COMPUTER VISION Y REALIDAD AUMENTADA

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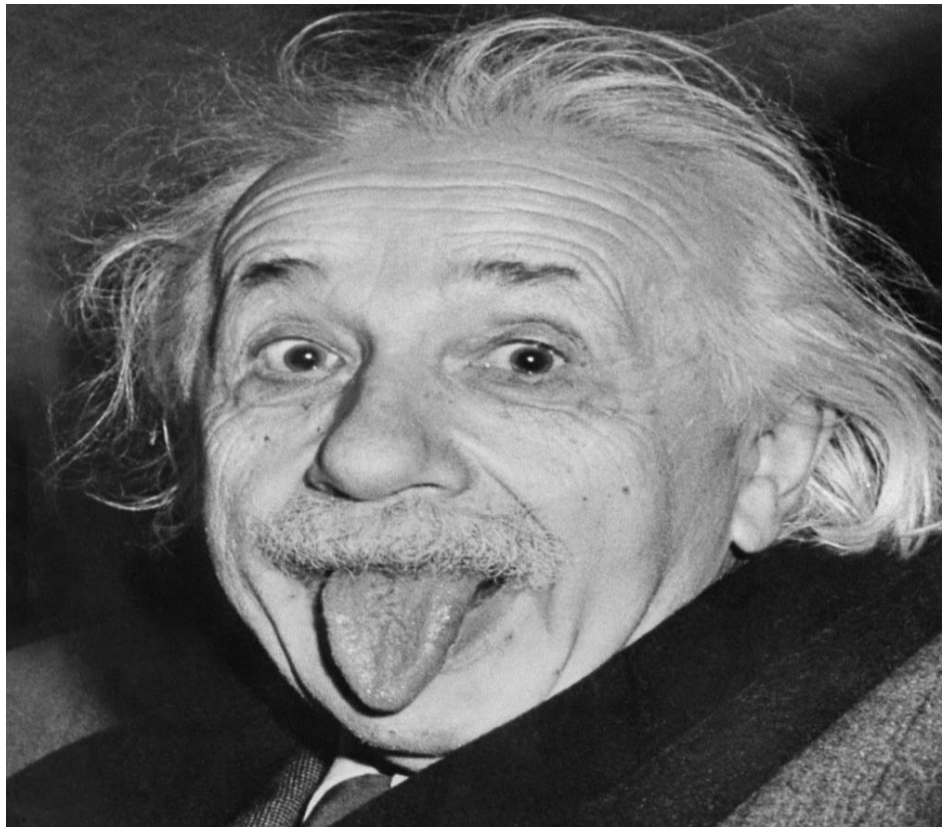
TALENT LAND 2022

https://github.com/bioruben/talent_land_2022_cv

- *"Everything human beings can imagine; nature has already created…"*
  - -Albert Einstein.



WHAT IS COMPUTER VISION?

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- Humans use our eyes and our brains to see and visually perceive the world around us. Computer Vision is the science that aims to provide a similar, if not better, capability to a machine or computer.

COMPUTER VISION

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1. Optics and 3D Reconstruction
2. Image Processing
3. Machine Learning in images

COMPUTER VISION

1. **Optics and 3D Reconstruction**
2. Image Processing
3. Machine Learning in images

OPTICS AND 3D RECONSTRUCTION

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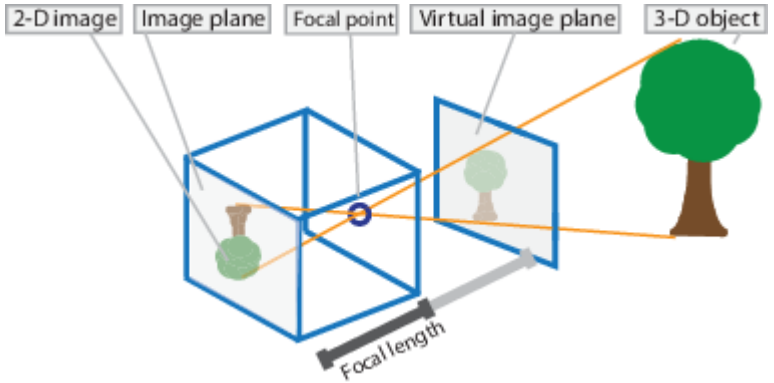

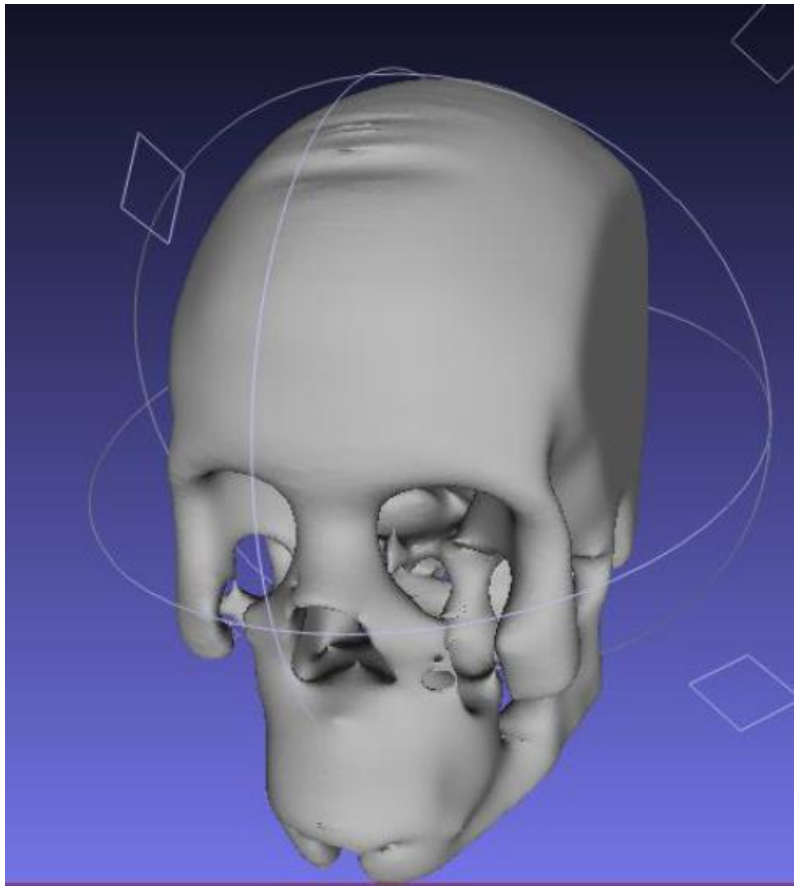

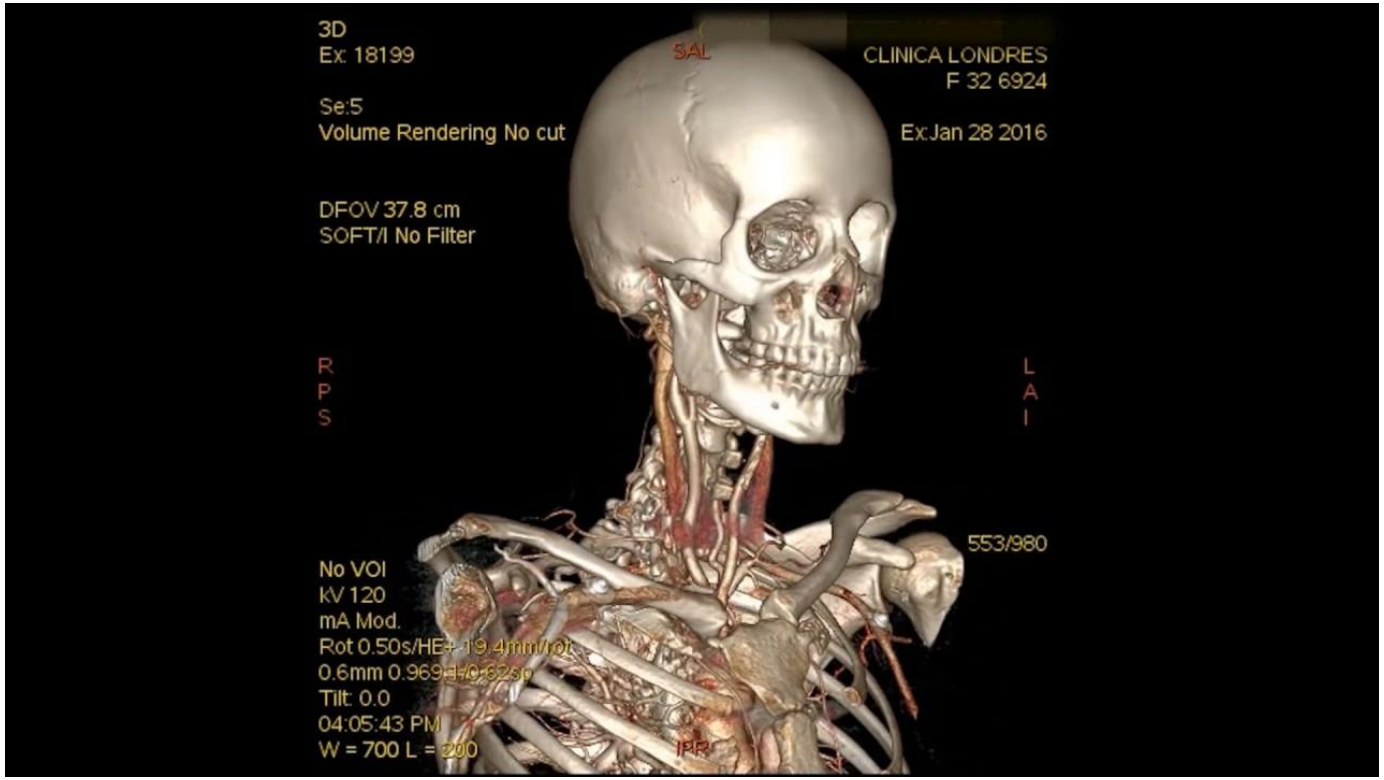
3D
Ex: 18199
Se:5
Volume Rendering No cut
DFOV 37.8 cm
SOFT/I No Filter
SAL
CLINICA LONDRES
F 32 6924
Ex:Jan 28 2016
R
P
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L
A
I
553/980
No VOI
kV 120
mA Mod.
Rot 0.50s/HE+ 19.4mm/rot
0.6mm 0.969:1/0.62sp
Tilt: 0.0
04:05:43 PM
W = 700 L = 200
IPR

COMPUTER VISION

DataLab Community

1. Optics and 3D Reconstruction
2. **Image Processing**
3. Machine Learning in images

IMAGE PROCESSING

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COMPUTER VISION

1. Optics and 3D Reconstruction
2. Image Processing
3. **Machine Learning in images**

OBJECT RECOGNITION

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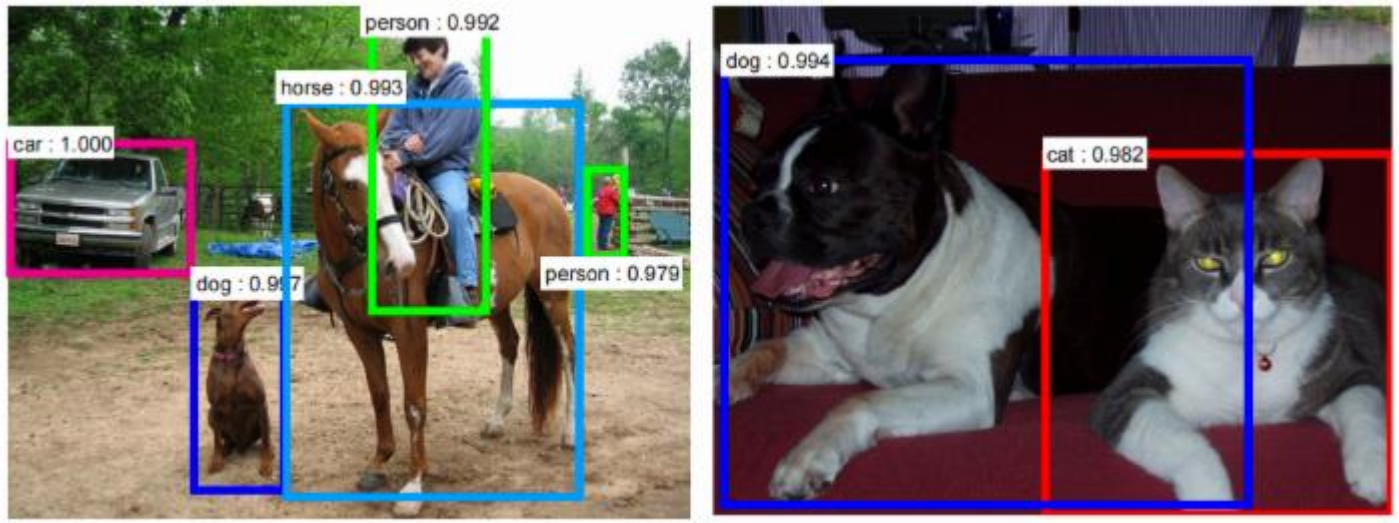

SEGMENTATION

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(c) Semantic segmentation

(d) Instance segmentation

STYLE TRANSFER

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Input image

GFPGAN output

VIDEO GAMES

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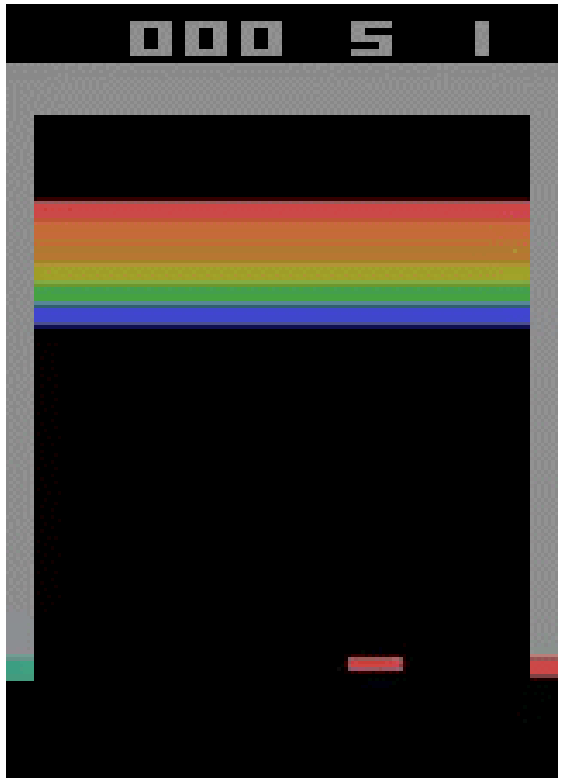
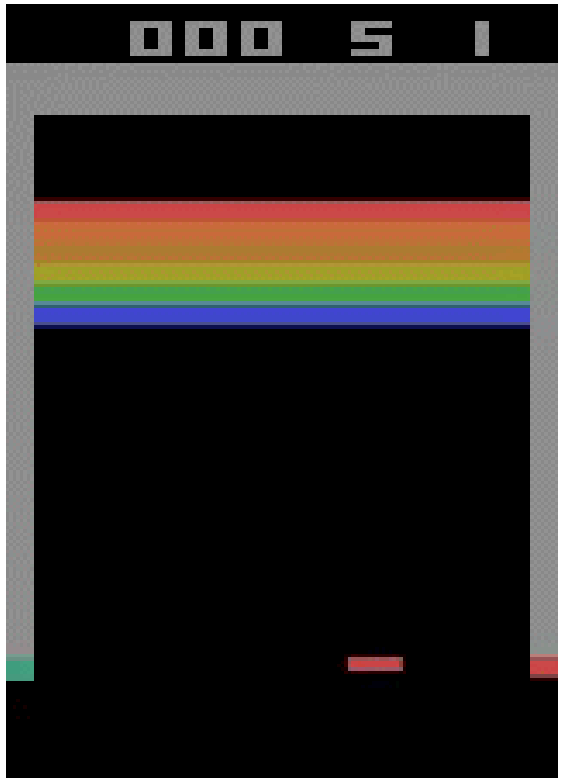


VIDEO GAMES



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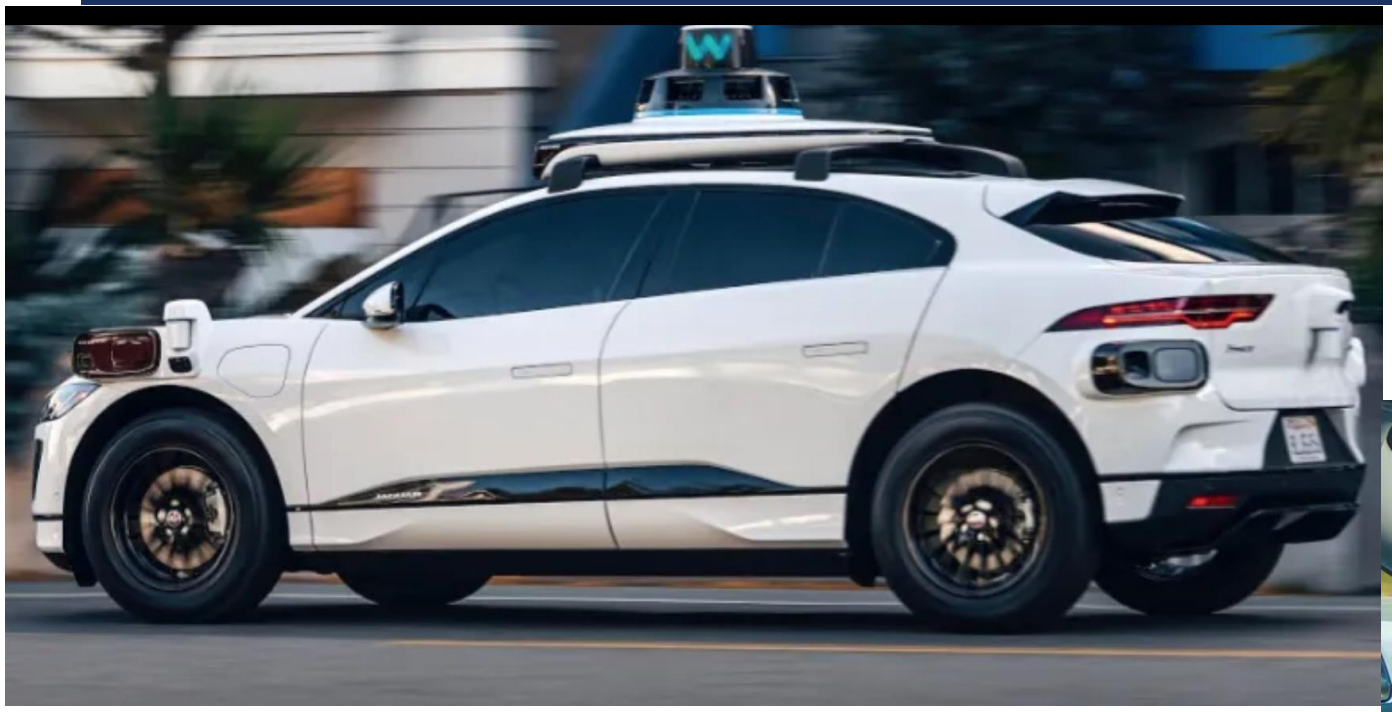

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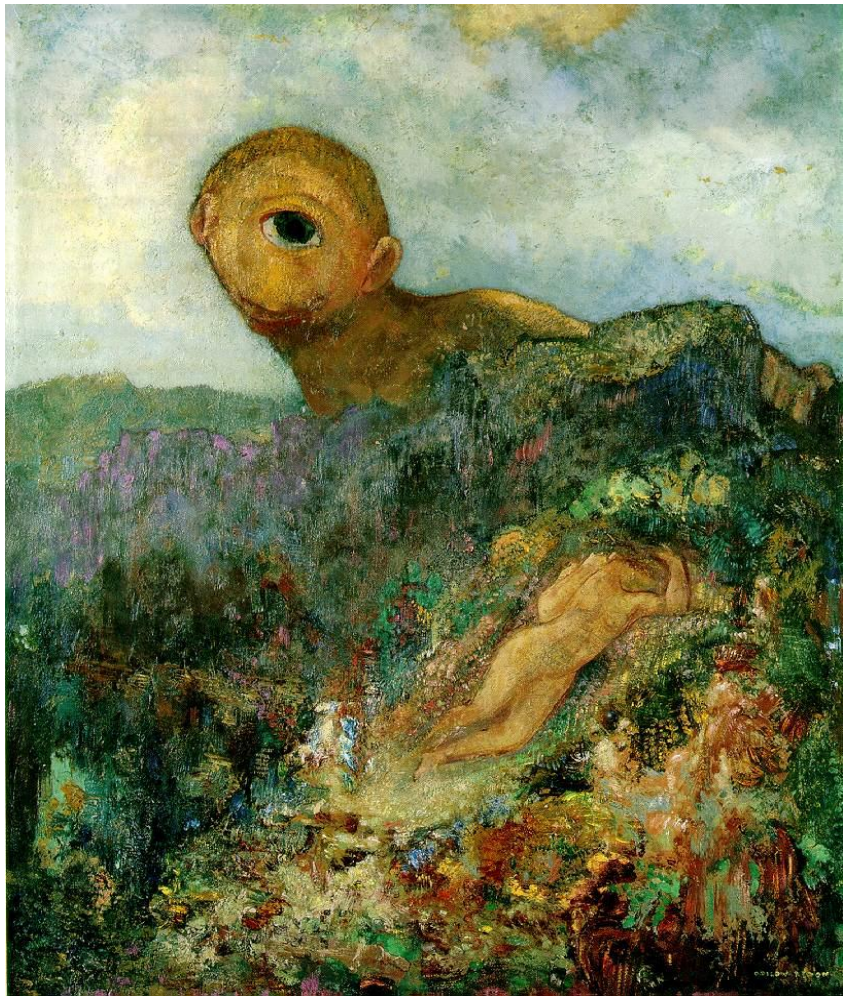
PERCEPCIÓN 3D

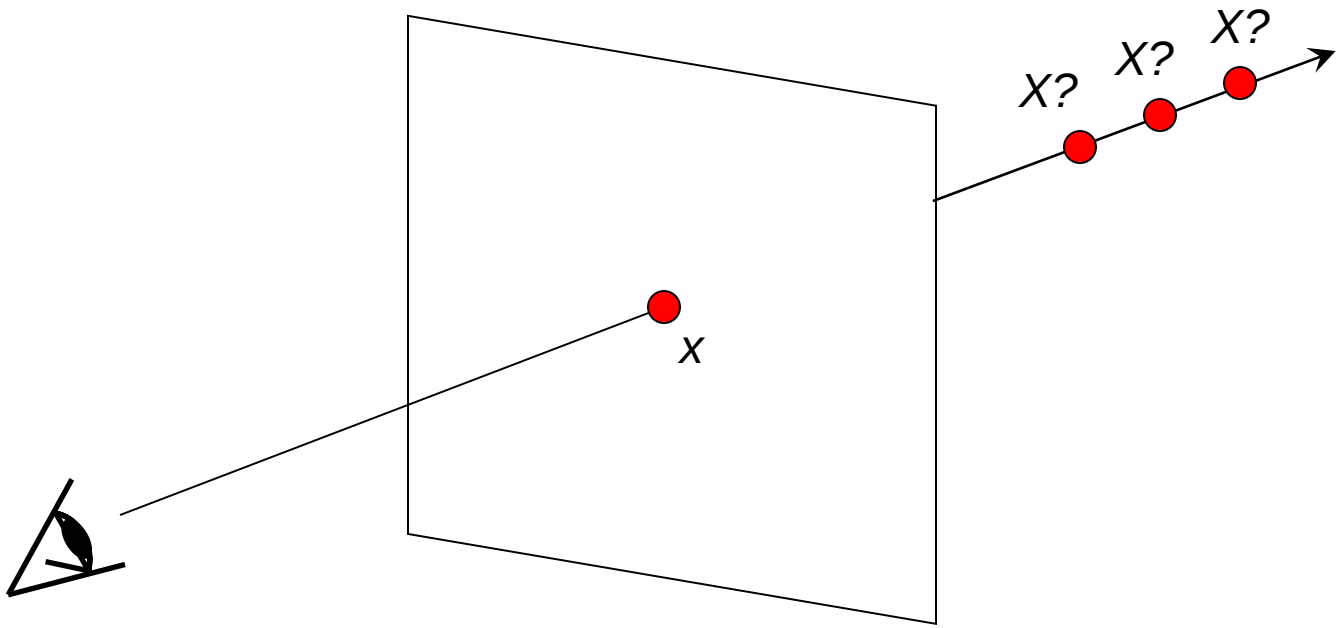
SINGLE-VIEW GEOMETRY



Odilon Redon, *Cyclops*, 1914

OUR GOAL: RECOVERY OF 3D STRUCTURE

- Is recovering the structure of an image unambiguous?



OUR GOAL: RECOVERY OF 3D STRUCTURE

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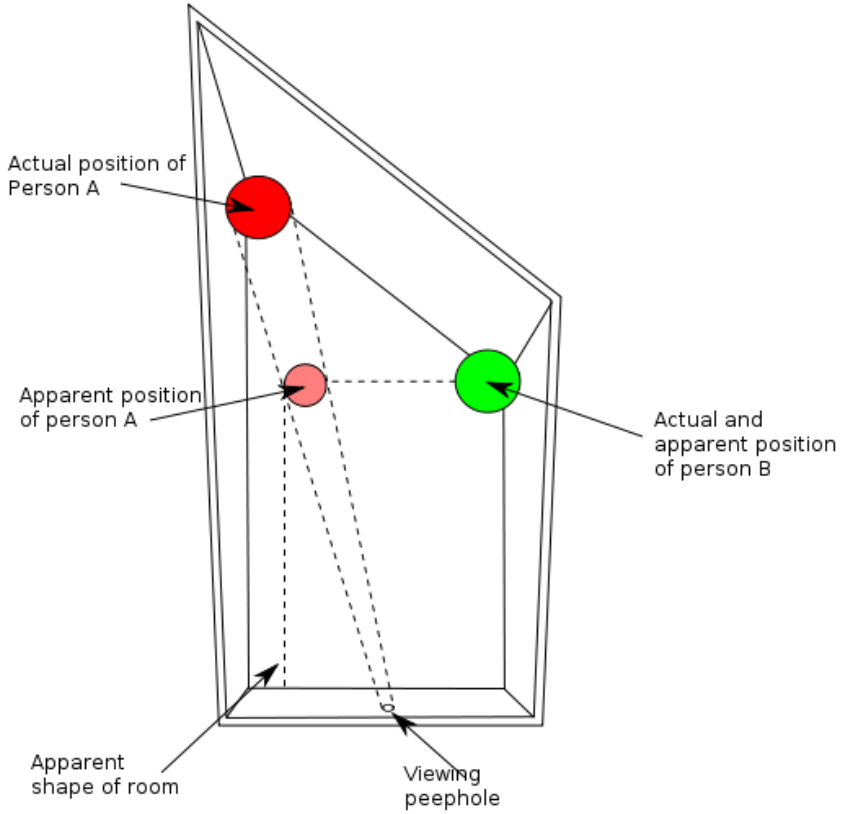
- What about perspective?

AMES ROOM


Actual position of Person A
Apparent position of person A
Actual and apparent position of person B
Apparent shape of room
Viewing peephole

AMES ROOM

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VIRTUAL REALITY LIGHTING

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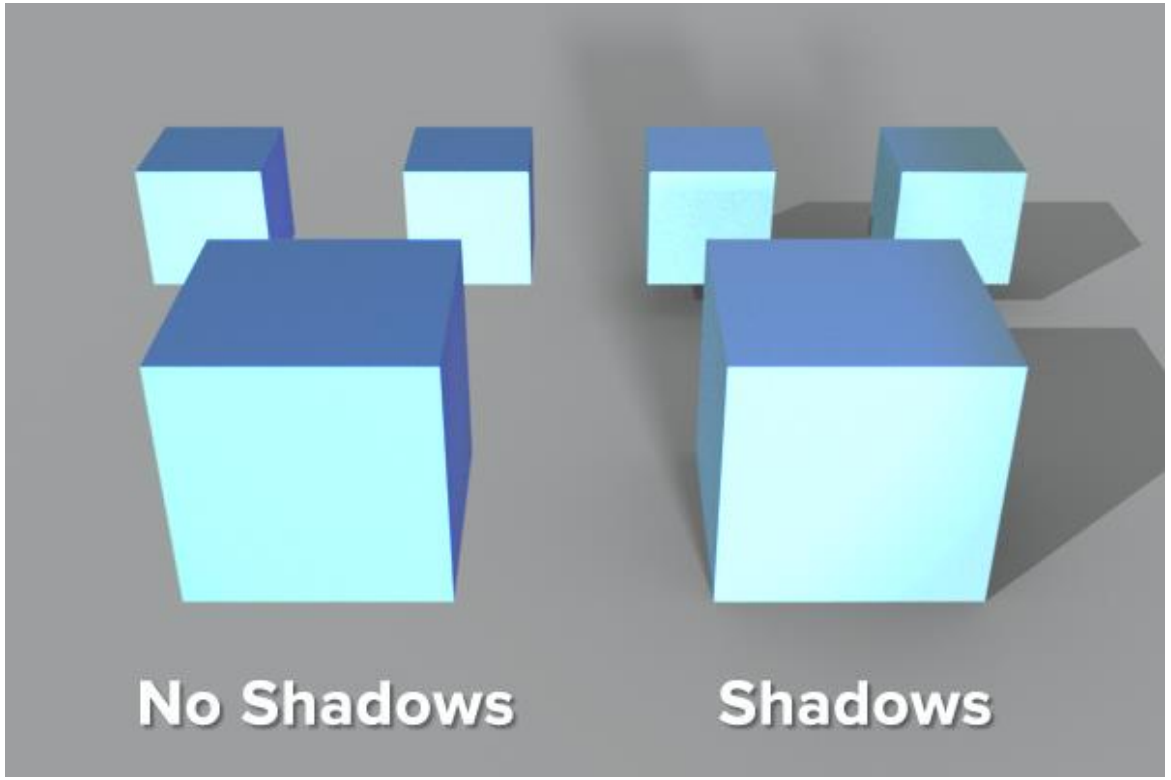

RAY TRACING

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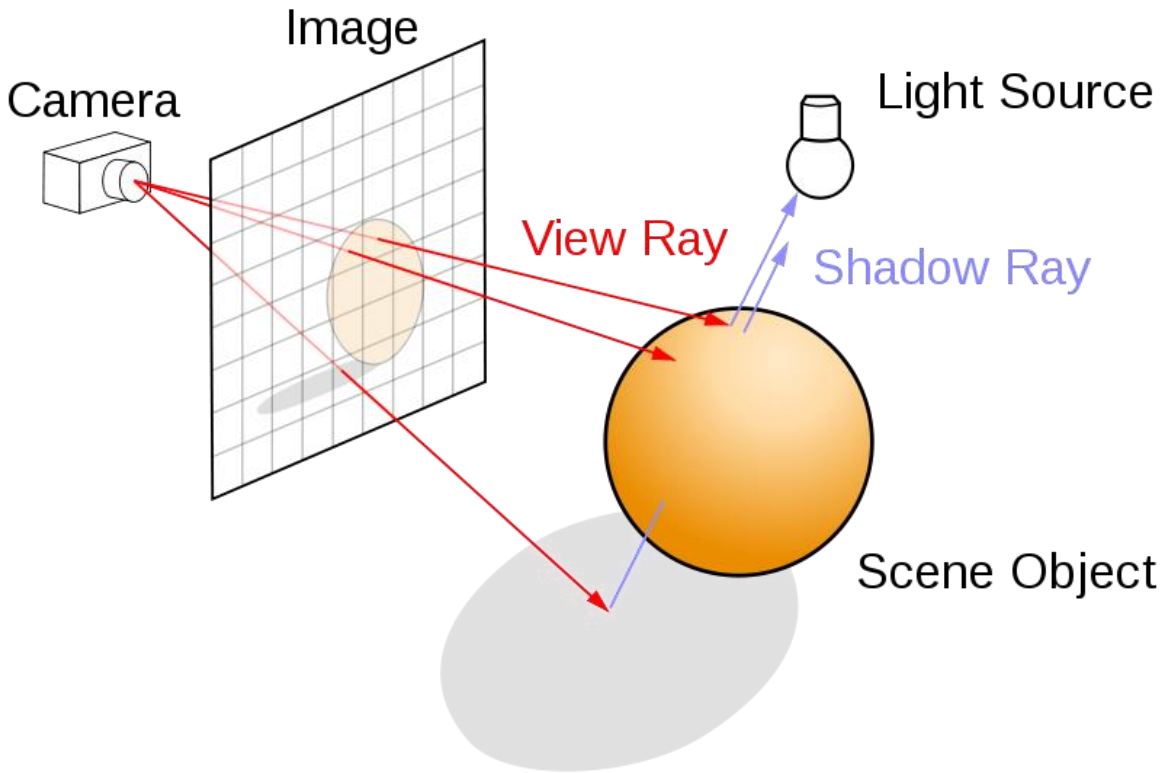

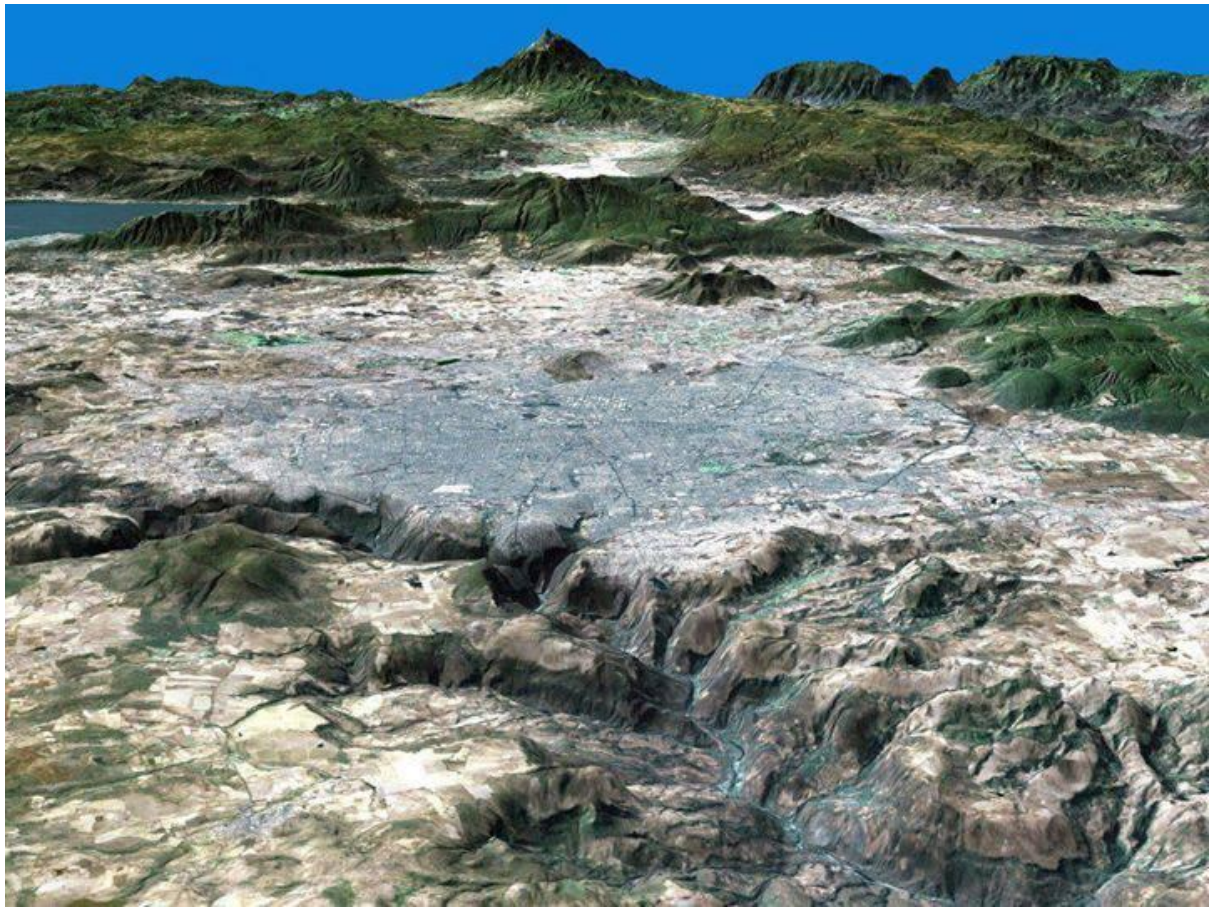

WHAT IF WE JUST WORK WITH THE CENTER OF THE LENS?

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MOVE INFORMATION FROM 3D TO 2D

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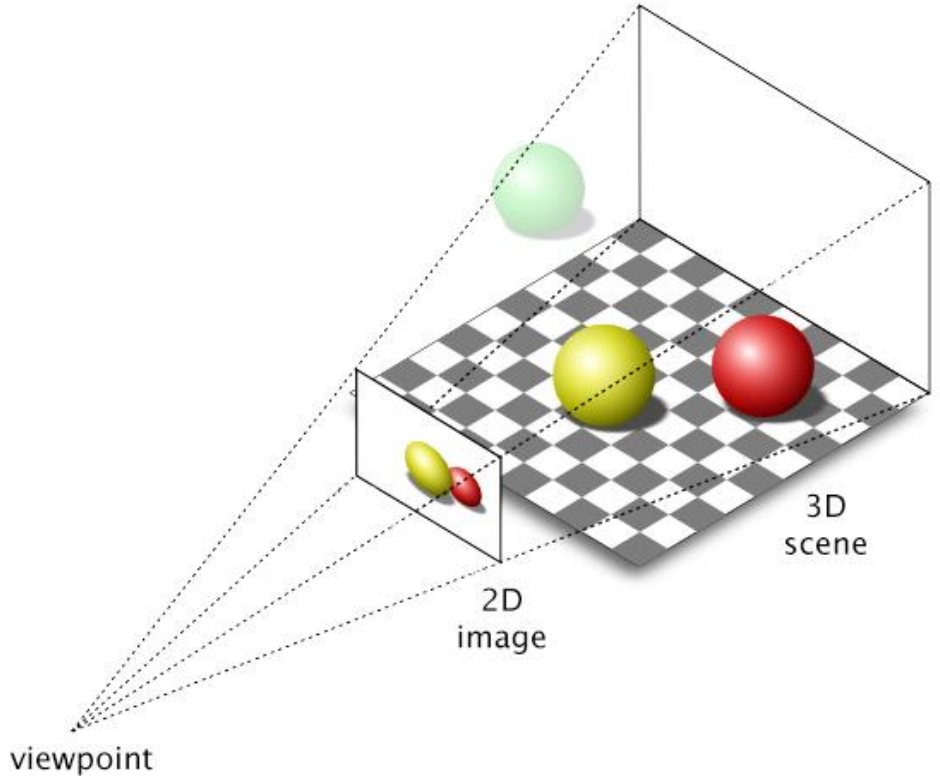
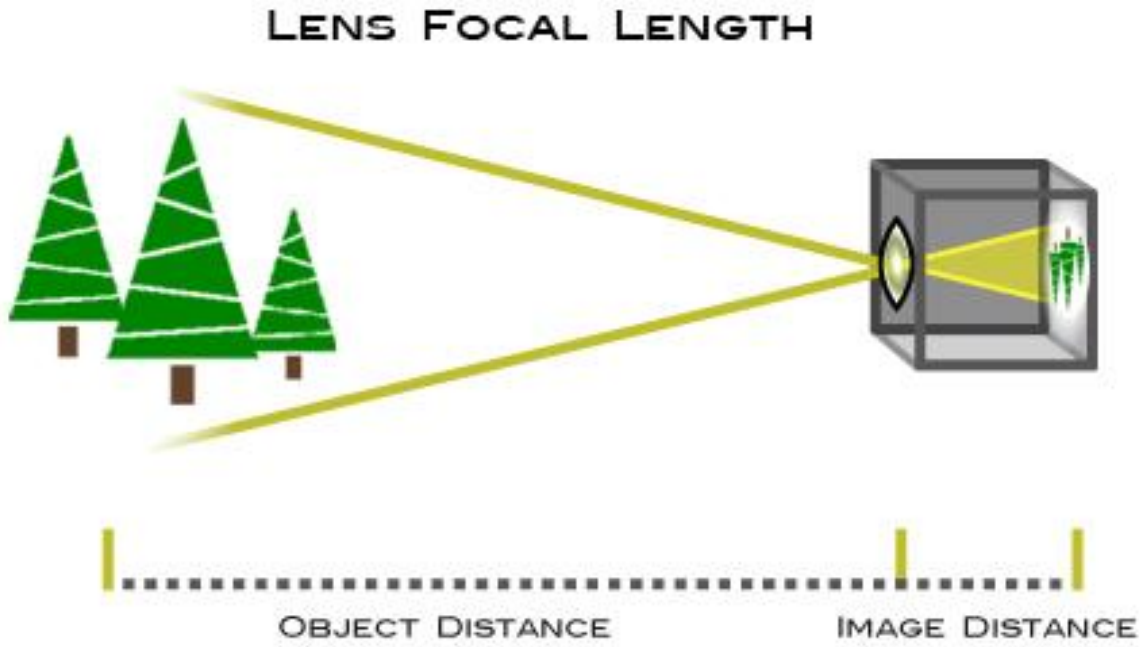


DOES OPENNESS MATTER?

- In the case of the above drawing, is it important to enter the dimensions of that opening where the light enters the box?



DOES OPENNESS MATTER?

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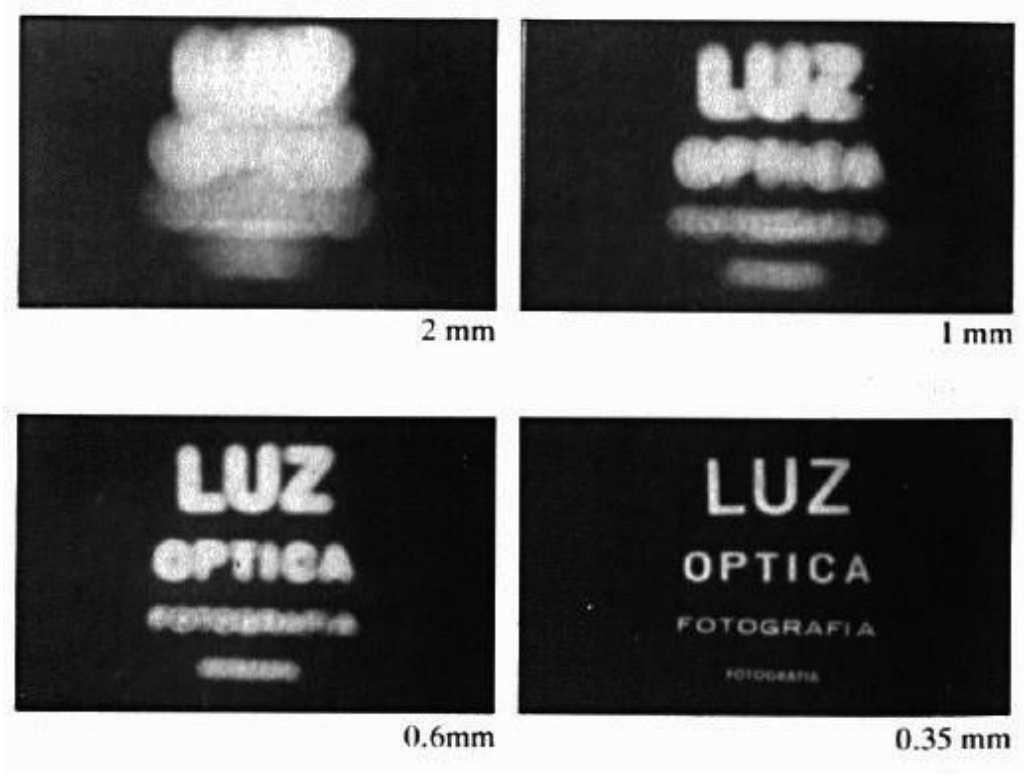
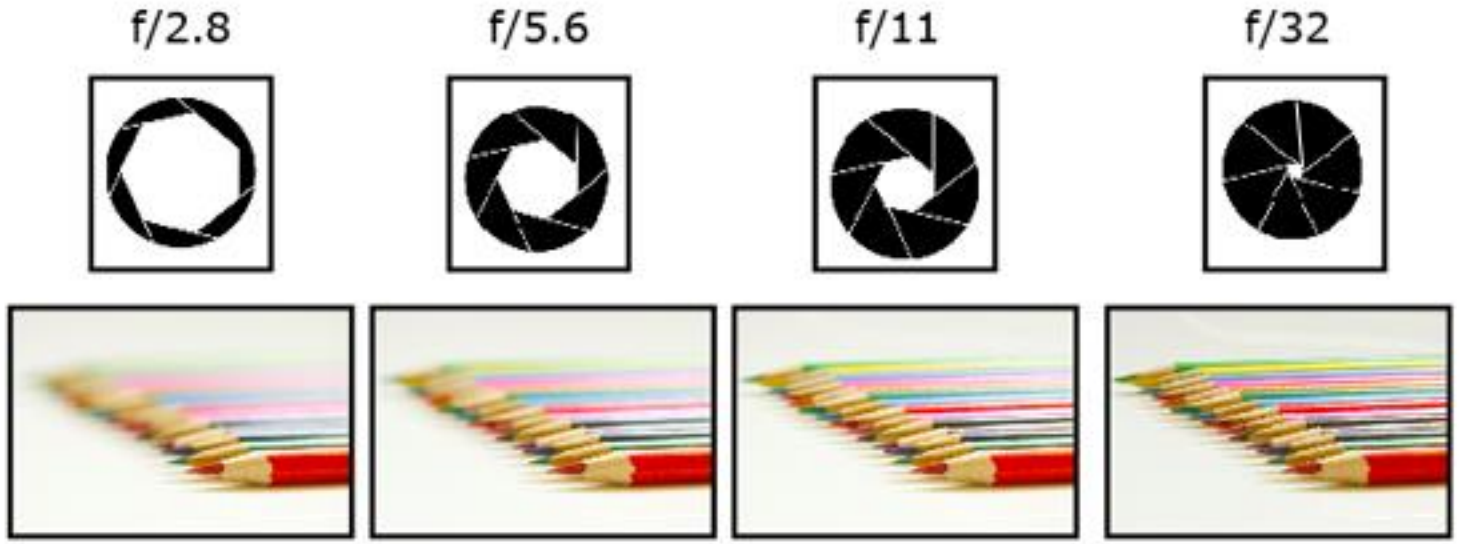
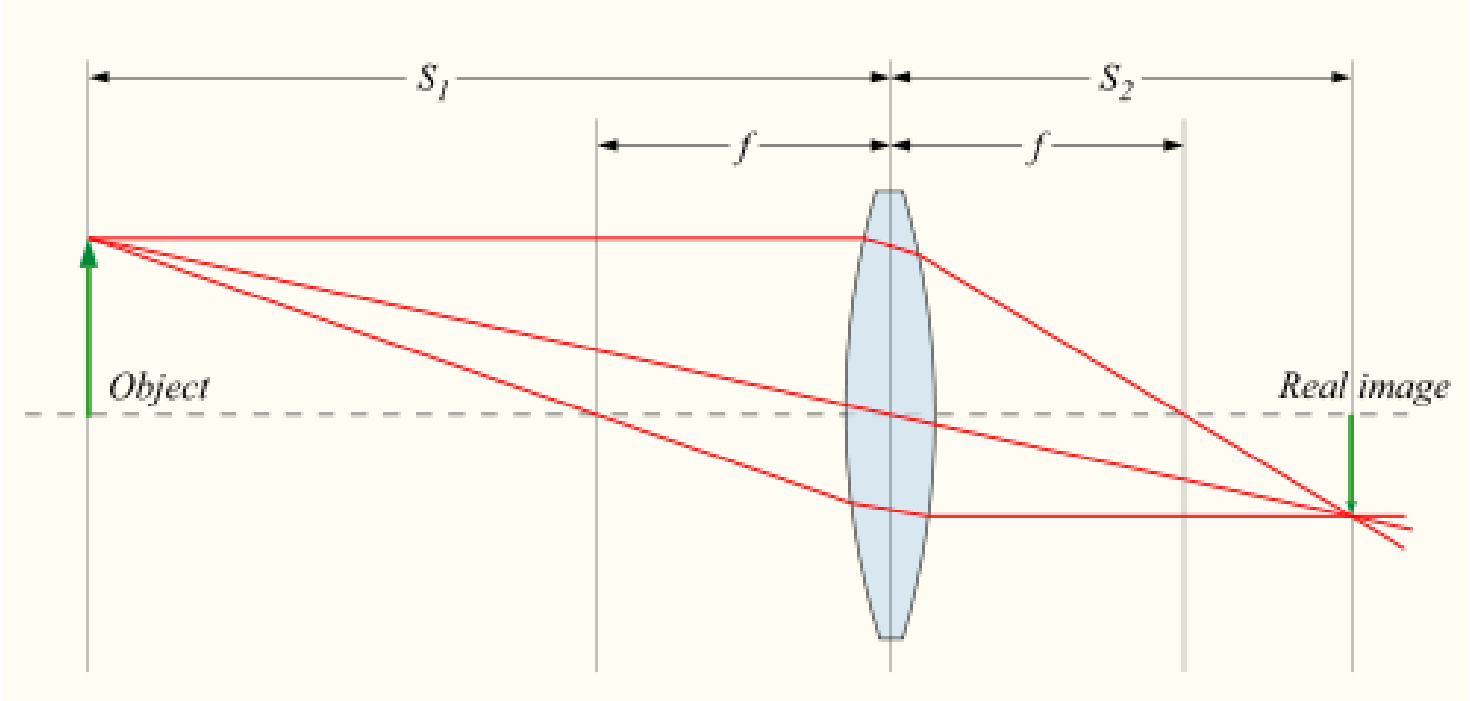


OPENNESS AND DEPTH ARE CORRELATED



THIN LENSES

- Gaussian Law $\frac{1}{Z} + \frac{1}{z} = \frac{1}{f}$



CAMERA CALIBRATION

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- $$\begin{pmatrix} p_{xi} \\ p_{yi} \\ 1 \end{pmatrix} = \begin{pmatrix} \frac{f}{dx} & -\rho\frac{f}{dy} & c_{xi} \\ 0 & \frac{f}{d_y} & c_{yi} \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} X_w \\ Y_W \\ Z_W \end{pmatrix}$$

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¿CUÁL ES LA DIFERENCIA ENTRE RV Y RA?

VIRTUAL REALITY

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AUGMENTED REALITY

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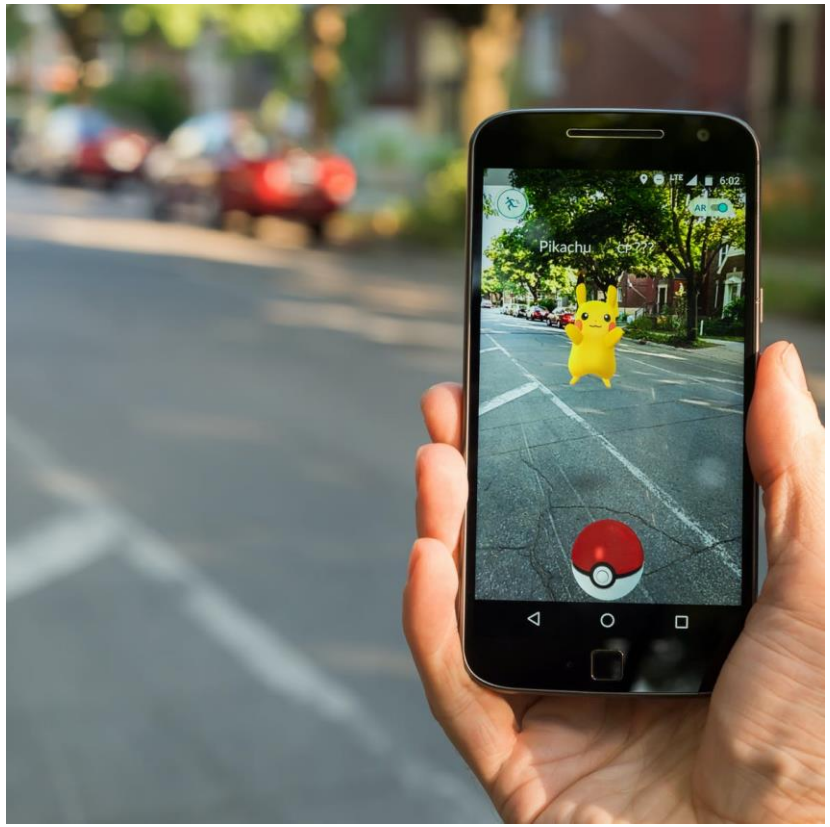

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DEMO ARUCO

CHECKERBOARD

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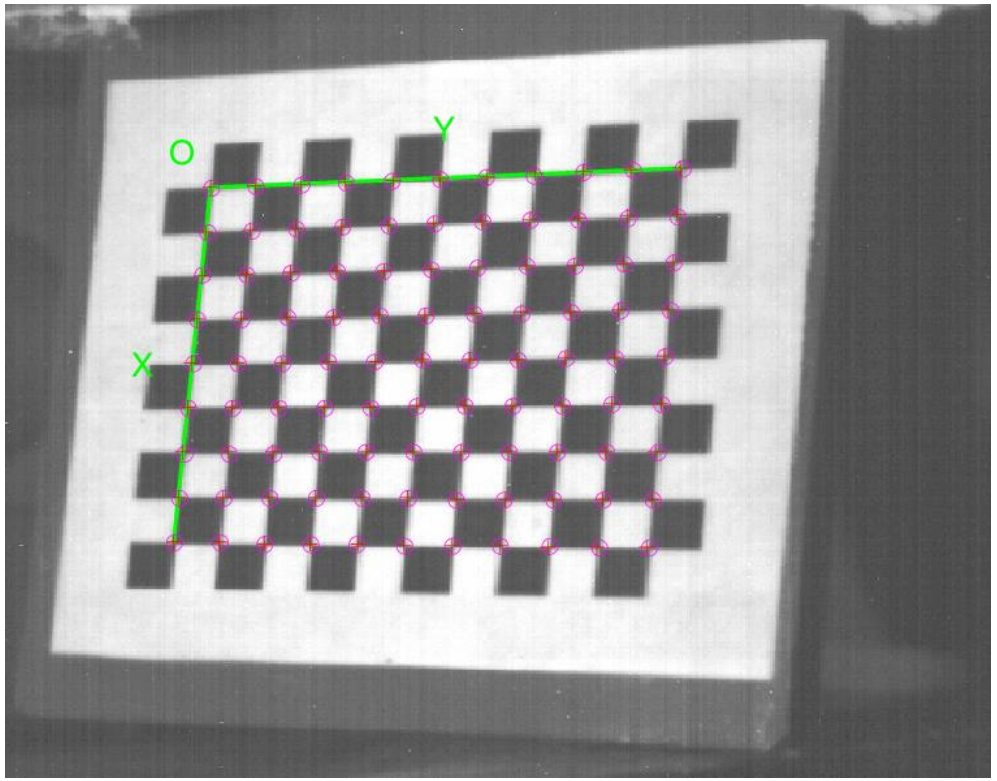

CHECKERBOARD

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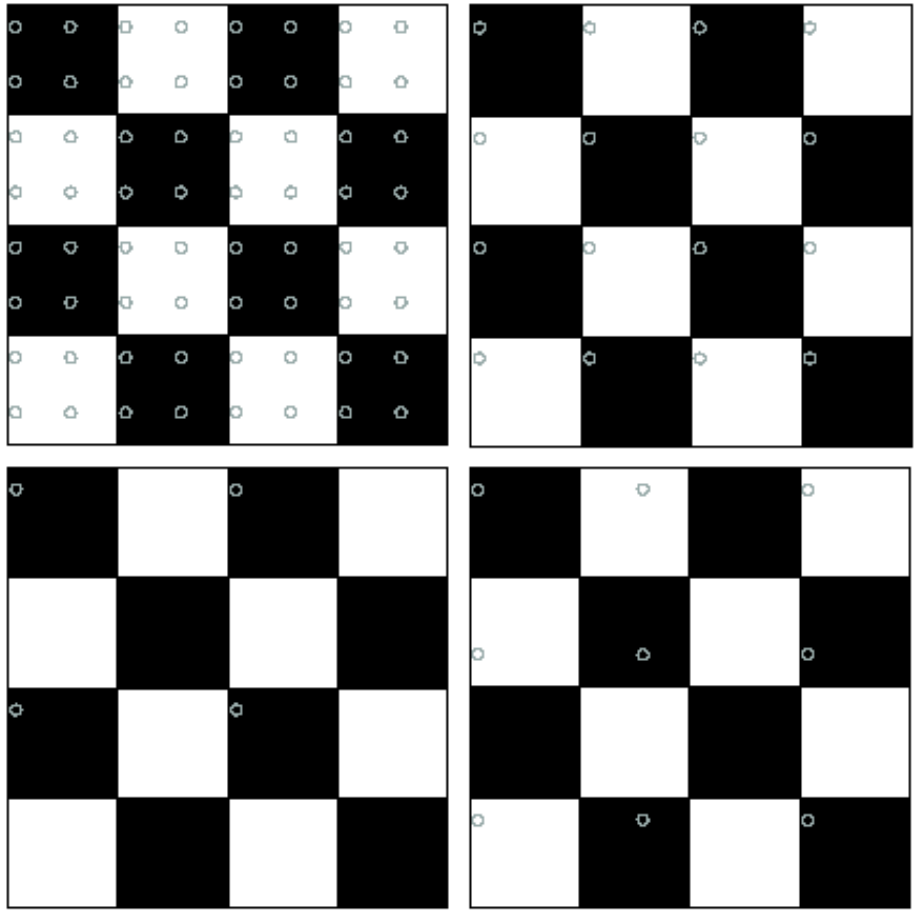

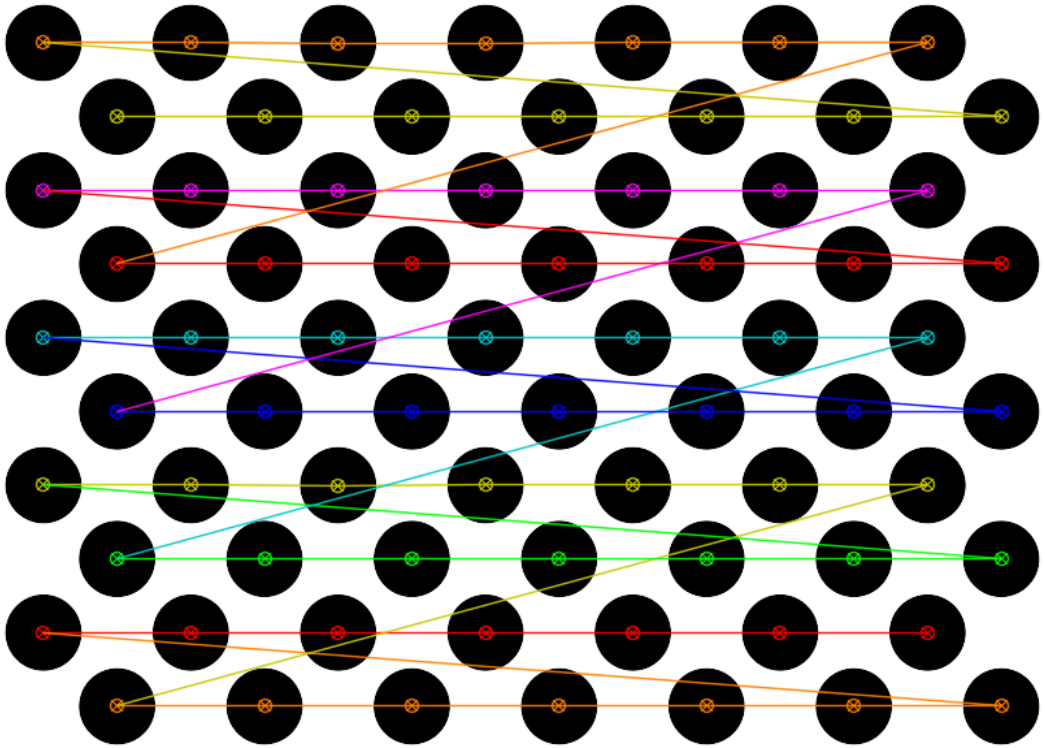

FEATURE MATCHING

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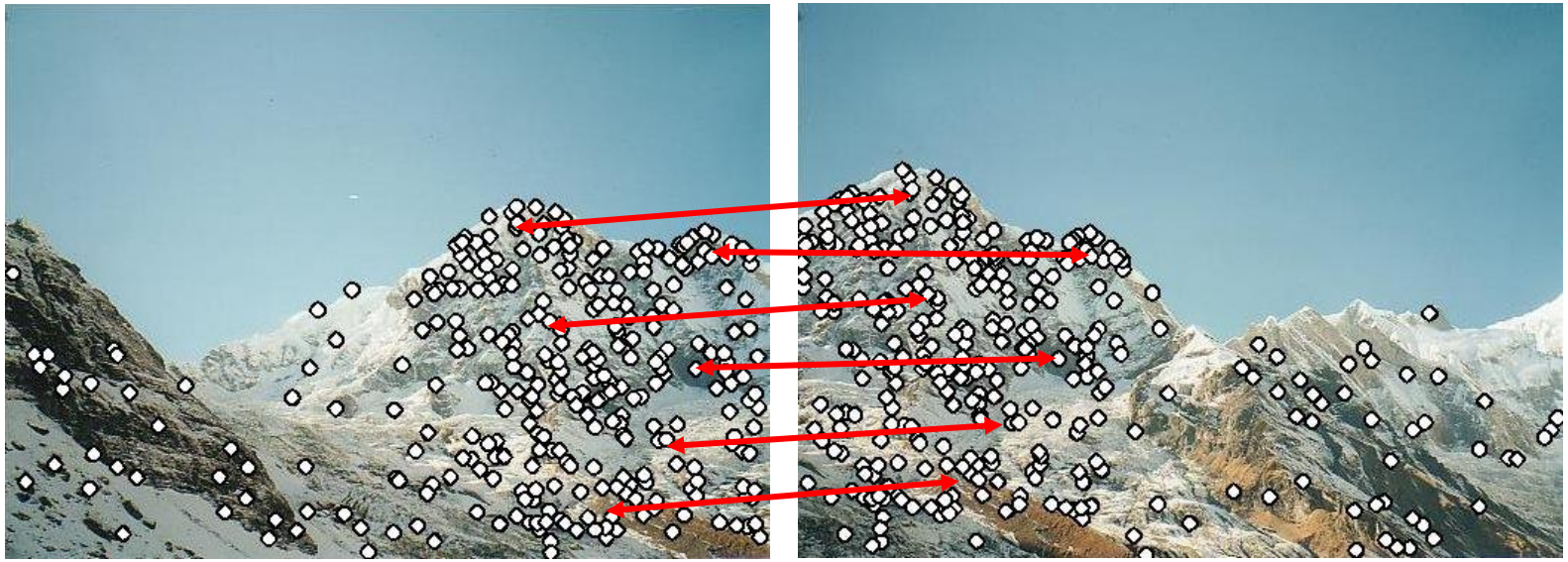

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3D CLOUD SAMPLES

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DEMO MARKERS 4 VOLUNTARIOS

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¿QUÉ POKÉMON DE LOS INICIALES USTEDES PREFERÍAN?

> “Those who can imagine anything, can create the impossible.”
>
> *-Alan Turing*

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Questions?

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@datalabmx

SCAN ME