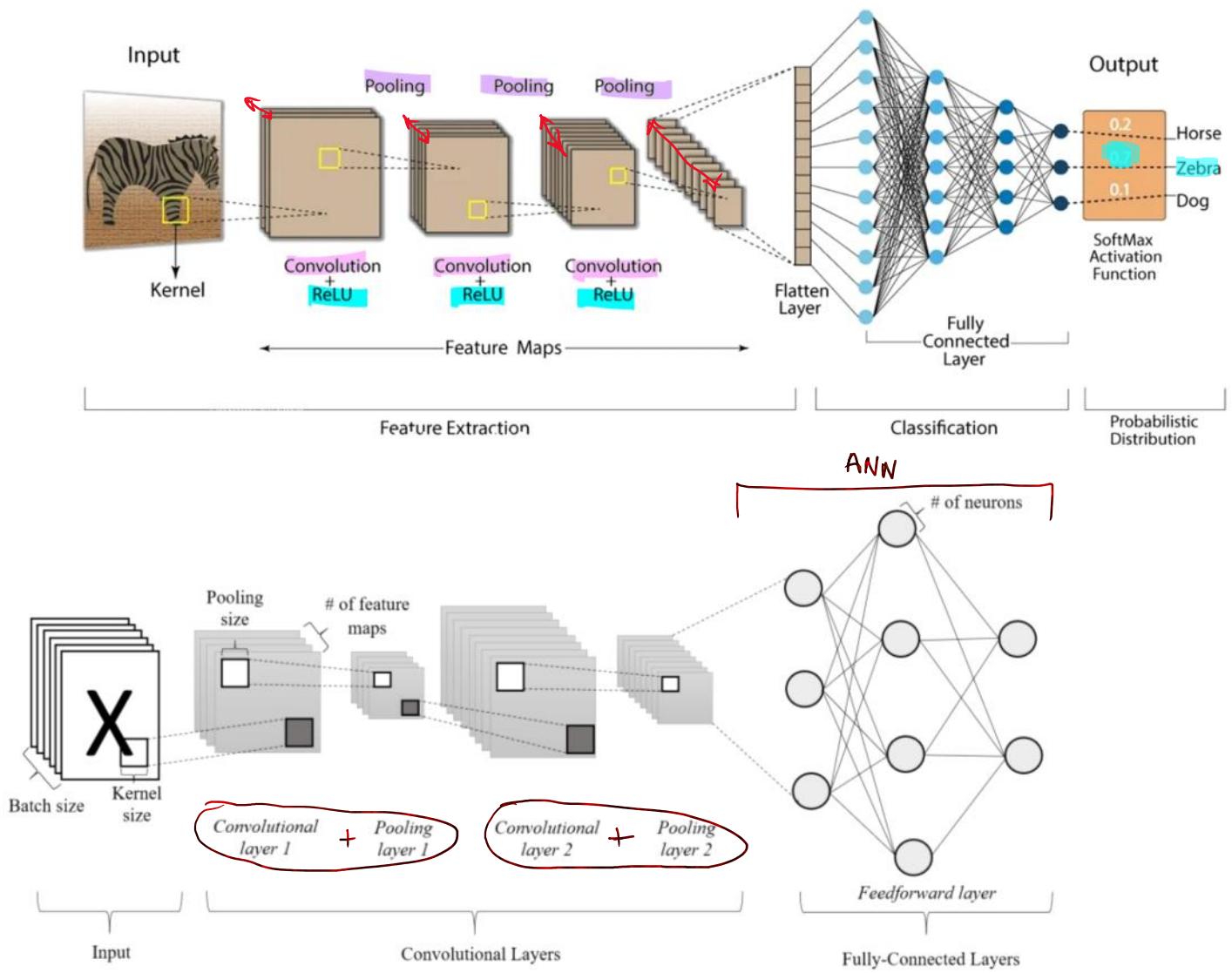


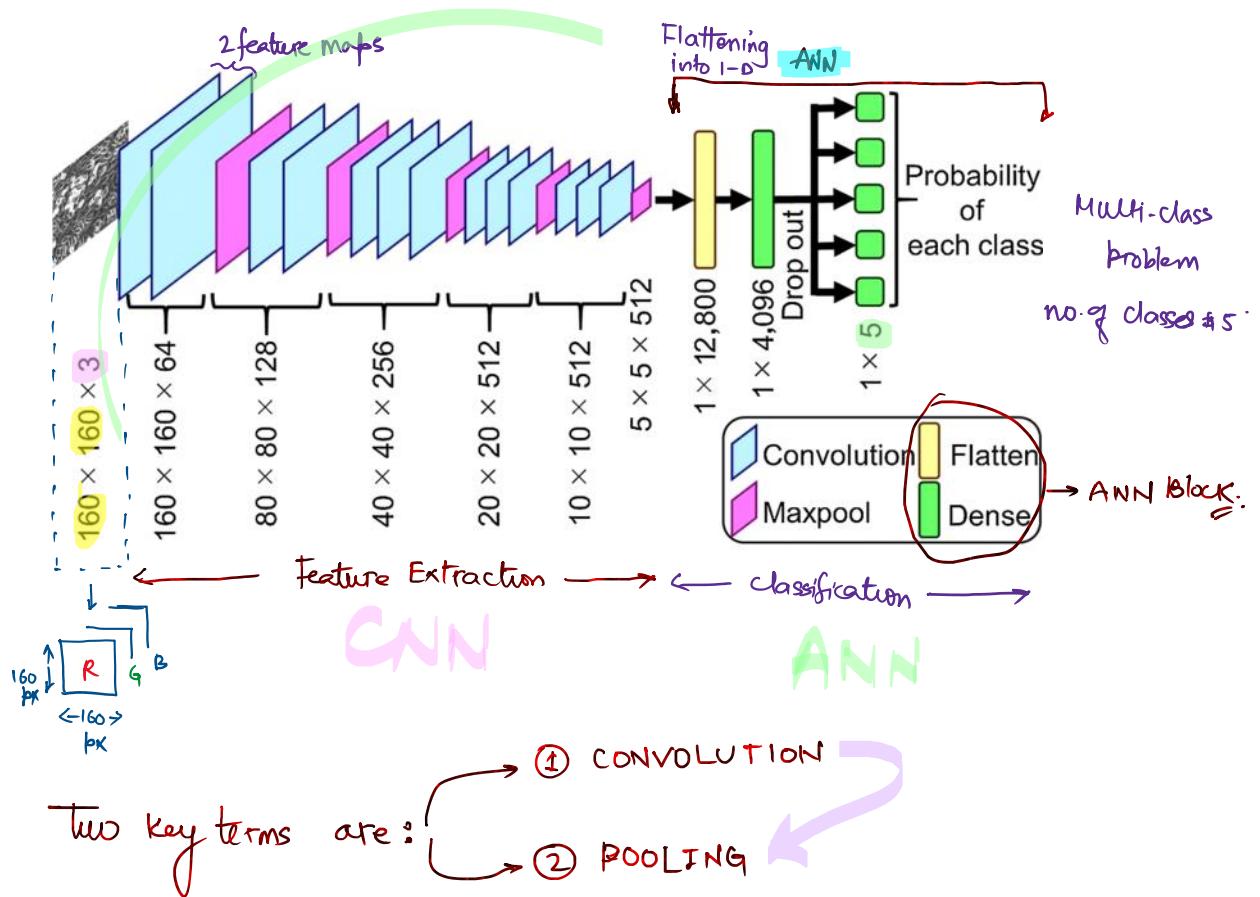
## CNN Model Architecture

09 November 2025 11:31



## Convolution Neural Network (CNN)





### 1. INPUT LAYER

Input layer of a CNN model receives the raw image data in the form of multi-dimensional array called TENSORS

For grayscale image

MNIST Use-case

Input Tensor

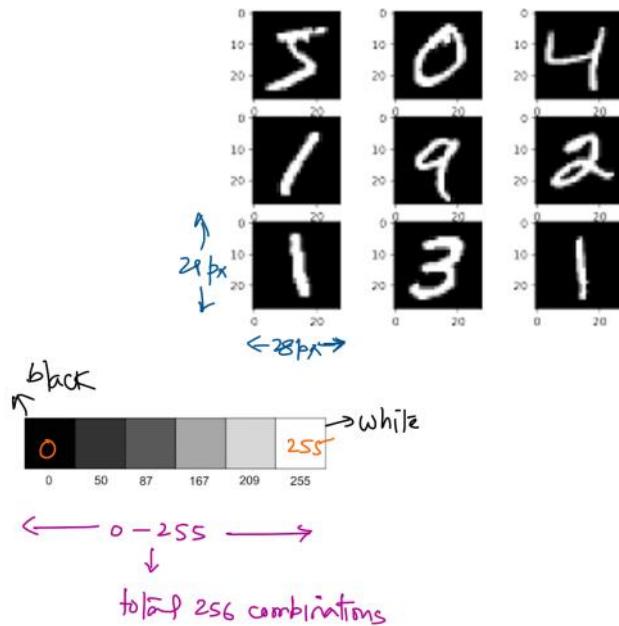
For each image:  $(H \times W \times 1)$

H: Height of the image (no. of pixels vertically)

W: Width of the image (—, — horizontally)

1: single color channel: grayscale

a grayscale image has no color but only intensity information



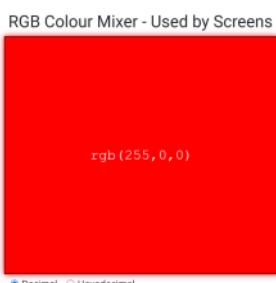
For color images: RGB

Input Tensor: ( $H \times W \times 3$ )

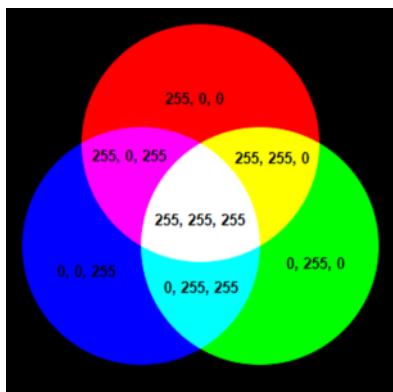
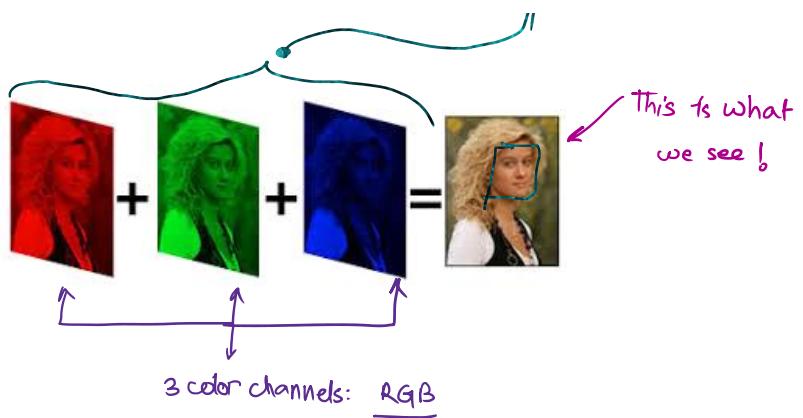
↳ represents three color channels

Red  
Green  
Blue

<https://www.csfieldguide.org.nz/en/interactives/rgb-mixer/>



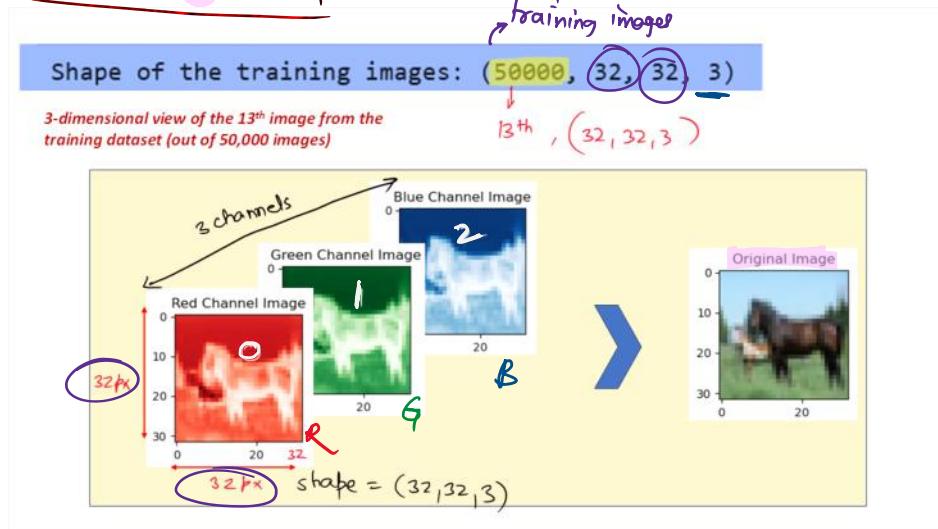
This is what



Note: CNNs are naturally designed to work with multi-channel inputs

[batch size, 3, height, width]  $\rightarrow$  4-dimensional array  
 ↓      ↓  
 (50,000) no. of channels  
 images  
 in training set.

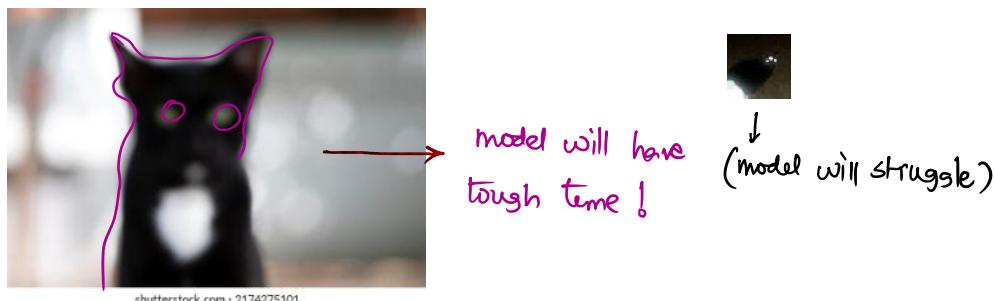
CIFAR - 10 dataset  $\rightarrow$  10 classes  $\rightarrow$  <https://www.cs.toronto.edu/~kriz/cifar.html>



	Grayscale	RGB	(In CNN model)
① MNIST Handwritten Digits Recognition	✓	✗	shapes/patterns matter not color.
② Medical Imaging (X-rays, CT scan)	✓	✗	shapes/patterns matter <u>Intensity is enough.</u>
③ Need extra information/ compare colors	✗	✓	Stop sign → Red  Pass/Go → Green 

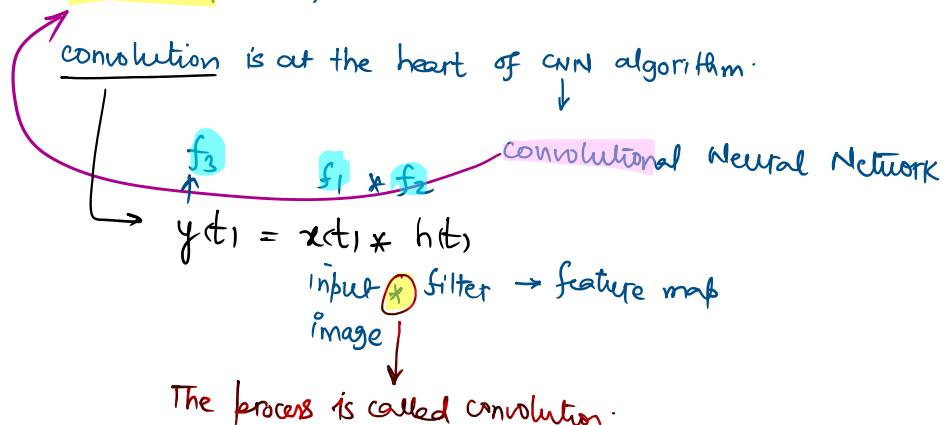
Conclusion: Build the baseline model using 'grayscale' and switch over to RGB if needed.

<https://imagecolorpicker.com/>

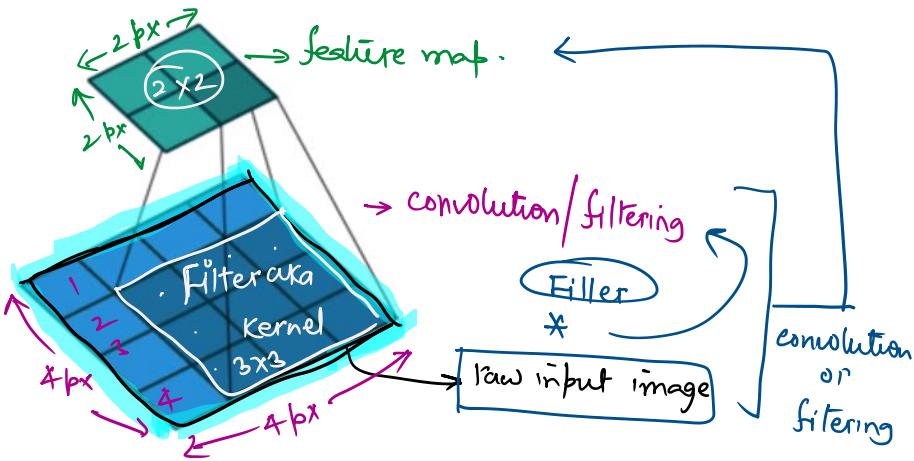


Yes, blurring does hurt CNN models.

## 2. CONVOLUTION (FILTERING) LAYER



Convolution is a mathematical operation - that blends two functions to produce a third function expressing how one modifies or shapes the other.



[https://maucher.home.hdm-stuttgart.de/Pics/gif/no\\_padding\\_no\\_strides.gif](https://maucher.home.hdm-stuttgart.de/Pics/gif/no_padding_no_strides.gif)

[https://adamharley.com/nv\\_vis/cnn/2d.html](https://adamharley.com/nv_vis/cnn/2d.html)

