# **Computer Vision**

### What is Computer Vision?

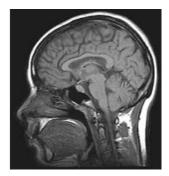
Computer vision is the science and technology of machines that see.

Concerned with the theory for building artificial systems that obtain information from images.

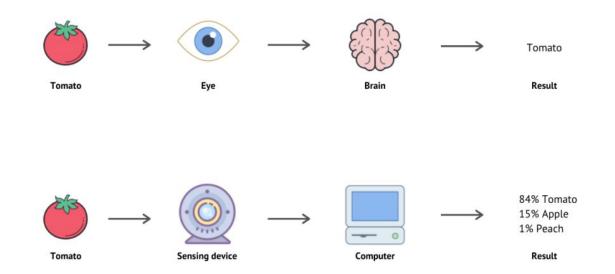
The image data can take many forms, such as a video sequence, depth images, views from multiple cameras, or multi-dimensional data from a medical scanner







### Image Processing Human vs Computer



### History of computer vision

- 1963 Computers were able to interpret the tridimensionality of a scene from a picture.
- 1974 Optical character recognition (OCR) was introduced to help interpret texts printed in any typeface.
- 1980 Dr. Kunihiko Fukushima proposed Neocognitron, a hierarchical multilayered neural network.
- 2000 2001 Studies on object recognition increased, helping in the development of the first real-time face recognition application.
- 2010 ImageNet data were made available containing millions of tagged images across various object classes.
- 2014 COCO has also been developed to offer a dataset.

### What Human vs Computer see?



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### Why computer vision matters



Safety



Health



Security



Comfort

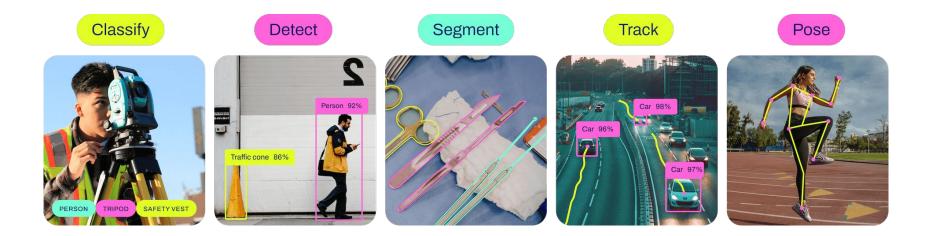


Fun



Access

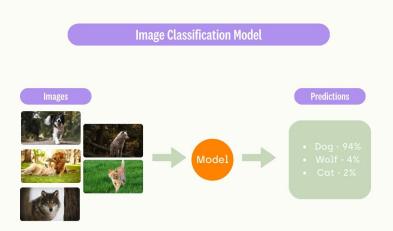
### **Major Classification of Computer Vision**



### Classification

Classification is a technique that involves identifying and categorizing objects within an image or video into predefined classes based on their features and characteristics using machine learning algorithms.

- Retail and Inventory Management
- Healthcare and Medical Imaging



### Detection

Object detection is a technique that involves identifying and locating objects within an image or video, providing both the classification of objects and their spatial coordinates using bounding boxes.

- Surveillance and Security
- Augmented Reality (AR) Applications
- Industrial Automation



### Segmentation

**Computer segmentation** involves partitioning a digital image into multiple segments to simplify and change its representation for easier analysis.

- Autonomous Vehicles
- Medical Imaging



### Tracking

Object tracking is a technique that involves monitoring the movement and position of an object over time across a sequence of images or video frames.

- Sports Analytics
- Traffic Monitoring



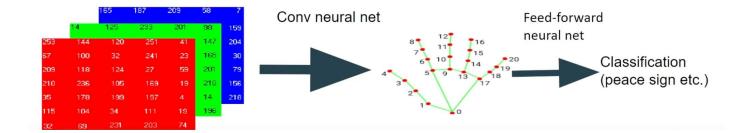
### Pose

Pose estimation is a technique that involves detecting and predicting the spatial positions of key points on a human body or object, enabling the analysis of posture, movement, and orientation.

- Fitness and Rehabilitation
- Human-Computer Interaction (HCI)



### How Computer understands?



### **Gesture recognition**

- Gesture recognition is a technology that allows computers to understand human body language.
- It is a way for computers to understand human body language that allows them to interpret human gestures via mathematical algorithms.
- It allows humans to interface with the machine (HM) and interact naturally without any mechanical devices.

### Example

A smart TV recognizing the hand movement to control the channels or to select a option from the menu.



## **Code Overview**