

AGENDA →

Starting at 15:12 hrs

1) Computer Vision Basics

2) Understanding Images / Video data (Theory)

3) Understanding Images / Video data (Practical)

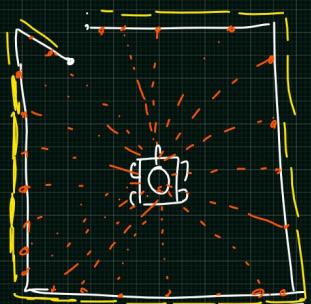
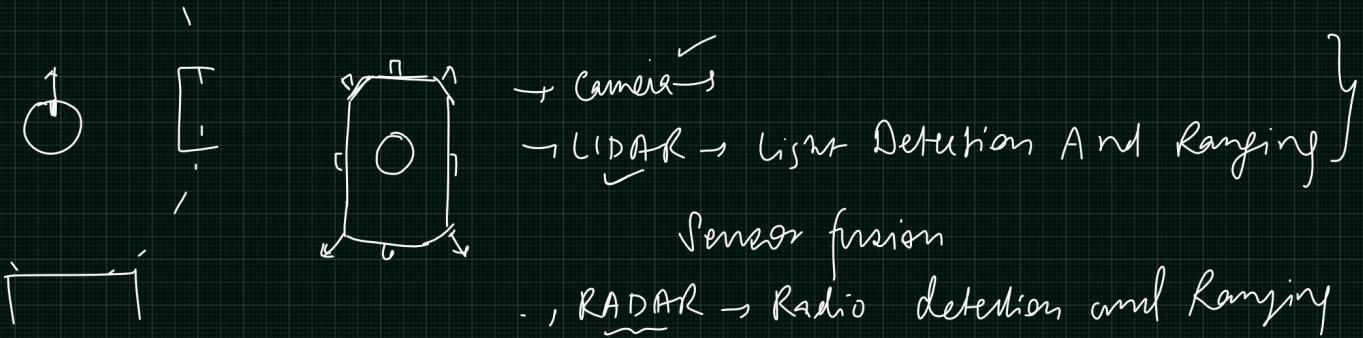
4) Filters and their use case (Theory / Practical)

5) CNN (theory / Practical)

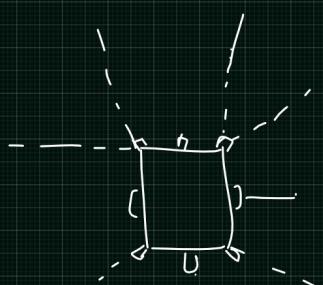
i) Computer Vision

Enables machine or computer to have a vision system close to human.

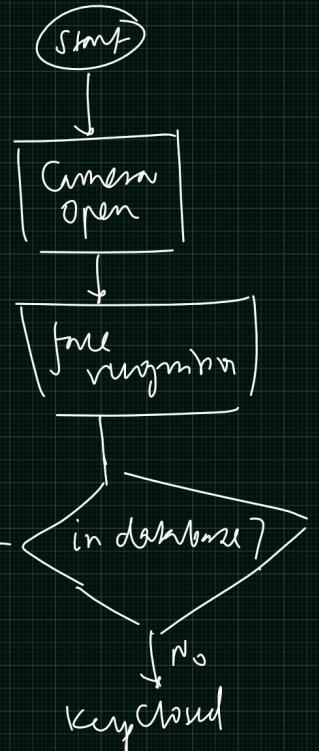
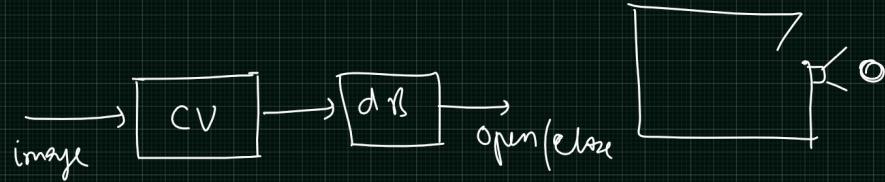
Object classification, detection, segmentation
tracking, recognition



V-SLAM Visual Simultaneous Localization & Mapping



Done



Classification



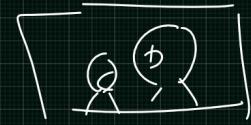
class 90%



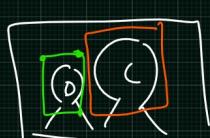
cut 95%



car 70%
dog 30%



Detection (Regression, Classification)



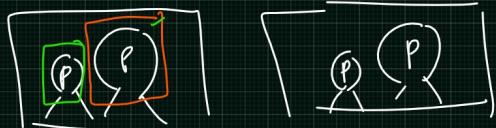
2 objects
1st car → 90% ✓
2nd dog → 93% ✓

Segmentation



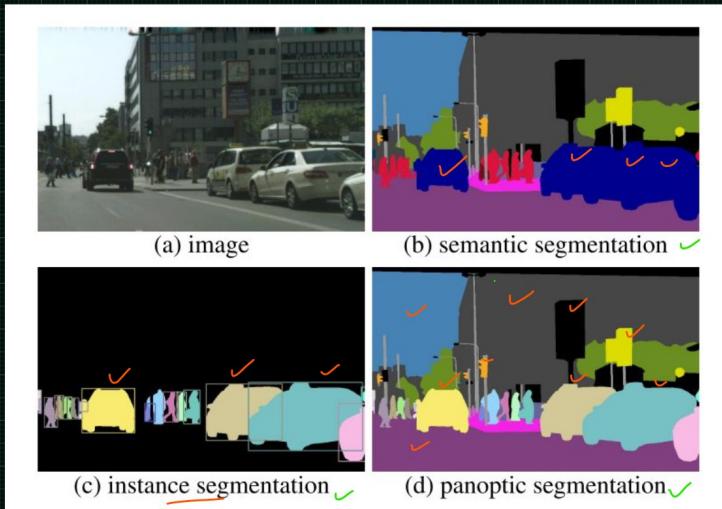
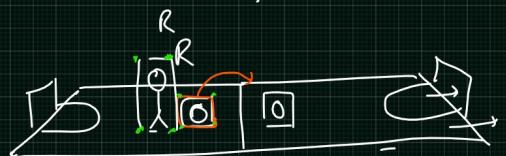
pixel wise classification.

Recognition



$P_1 \rightarrow$ Sarah -
 $P_2 \rightarrow$ Ann -

Training



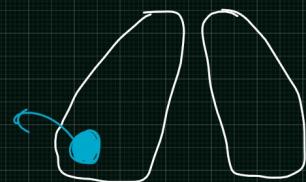
Semantic
+
instance

= panoptic segmentation

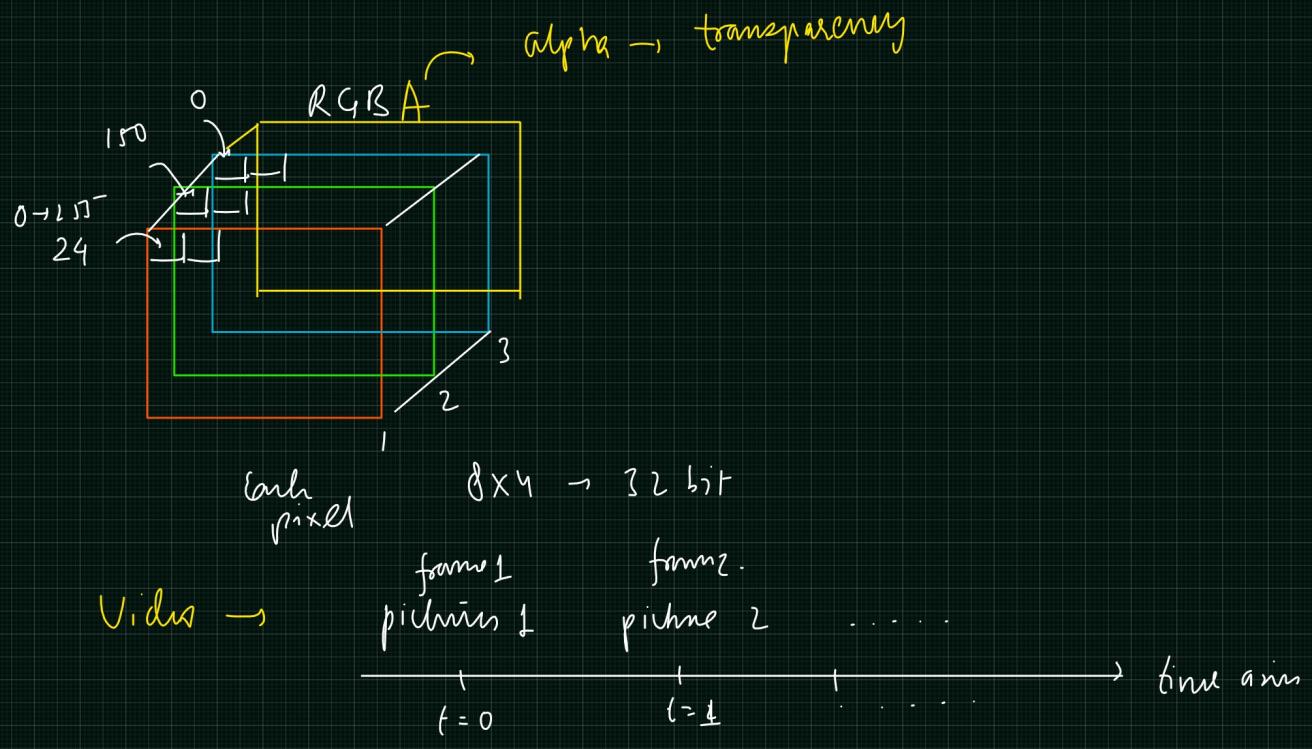
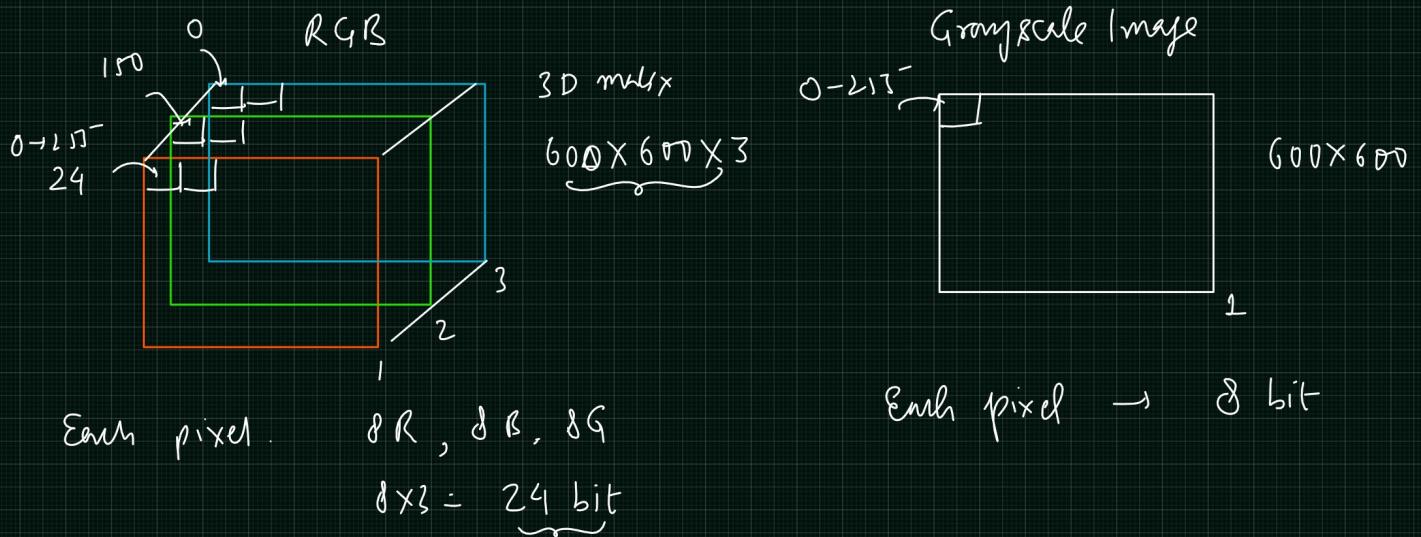
Healthcare → cancer cell detection (segmentation)

Tumors

UNet



2) Image dataset



- frames / pictures {RGB} , t \rightarrow time information

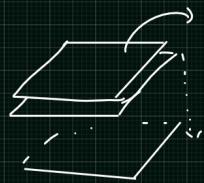
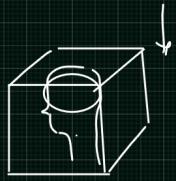
{Grayscale} , t

Algo \rightarrow image

video , each frame of the video



MRI

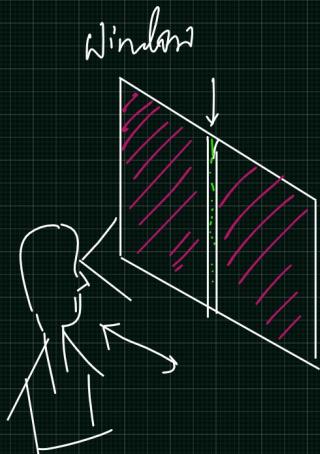
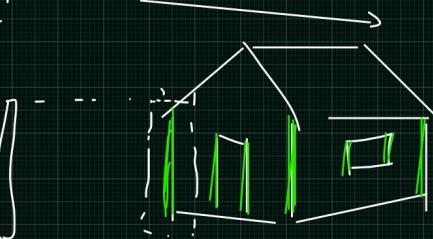
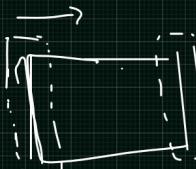
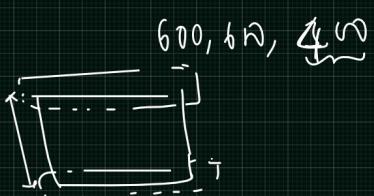
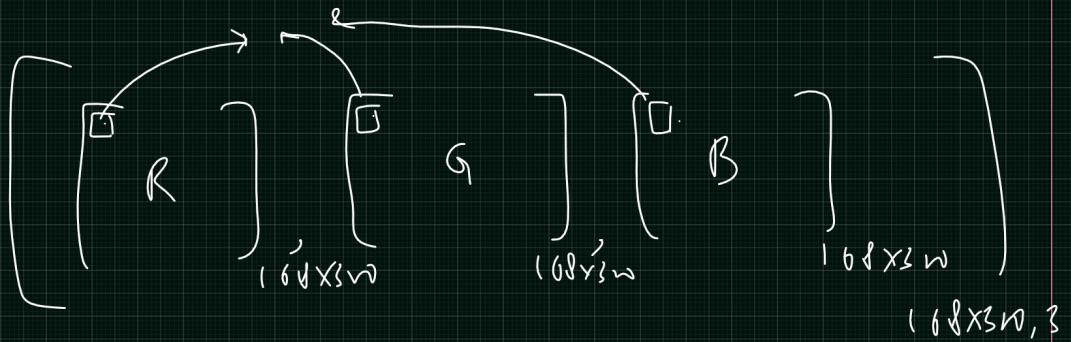


600x600x400

3D matrix

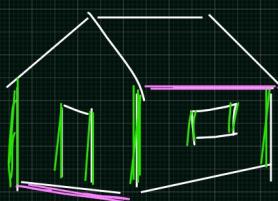
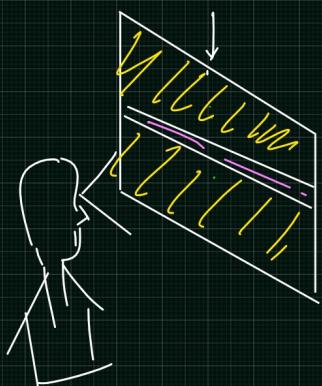
conv3D

168, 3w
r c



$$\begin{bmatrix} 1 & 0 & -1 \\ 2 & 0 & -2 \\ 1 & 0 & -1 \end{bmatrix}$$

Window



$$\begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

Horizontal Sobel filter

$$\begin{array}{cccc} z_1 & z_2 & z_3 & z_4 \\ \downarrow & \downarrow & \dots & \downarrow \\ z_1 & z_2 & \dots & z_8 \\ z_{16} \end{array}$$

$$\begin{array}{c} p \quad f \\ 6-3 \quad +1 \\ \hline 1 \rightarrow 5 \end{array} \quad 3+1=4$$

$$z_1 = p_1 f_1 + p_2 f_2 + \dots + p_{15} f_9$$

h-stride
0 1 2

0:3 → 0, 1, 2

3,3

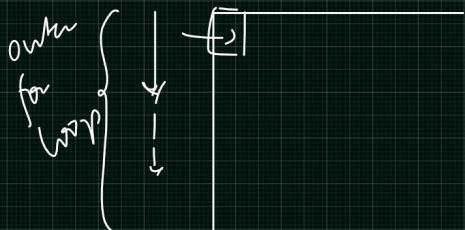
f ₁	f ₂	.
-	-	-
-	-	f ₉

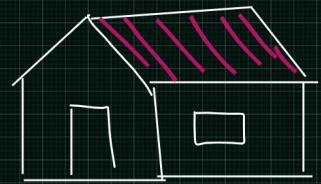
z₂

0						
1						
2						

$$z_2 = p_1 f_1 + p_3 f_2 + \dots + p_{16} f_9$$

Right → val → inner row



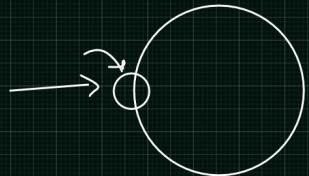
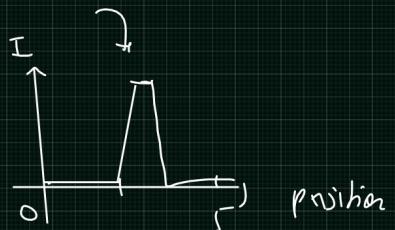
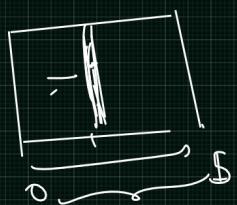
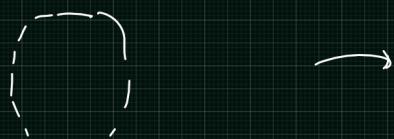


CNN

Level 1

Level 2

Level 7



$0 \rightarrow 2\pi^-$

