Convolutional neural networks (CNN)
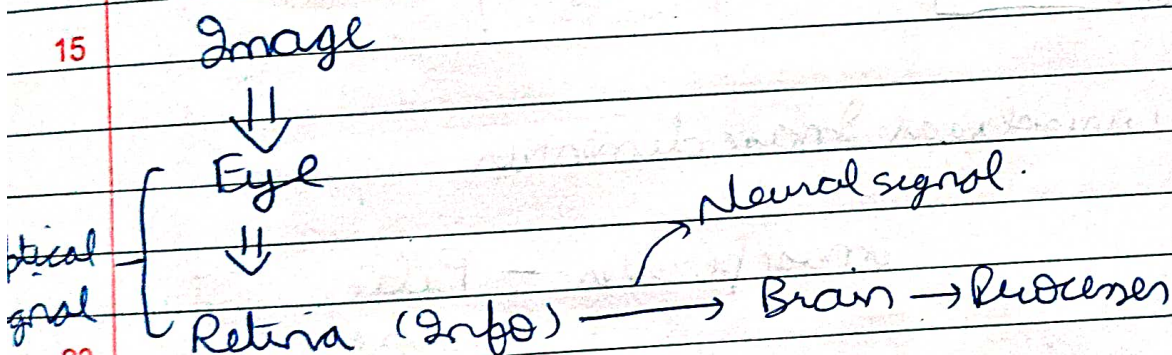
Grid → matrix
→ relative position of pixels is very important to so to work on such data, CNN is used

ANN (Multi layer Perceptron) → Brain

Biological model of CNN

Image
⇓
Eye
⇓
Retina (Info) ⟶ Brain → Processes

Neural signal

Optical signal

Why CNN?

* Image → High data dimensionality
* Highly selective → so doesn't need unimportant features.
   ↳ use only specific required

Convolution & filtering

Image → filtered → convolved feature

(eg - sharpen, outline, blur)

filters

Stride → Moving of filter

filter

① Convolved Image dimension

$$= \text{Image pixels} - \text{Filter} + \text{Stride}$$
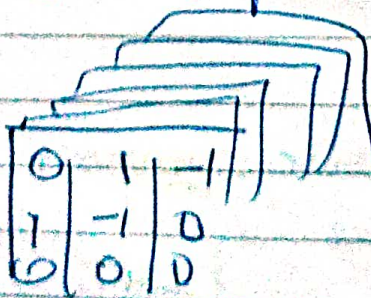$$\text{Size}$$

$-4 + 2$

we can apply many filters

| 3 | * | 0 1 -1
 1 -1 0
 0 0 0 | = | 3 |

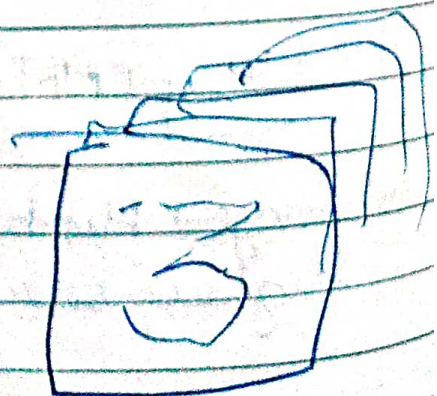Image
(28×28)

32 filters

(26×26×32)

Now pooling is done to select
best feature out of these 32

Pooling

→ Max pooling
→ Mean pooling

eg Convolved features pooling ———→ Pooled feature
    26 × 26 × 32   13 × 13 × 32
                                            └─→
                                        best
                                        features

This convolution → pooling
                    ↰

keeps on repeating
till you have very
discrete features

Final model

Image ——→ CNN ——→ ANN
          (Feature   (fully
          Extraction) neural
                       network

Forward & backward prop occurs till
probability of output becomes max

Face recognition

① Dataset creation → ② Model Training

Dataset

↓

100 images → 10 folders

1000 images

Training
80%.
(800 images)
(80 images from each folder)

Testing
20%.
(200 images)
(20 images from each folder)

↓

Model Training
(unique features)