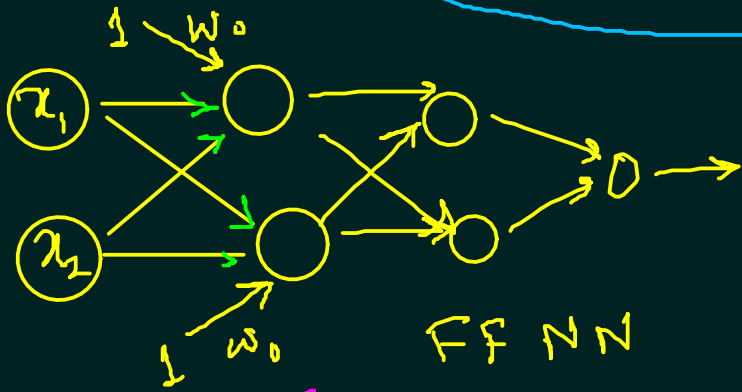


Deep Learning

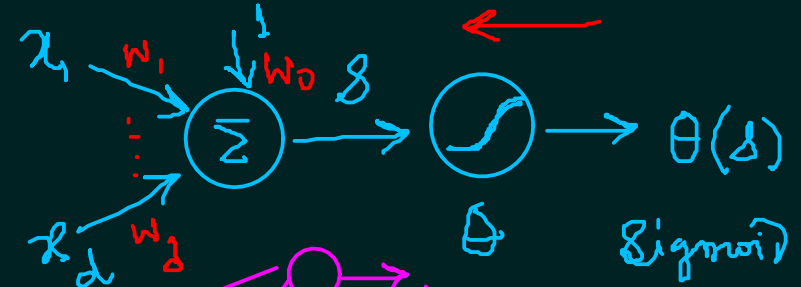
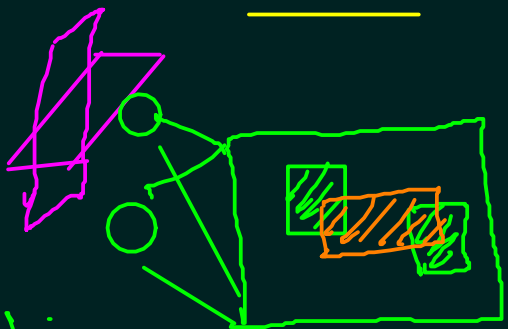
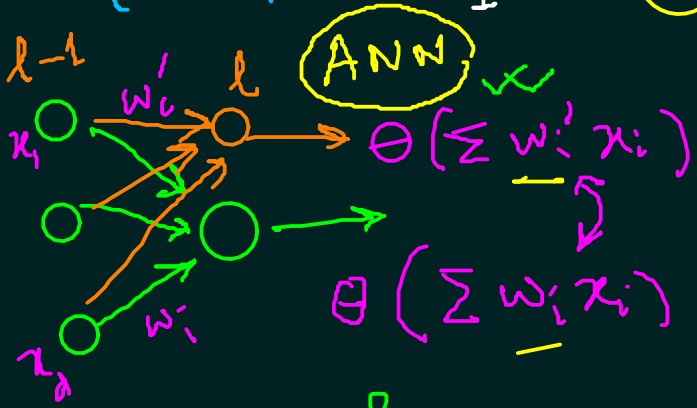
machine can emulate human

machine can learn

machine can think

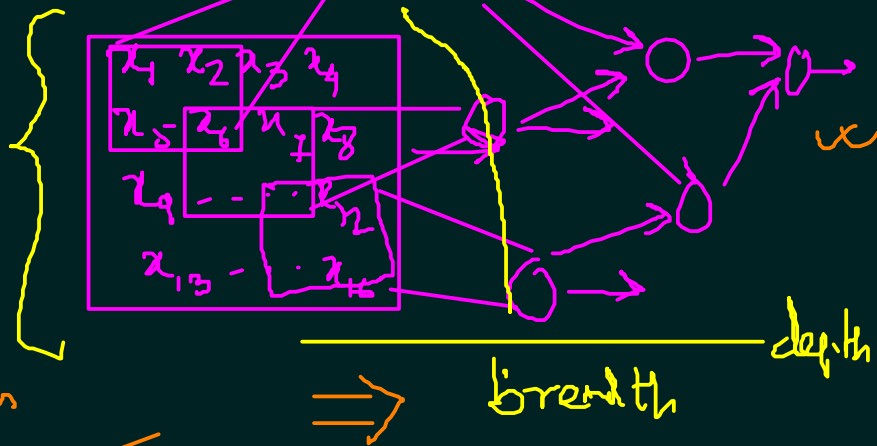


landscape
AND \rightarrow XOR
(higher depth in NN)



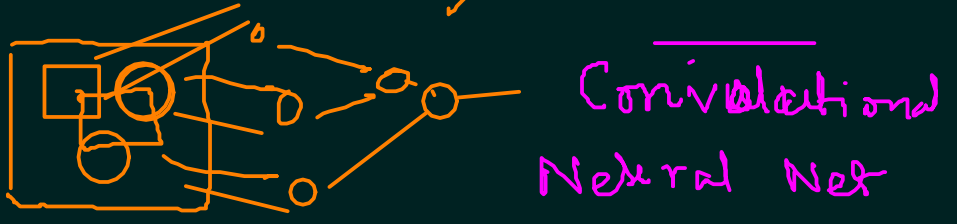
feature extraction

- \rightarrow hierarchical
- ① edges \rightarrow ② boundaries of sep.
- ③ object \rightarrow ④ Association

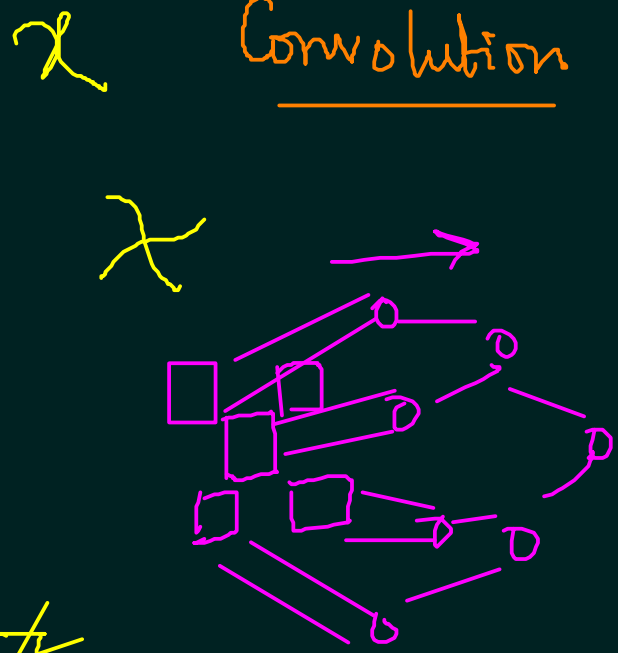
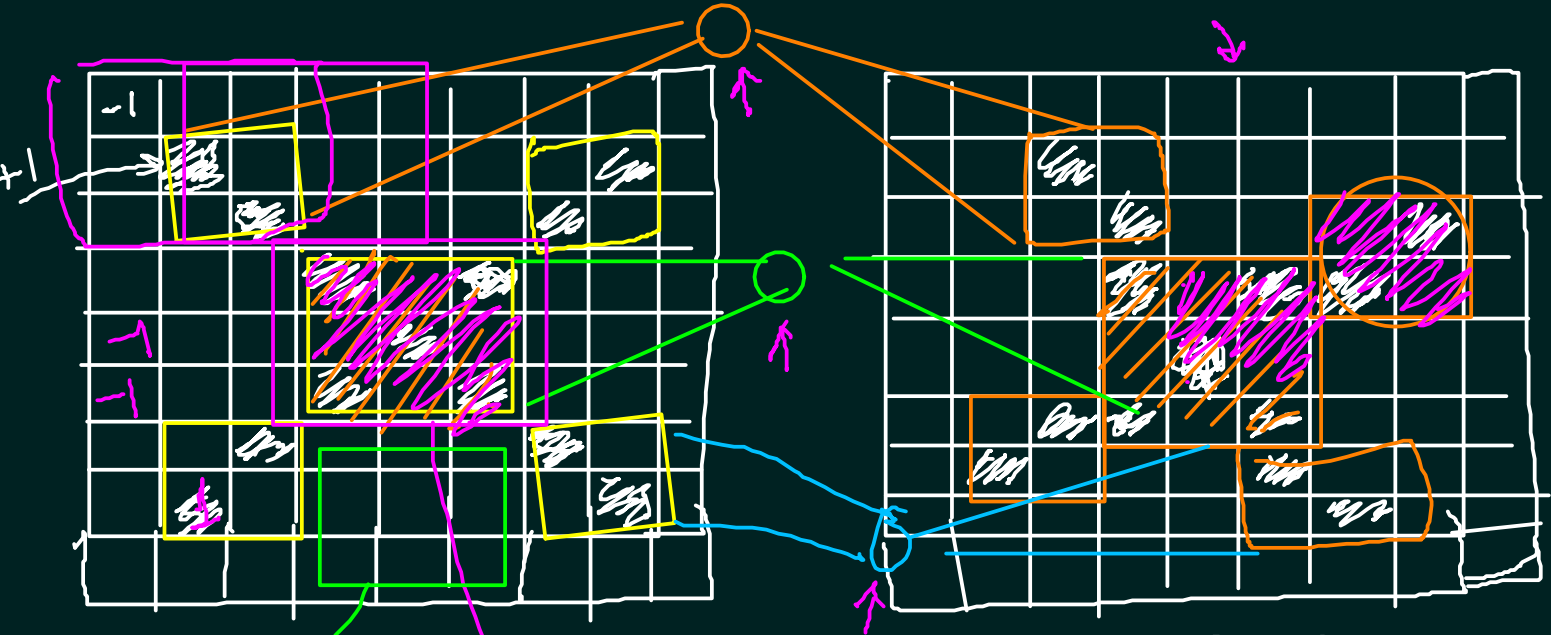


(a) orientations
(b) occlusion

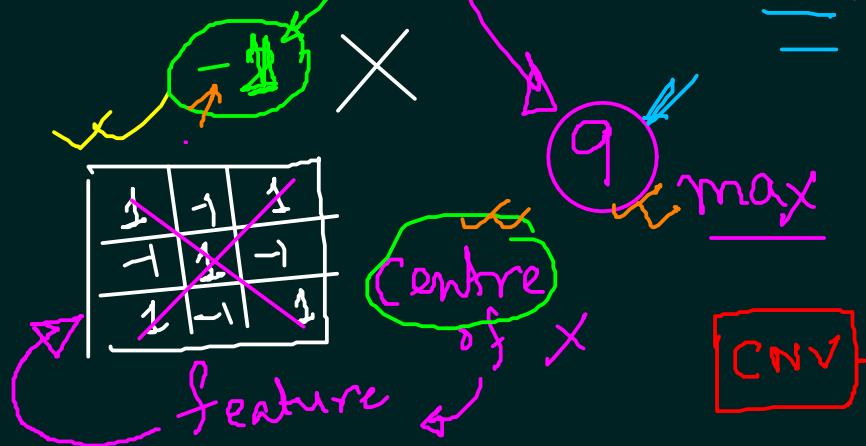
(c) bright ness
(d) shades



Convolution

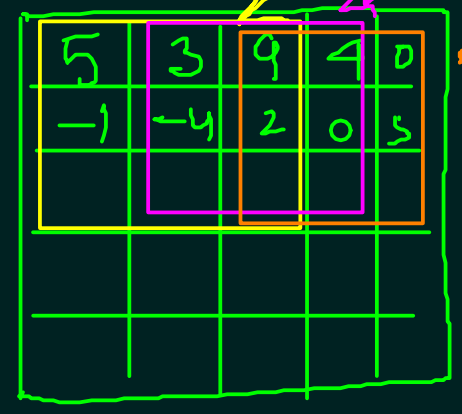


① Convolution

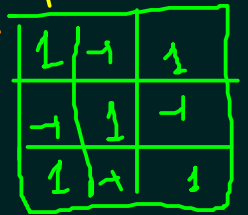


CNV → RELU

Feat

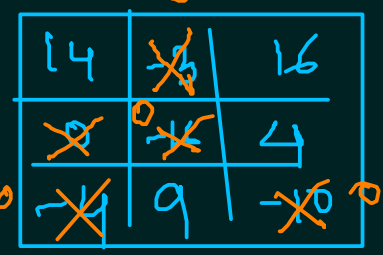


\otimes



Kernel

$\max(0, val)$



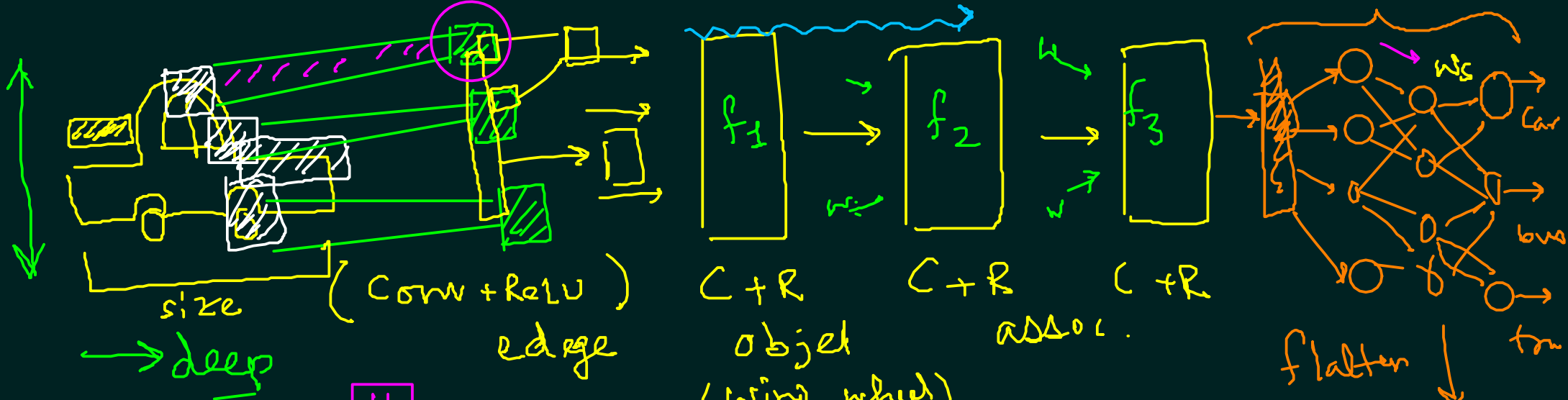
Input image

Extract Feature

② ReLU

features prominent





How can we select kernel?

Pooling

- (max-pooling)
- (avg-pooling)

Images to train ✓

Kernel → Smooth → Detect edges
 → Sharpen

High amount of TEs.

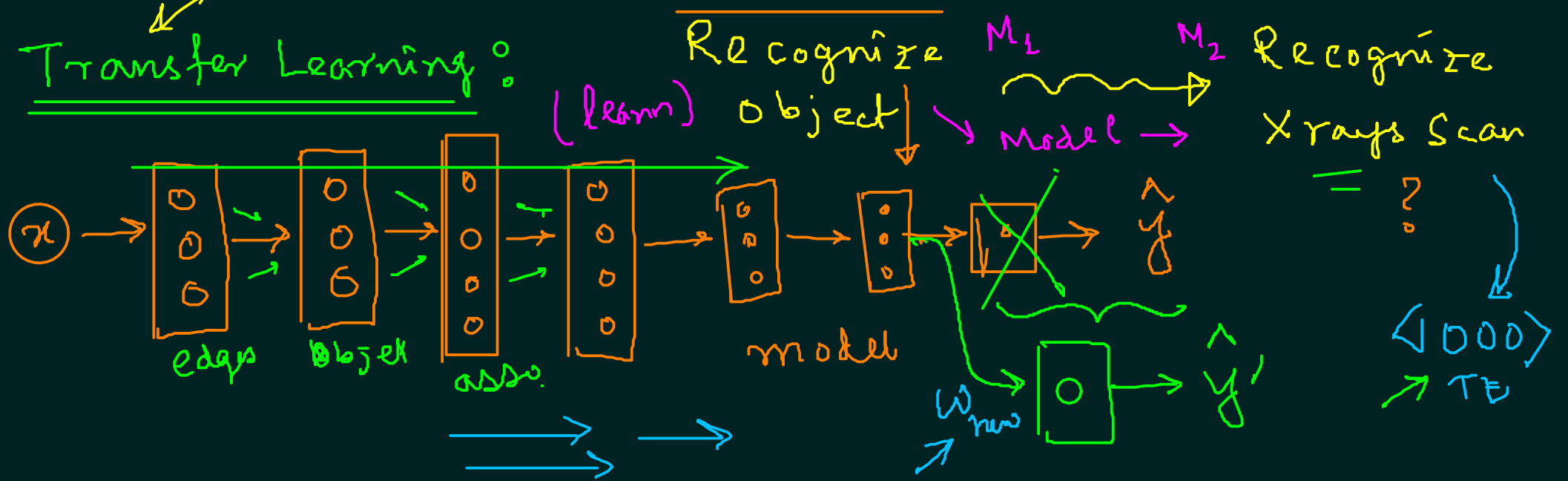
Training time ↑

Appl: Breast Cancer Detection ✓

$\frac{0}{x} \mu \rightarrow > 0.5 \checkmark$

→ IMAGENET → CNN → ✓

Transfer Learning:



* TEs (M_1) → huge \oplus TEs (M_2) → less
 $\sim 10^9$ $\sim 10^3$

