

# COMPUTER VISION

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# HAVE YOU WONDERED HOW FACE UNLOCK TECHNOLOGY OF YOUR PHONE WORKS?



# HOW SELF DRIVING CAR WORKS?

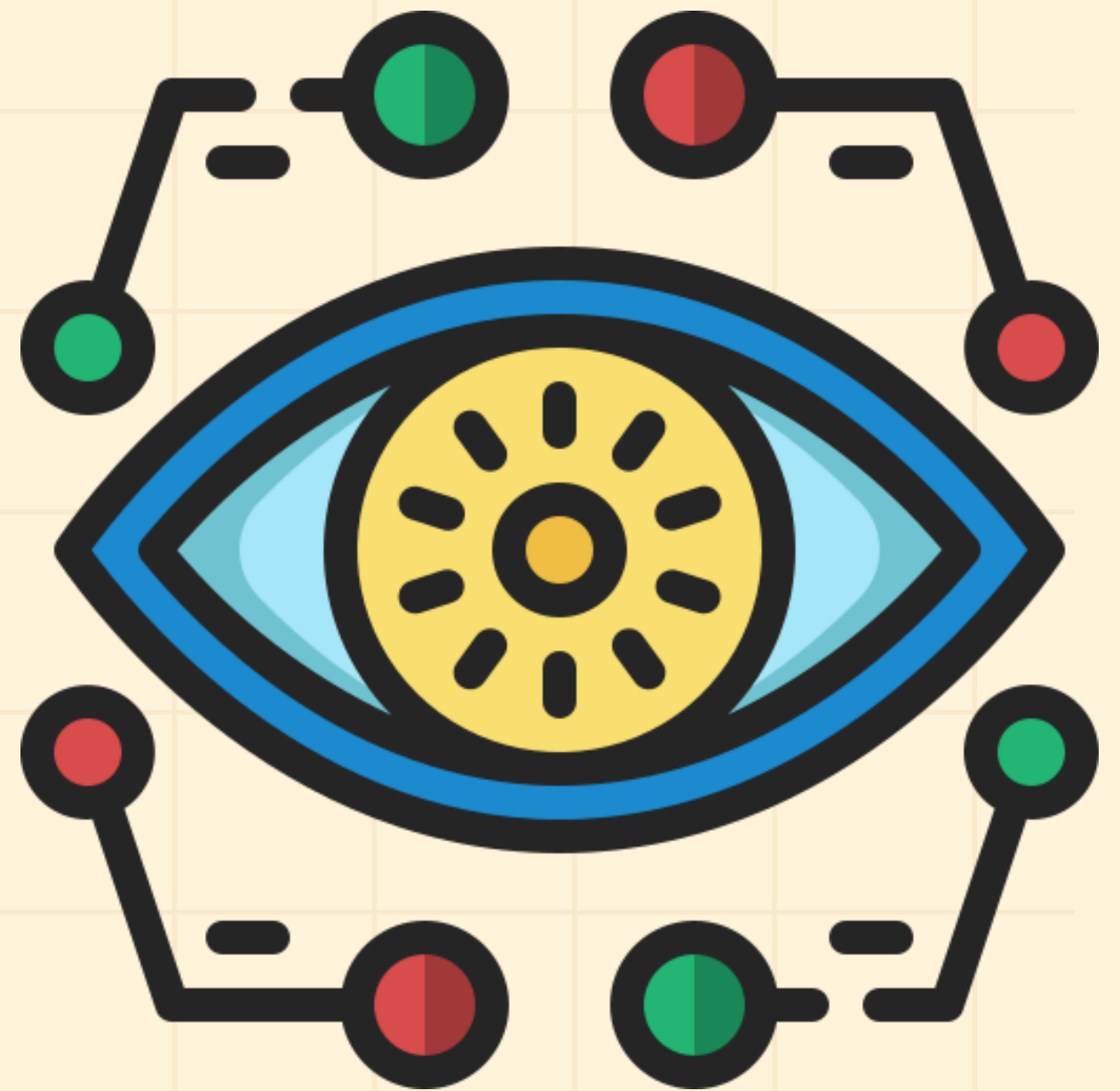


# HOW A MOTION DETECTION AI CAMERA WORKS?



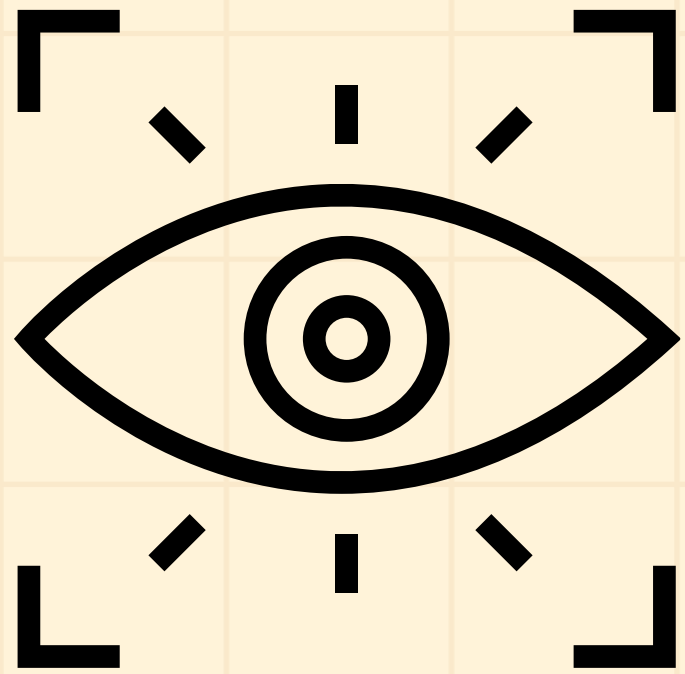
# COMPUTER VISION

Computer Vision is a branch of Artificial Intelligence that helps computers see, understand, and interpret images or videos, just like humans do



# IMAGINE YOU ARE ALONE AT HOME





**YOU WILL OPEN THE DOOR, IF YOU RECOGNIZE THE PERSON.**



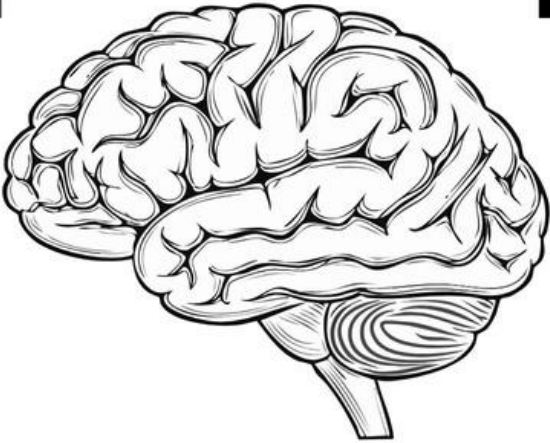
Mom



Dad



Brother



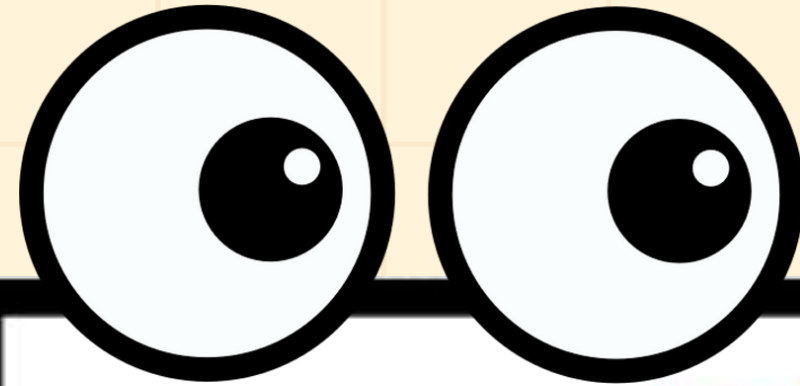
Sister

# SIMILAR WAY WE TRAIN THE MACHINE WITH DATA SETS TO RECOGNIZE.



<b>airplane</b>	
<b>automobile</b>	
<b>bird</b>	
<b>cat</b>	
<b>deer</b>	
<b>dog</b>	
<b>frog</b>	
<b>horse</b>	
<b>ship</b>	
<b>truck</b>	

# MACHINE VISION V/S HUMAN VISION



## Machine Vision



input



sensing device

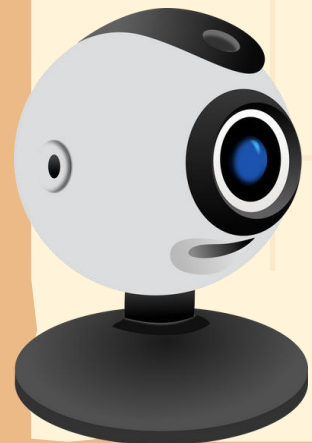


machine

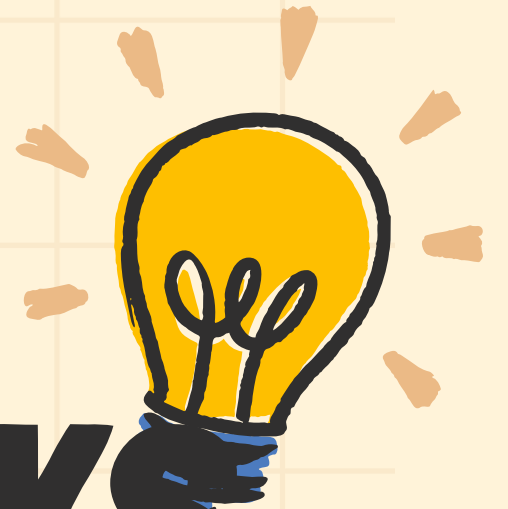


output

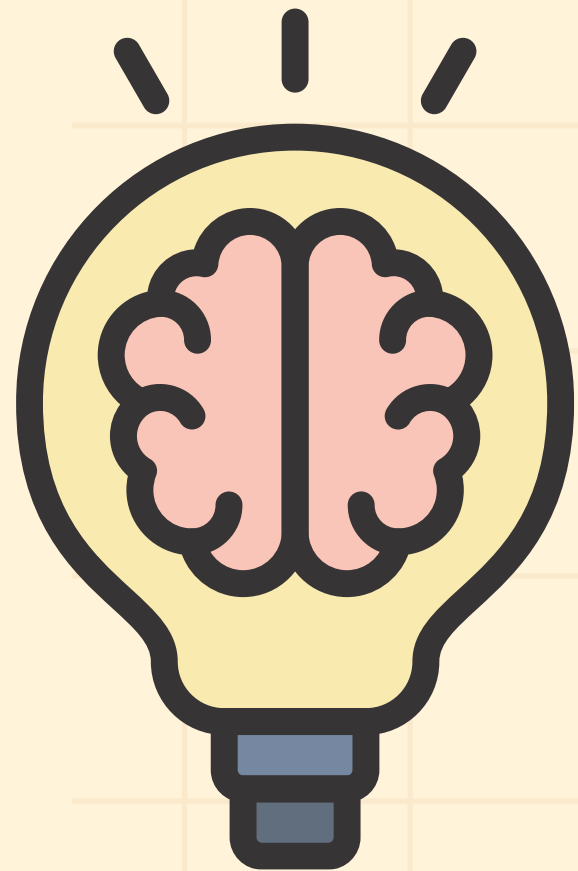
## Human Vision



# HOW COMPUTER VISION WORKS



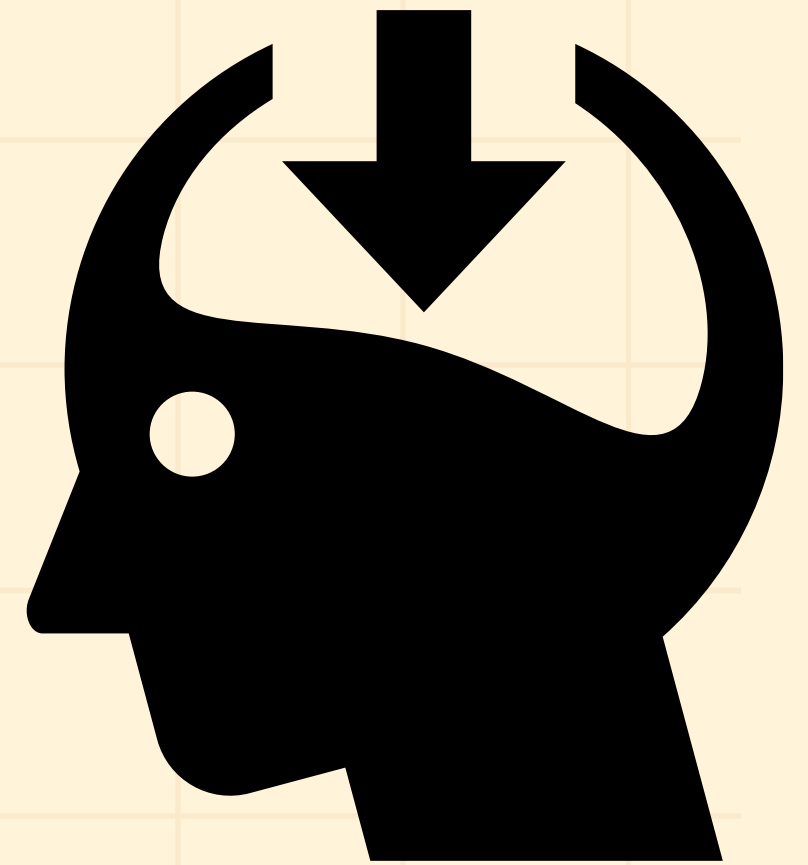
# WE SHOULD KNOW ABOUT THESE CONCEPTS



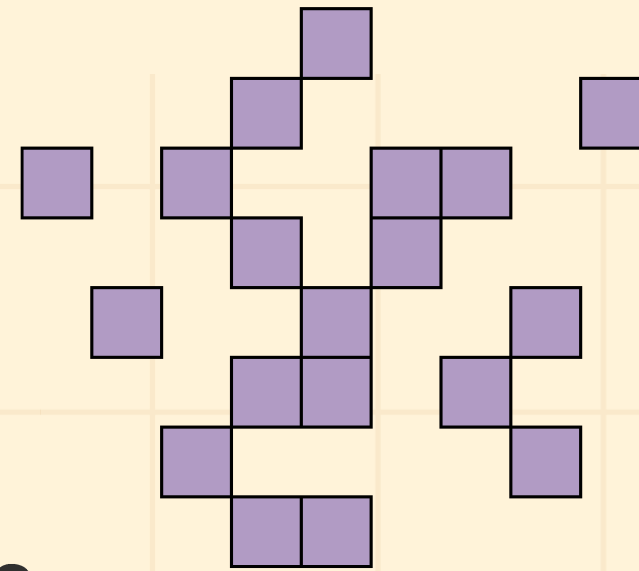
PIXEL

PIXEL VALUE

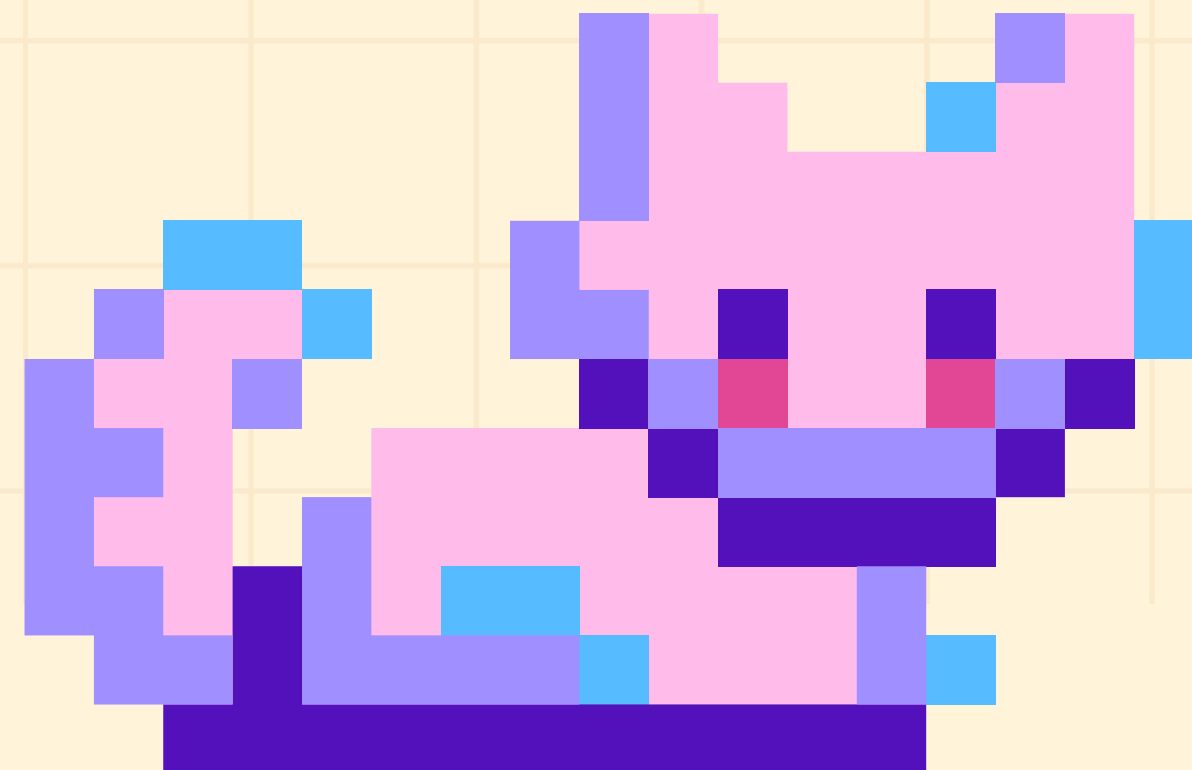
RESOLUTION



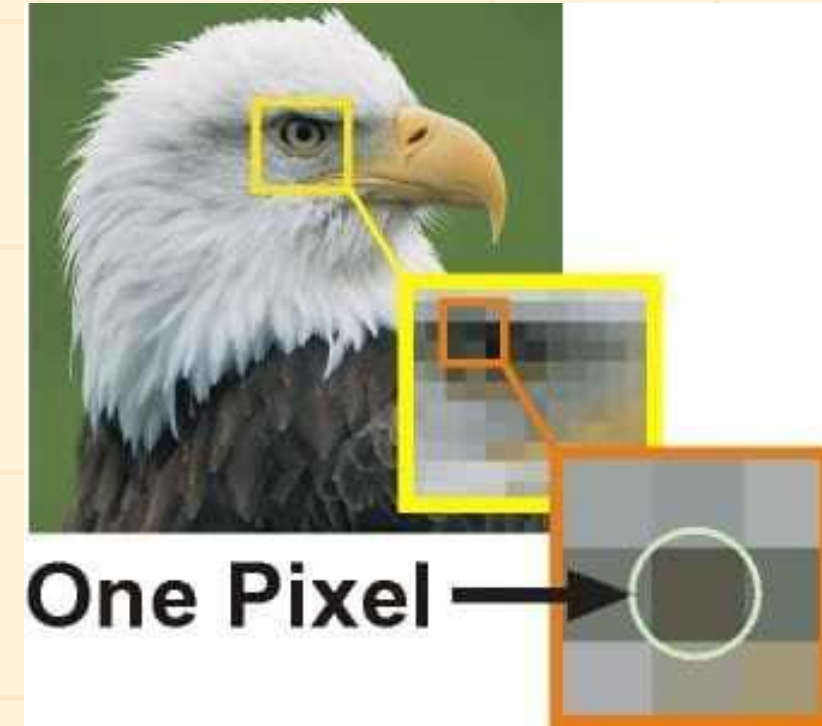
# PIXEL



- A Pixel is the smallest unit of an Image.
- Every pixel you see on a screen is made up of tiny dots or squares called pixels.
- Each Pixel has a color, when millions of pixels combine, they form a complete image.



When you zoom in on a photo, you start seeing small coloured squares — those are pixels!

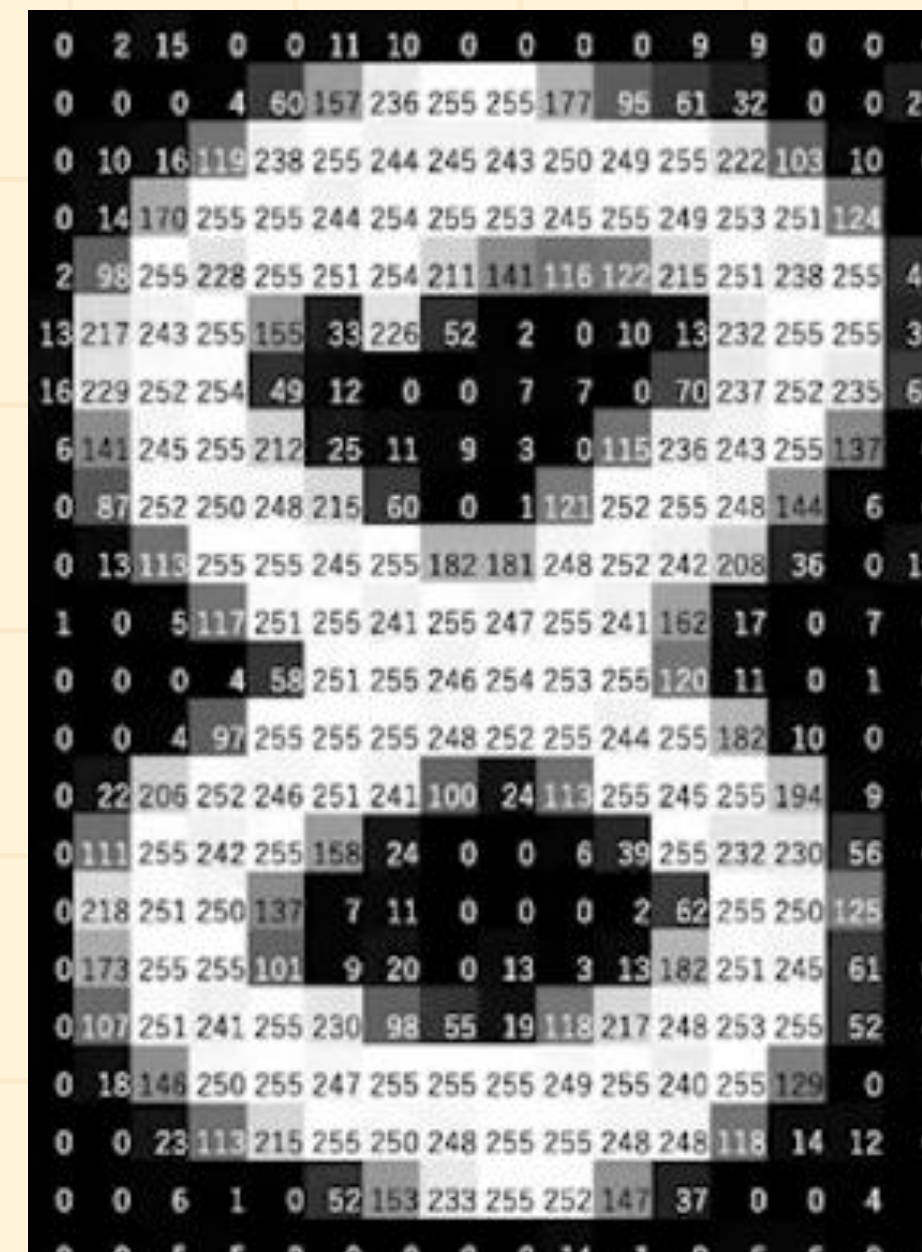


A phone camera that says 12 megapixels means it can capture 12 million pixels in one photo.



# PIXEL VALUE

•Each pixel in an image has a value that tells the colour or brightness of that pixel. This number is called pixel Value.

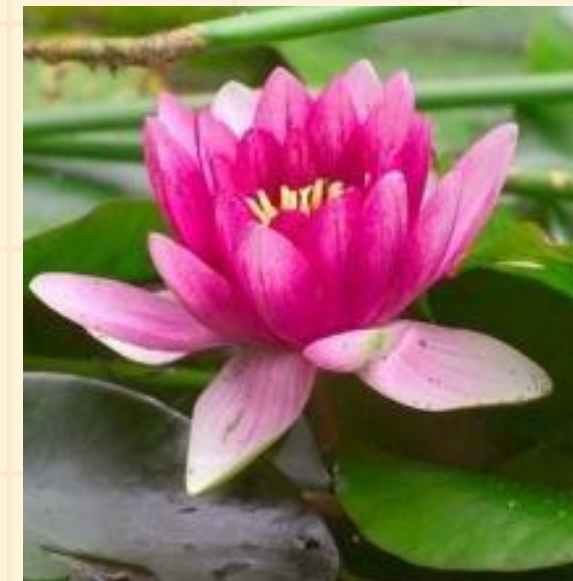


An Image can be Grayscale image (Black and White) or Coloured Image.

**GRAYSCALE IMAGE**

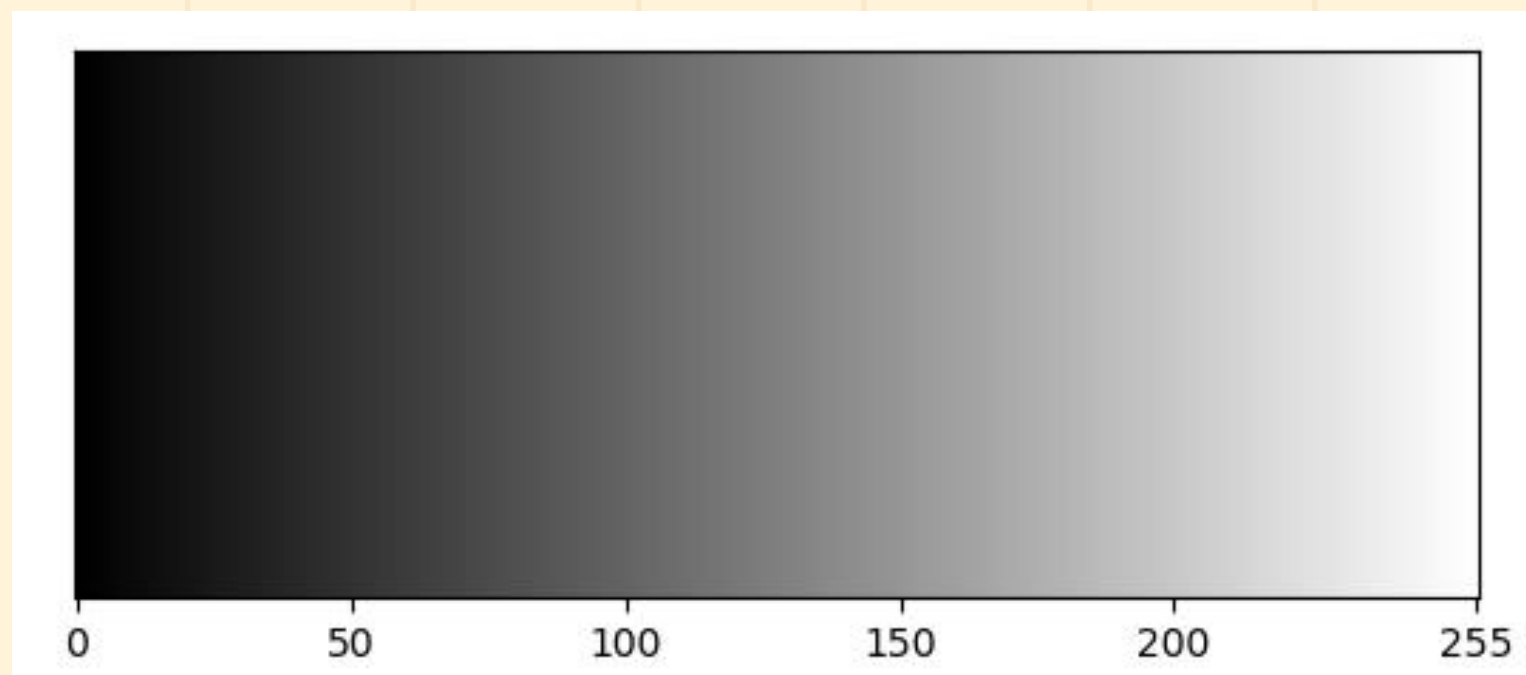


**COLOURED IMAGE**



# GRAYSCALE IMAGE

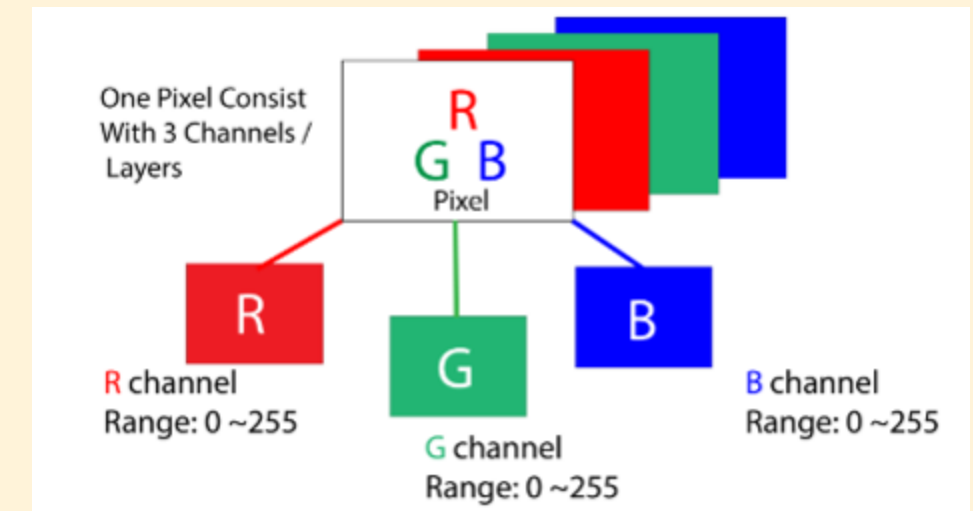
- Each pixel value shows how dark or light that pixel is .
- The value usually ranges from 0 to 255
- 0 – Black
- 255 -White
- Numbers in between (100,150,200) – Different shades of gray.



# COLOURED IMAGE

Each pixel has three values – one for each color channel:

- R (Red)
- G (Green)
- B (Blue)



Example: pixel's value:

- (255, 0, 0) → It's pure red.
- (0, 255, 0) → It's pure green.
- (0, 0, 255) → It's pure blue.
- (255, 255, 255) → It's white.
- (0, 0, 0) → It's black.

# RESOLUTION

Resolution means how many pixels an image has — or how clear and detailed that image looks.

Resolution is usually written as width × height (in pixels).

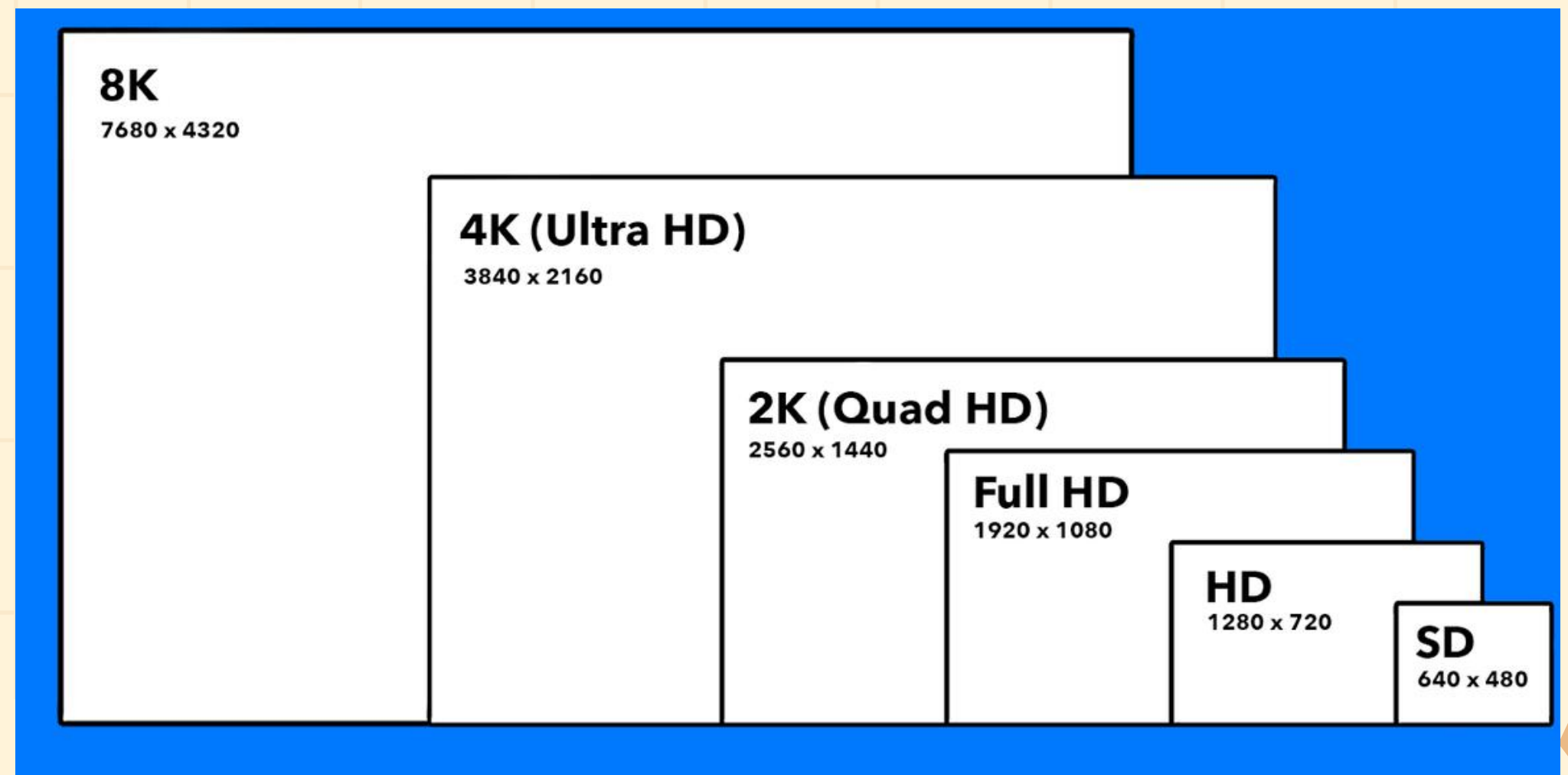
That means:

A 1920 × 1080 image has

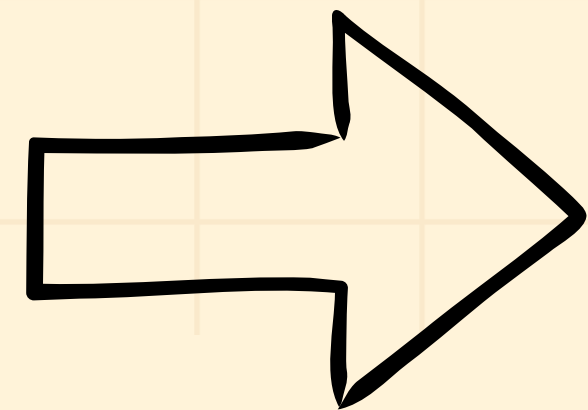
→ 1920 pixels across (width)

→ 1080 pixels down (height)

→ Total = 2,073,600 pixels ≈ 2 Megapixels



# STEPS OF WORKING WITH COMPUTER VISION



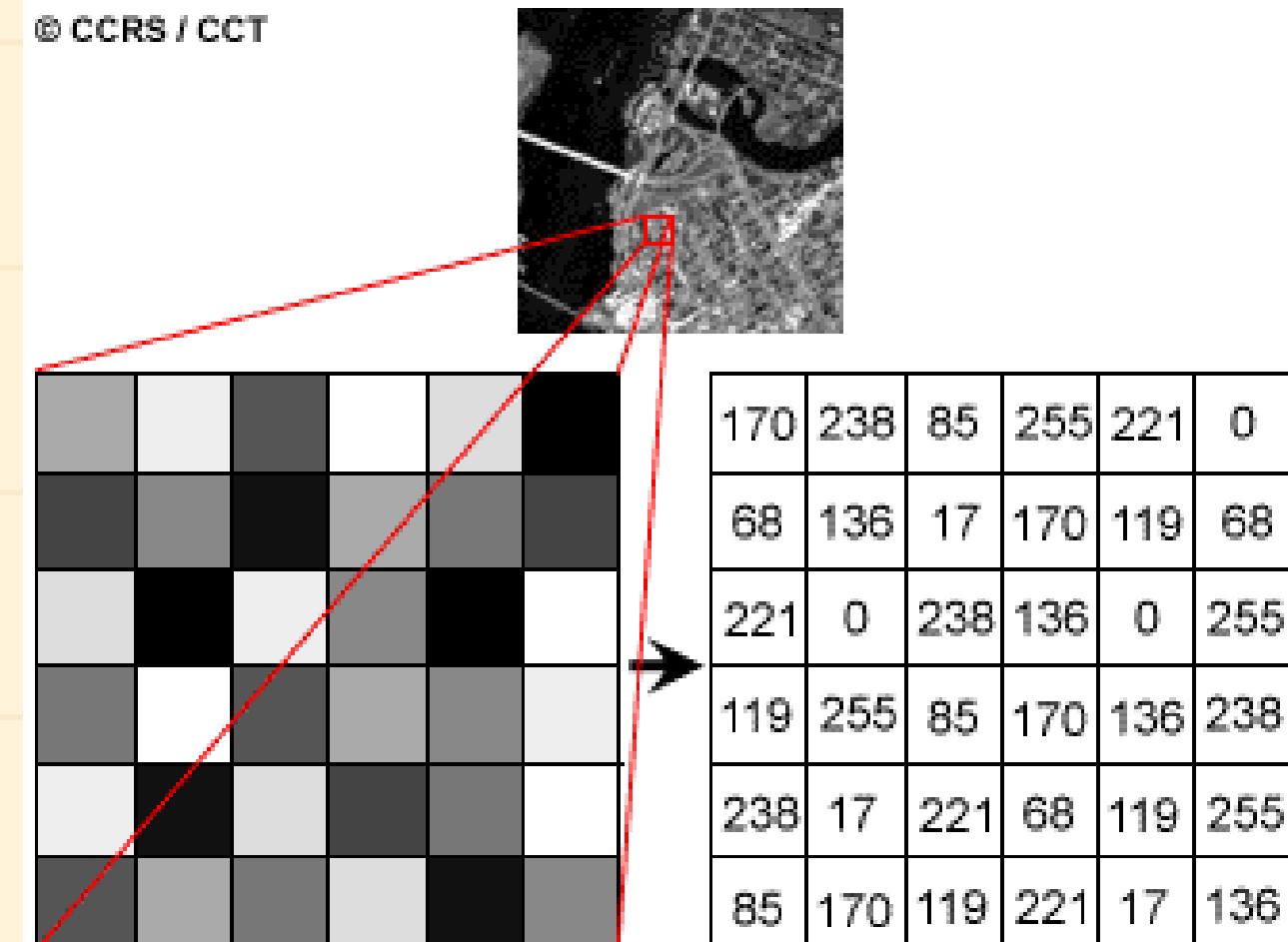
# STEP 1 – IMAGE CAPTURE

- The computer or camera takes an image or video.
- This image is made up of tiny dot called pixel.



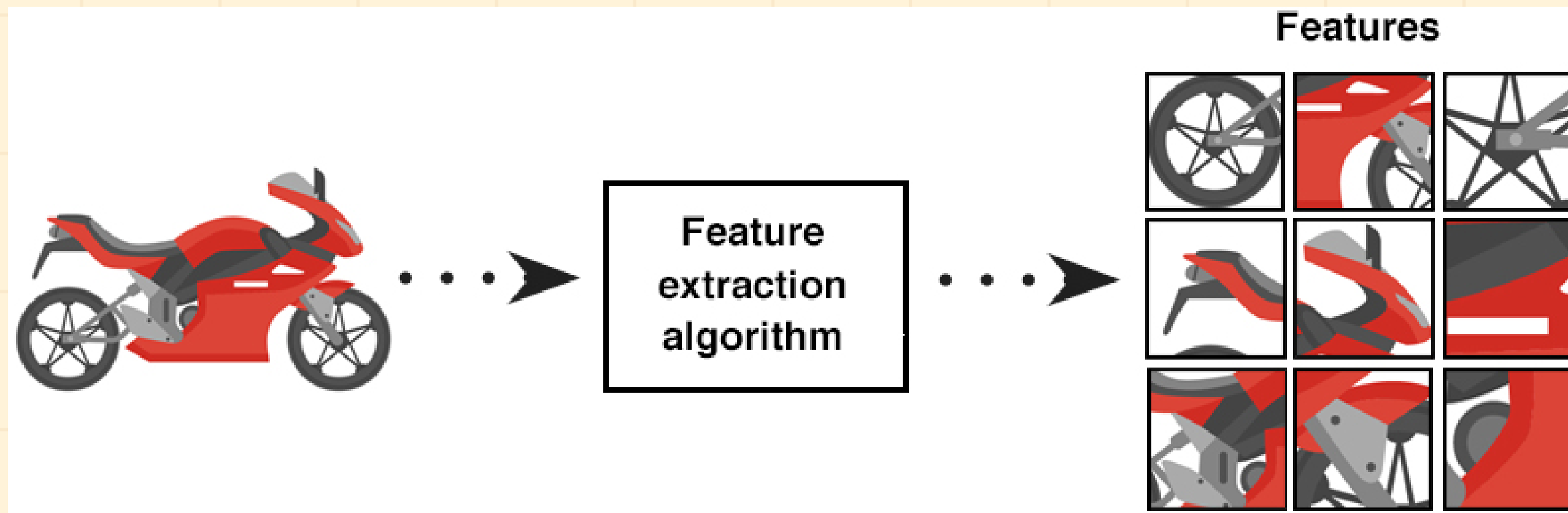
# STEP 2: IMAGE PROCESSING

- The computer analyzes these pixels – Checking color, shapes and edges.
- It converts the image into numerical data , so that it can understand it.



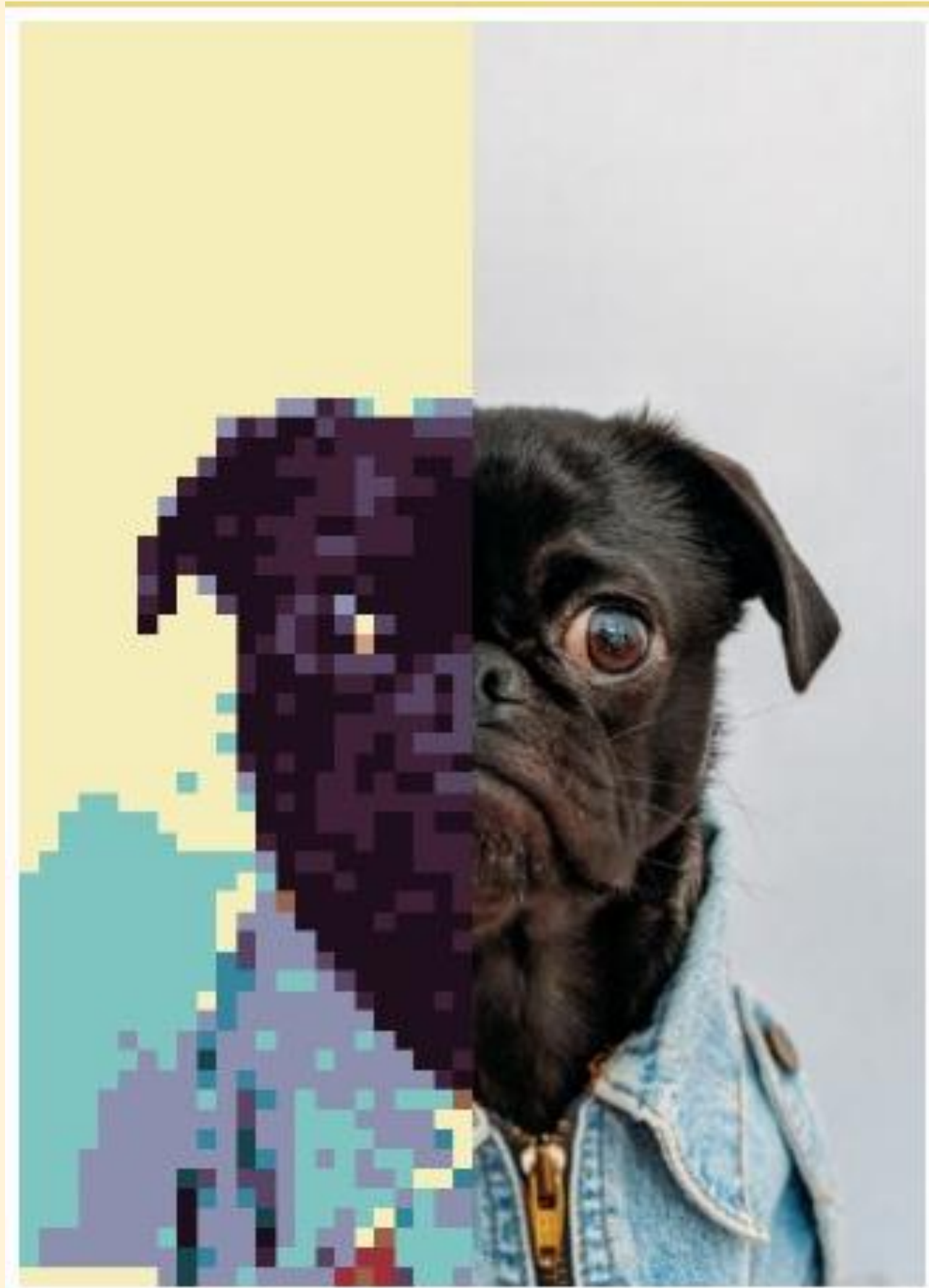
# STEP 3: FEATURE EXTRACTION

- The system looks for important details (called features) – like eyes, nose, or mouth for faces, or wheels for bikes.



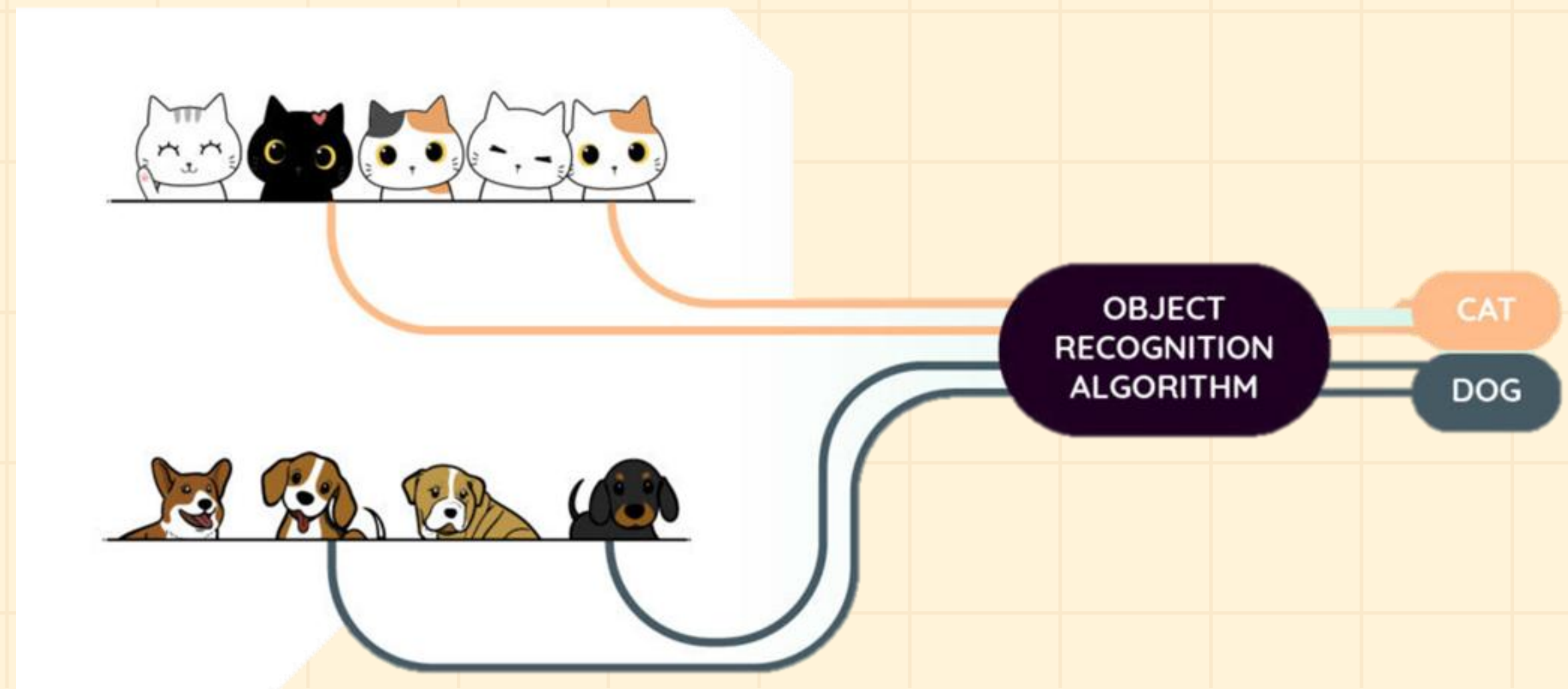
Each group of pixel is labelled, and objects of the same class are assigned unique identifiers. For instance, in an image with Five person standing each person is labelled





# STEP 4: OBJECT RECOGNITION

- The AI model compares with what it sees with what it has learned before.
- It decides: "This is a cat", "That is a human face" or "This is a traffic light"



# STEP 5: DECISION MAKING / OUTPUT

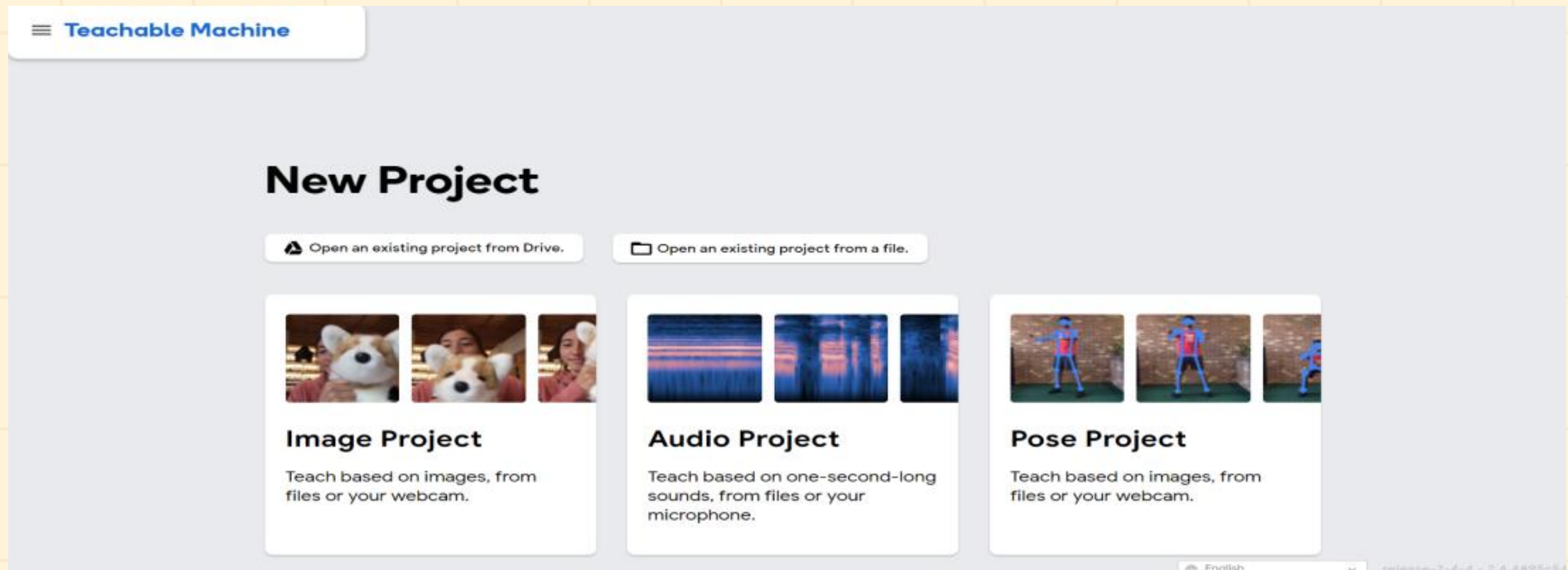
•Finally, it gives output



**Teachable**

**Machine**

- Teachable Machine is a free online tool by Google that allows anyone – even without coding – to train an AI model to recognize images, sounds, or body poses.



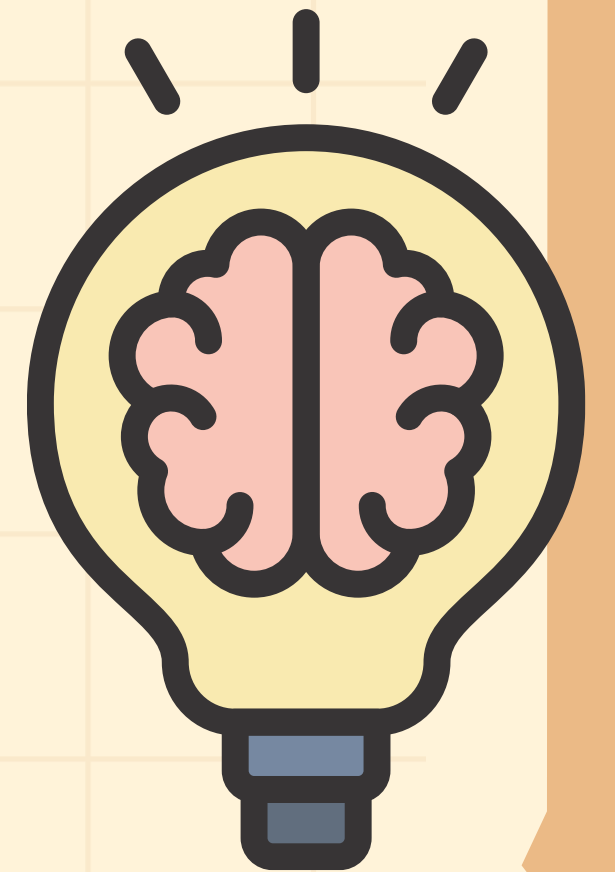
# WHY IS TEACHABLE MACHINE USED?

understand how machine learning works in simple way

train custom AI models

integrate AI into real projects

AI learning fun and hands-on



# HOW DOES TEACHABLE MACHINE WORK?

## Collect Data

- Capture images, record sounds, or take pose samples using your webcam or microphone.

## Train the Model

- The system analyzes your samples and learns to recognize the patterns.

## Test the Model

- Try out your model live to see if it correctly identifies new data.

## Export the Model

- Download it or use it in your Python, Web, or Arduino projects!

# ADVANTAGES OF TEACHABLE MACHINE

- No coding required!
- Works directly from your browser.
- Simple and interactive interface.

