Computer Vision

Introduction

- ❖ **Computer vision** is the field of computer science that focuses on simulating the human vision system and enabling computers to identify and process objects in images and videos.
- ❖ With advances in AI, deep learning, and available data, the field has been able to take great leaps in recent years and has been able to surpass humans in some tasks related to detecting and labeling objects.
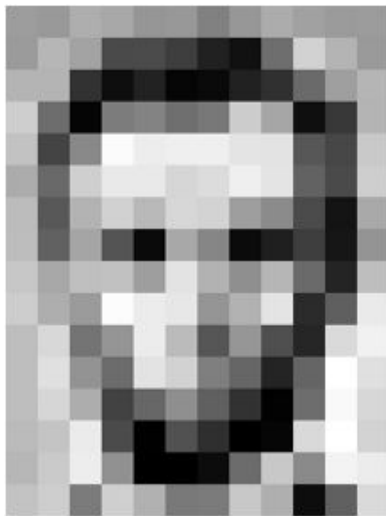
❖ Computer Vision Algorithms now have reached 99 percent accuracy because of the tremendous amount of visual data and the computing power required.

How Does Computer Vision Work

❖ The computer read any image as a collection of pixels of numeric values
❖ Each pixel's brightness is represented by a single 8-bit number, whose range is from 0 (black) to 255 (white) in grayscale images.
❖ Computers read color as a series of 3 values **red**, **green**, and **blue** (**RGB**) on that same 0–255 scale.
❖ Each pixel actually has 3 values for the computer to store.

The Evolution Of Computer Vision

- ❖ Deep learning relies on neural networks provided a fundamentally different approach to doing machine learning.
- ❖ When you provide a neural network with many labeled examples of a specific kind of data, it'll be able to extract common patterns between those examples and transform it into a mathematical equation that will help classify future pieces of information.
- ❖ Creating a facial recognition application with deep learning only requires you to develop or choose a preconstructed algorithm and train it with examples of the faces of the people it must detect.

Applications Of Computer Vision

❖ CV In Self-Driving Cars
- Enables self-driving cars to make sense of their surroundings.
- Allow cars to find the extremities of roads, read traffic signs, detect other cars, objects and pedestrians.

❖ CV In Facial Recognition
- Enables computers to match images of people's faces to their identities.
- Computer vision algorithms detect facial features in images and compare them with databases of face profiles.

❖ CV In Augmented Reality & Mixed Reality
- Enables computing devices such as smartphones, tablets and smart glasses to overlay and embed virtual objects on real world imagery.

- AR gear detects objects in the real world in order to determine the locations on a device's display to place a virtual object.

❖ **CV In Healthcare**
- Help to automate tasks such as detecting cancerous moles in skin images or finding symptoms in x-ray and MRI scans.

Computer vision tasks

❖ Object Classification
❖ Object Identification
❖ Object Verification
❖ Object Detection
❖ Object Landmark Detection
❖ Object Segmentation
❖ Object Recognition
❖ Optical character recognition (**OCR**)
❖ Video motion analysis
❖ Image segmentation
❖ Scene reconstruction
❖ Image restoration
❖ 3D model building (photogrammetry)
❖ Motion capture (mocap)

Image processing

❖ Is the process of creating a new image from an existing image

❖ It is a type of digital signal processing and is not concerned with understanding the content of an image.