

IT KALEIDOSCOPE

THE ERA OF DIGITALEYE

IT KALEIDOSCOPE

THEME: " THE ERA OF DIGITAL EYE "

INTRODUCTION TO COMPUTER VISION

Computer vision: giving vision (ability to see) to the computers, developing techniques that enable the computer to see and understand the content of digital images and videos. In technical words, we can say that Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. For the past 60 years, engineers and scientists have been trying to develop a system that would help machines to see and interpret visual data.

Computer vision works just like the way the human brain works. Humans have a pair of eyes that enables them to see any object, to tell them at how much distance an object is from them, whether the object is in motion or at rest, or if there is something wrong with any image. All these functions are done by human eyes. Computer vision on the other hand is based on recognizing patterns from images or videos. It is trained with a large amount of visual data (computers processed images) by adding label objects on them and then finding patterns in those objects. With the help of computer vision, thousands of products can be processed per minute, humans cannot beat it. It trains machines to perform the functions which are performed by optic nerves, retina, and visual cortex of human eyes are performed with the help of cameras, algorithms, and data.



Computer vision is used to perform multiple tasks like-

Object classification - The system breaks the visual content into parts and analyzes each element and classifies the object on a photo/video to the defined category.

Objects Identification - The system analyzes visual content and identifies a particular object on a photo/video.

Object Tracking - The system processes video, tracks the object that matches search criteria, and tracks its movements.

And with the evolution of technology, computer vision is used in almost every field and is expected to grow its market in the coming years. It is commonly used in-

- Health care
- Transportation
- Facial Recognition
- Augmented Reality
- Agriculture
- Retail

Presently, computer vision is playing a very crucial role. It has made work a lot easier and less time-consuming than it was before as it does not require human efforts. The future of computer vision will certainly perform a wide array of functions in the future. It can also be used with other technologies to create more versatile applications.



ADITI JAIN
BCA 1ST YEAR (1ST SHIFT)



WORKING OF COMPUTER VISION

Computer vision technology is designed to work in the same way as the human brain. The core of today's computer vision algorithms is pattern recognition.

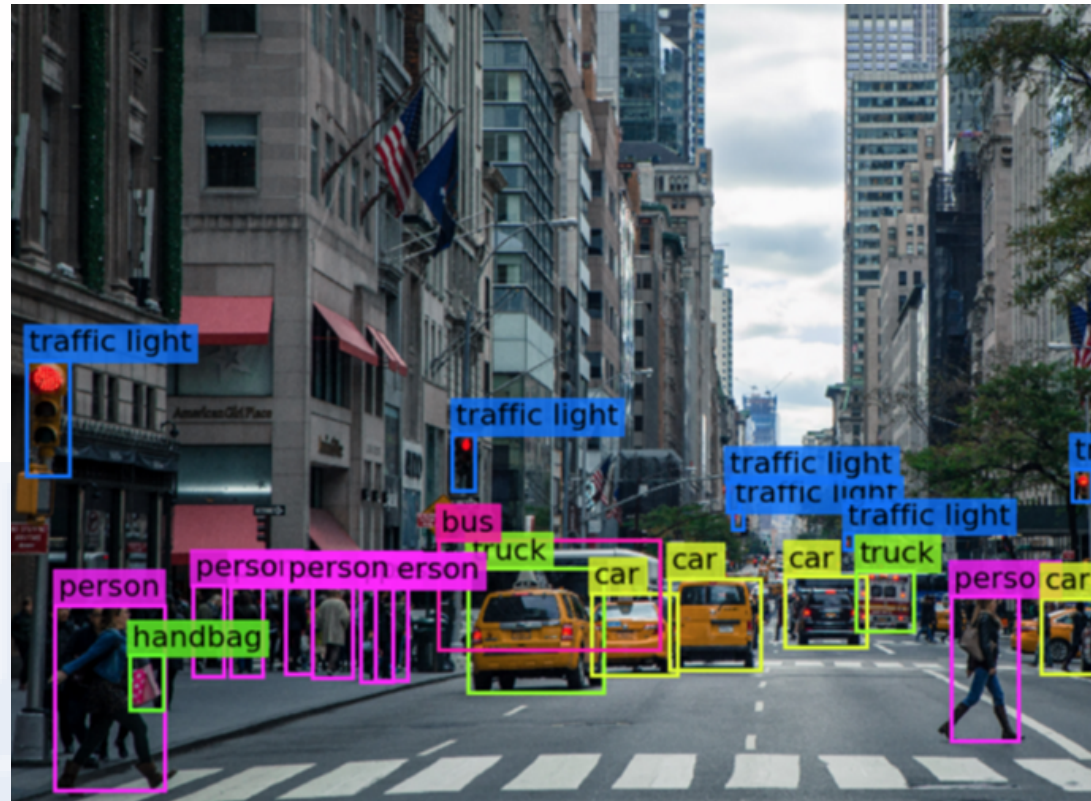
We train computers with a vast amount of visual data. To teach a computer to recognize a certain object, it must be fed a large number of that object's photos and materials related to it for it to understand the distinctions and recognize a similar object, particularly one with no faults. For example, if we send 1,000,000 pictures of roses, the computer will analyze them, find patterns that are common to all roses, and create a model "rose" at the end of the process. As a result, every time we transmit photographs to the computer, it will be able to precisely determine if a certain image is a flower.

Working of Computer Vision is implemented using two main technologies, namely, Deep Learning and Machine Learning

Deep learning is an efficient method of performing tasks using computer vision because it employs a specialized algorithm known as Convolutional Neural Network (CNN). These algorithms are based on human understanding of how the brain works. CNN is employed by deep learning so that the computer can utilize it to distinguish and extract patterns from provided data.

By splitting pictures into pixels that are given labels or tags, a CNN aids a deep learning model in "seeing". It creates predictions about what it "looks" like by using the labels to do convolutions (a mathematical operation on two functions to produce a third function). The neural network performs convolutions and evaluates the accuracy of its predictions in a series of iterations until the prediction begins to come true.

Image classification has always been a crucial task in computer vision. Computers can automatically produce and learn features – distinguishing qualities and properties – by using deep learning in image identification and categorization. Machines also anticipate what is on the image and show the level of outcome-based on many features.



One of the other bases that computer vision works on is Machine Learning. While on the other hand, deep learning provides algorithms for computer vision, machine learning, on the other, provides efficient methods, image processing, and object focus methods for computer vision. Instead of someone training the machine to recognize an image, algorithms allow it to learn on its own.

Computer vision has advanced in terms of recognition and tracking through machine learning. Machine learning offered a unique perspective on computer vision challenges. Developers no longer have to manually code every rule into their vision applications thanks to machine learning. Instead, they created "features," which were mini-apps that could detect certain patterns in photographs. They then utilized a statistical learning technique to find patterns, classify photos, and detect objects in them, such as , logistic regression, decision trees, linear regression, or SVM (Support Vector Machines).

It has become increasingly important that we all understand how computer vision's system works and what types of problems it's appropriate for.

Computer vision may open up a whole new universe of possibilities, but in the end, a machine is only as good as the data used to train it.

How Does Computer Vision Work?

Computer Vision



ROHAN SINGH
BCA 1ST YEAR (1ST SHIFT)



CURRENT IMPLEMENTATION OF COMPUTER VISION IN DIFFERENT INDUSTRIES

Computer vision technology is used in various fields like Automotive Industry, Manufacturing Industry, Agricultural Sector, etc. for various aspects like data security, storing information, checking defects in different materials, etc. Currently, it is used in mostly each and every industry for various aspects. Some of the aspects related to the implementation of computer vision in different industries are discussed in this section.

1) Government Associated Works:

The most common use of computer vision in Government Associated works is for biometric scanning. For example, while making an Aadhaar Card, biometric scanning like a thumb impression scan and a Retina blood vessel scan is done. All that biometric scanning is a part of computer vision. The computer scans and then analyses the fingerprint or the retina blood vessels and saves the scanned information to its cloud/server, which can be used later for various purposes like data security.

2) Automotive Industry:

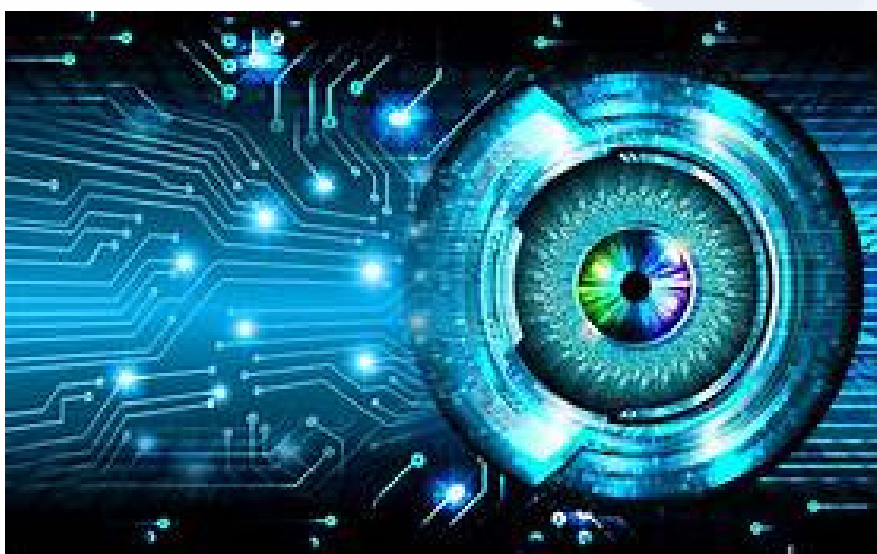
In the present scenario, we have autonomous vehicles that use computer vision technology for driverless rides and to prevent road accidents. The system detects the roads, surroundings, and nearby people, and if it detects that an accident can happen, it tries to prevent the accident by applying brakes automatically. Some cars nowadays even have a facial recognition system that checks whether the driver is alert or not while driving. If it is detected by the system that the driver is asleep, it alerts the driver. Also, it is used for monitoring the condition of roads. The task of monitoring potholes and manholes on a road becomes a much easier task when it is done through computer vision since this method is time-efficient and requires less effort.

3) Manufacturing:

In the manufacturing industry, computer vision is used to analyze the products which were earlier done manually by workers which helped to improve the product quality. Consider the case of a factory which produces metal on a large scale. Earlier, trained people were hired to check for the crack in the metal. But now it can be done by using Computer Vision since computer (which is based upon sets of codes) can easily detect any kind of crack or defect in that metal. So, the work can be done more conveniently than manual work. Some smart camera applications are available which help to implement visual inspection to analyze defective parts in a system as shown in the picture given below.

4) Agriculture:

Computer vision can prove to be very helpful in the field of agriculture too. It can be used to check the quality of soil, crop yield, and ripeness. It can also analyze the quality of the crop by checking for pests. This helps farmers have a fair idea about their crop's yields. Not only crops, but computer vision can help in other aspects as well. For example, using computer vision, the behavior of the animals can be monitored. By doing so, one can increase productivity and keep an eye on the health of animals, which ultimately proves to be beneficial since we can focus more on the animals with more critical conditions.



ADITYA PANDEY
BCA 1ST YEAR (1ST SHIFT)



WIDELY USED PROJECTS RELATED TO COMPUTER VISION

The world is experiencing and innovating to make human life more resourceful and plenty. Brilliant minds have produced bewildering advancement ideas, which it came to life can completely change the trajectory of human perception of living life. There are many projects such as object detection, edge detection, color detection, face recognition, image classification, hand gesture recognition, vehicle counter, and many more.

Object Detection: Object detection enables the ones and zeroes to detect an object which is done through tracking the objects in real-time using the pre-embedded raspberry pi module. Zeroes and ones learn from mistakes and display an impeccable efficient way to solve the issue. Object detection is one of the most prominent fields of artificial intelligence. Computer vision is a collection of numerous individual parts such as a part for generating an image, image recognition, etc. object detection is the umbrella under which subfields such as vehicle detection, color detection, face detection pedestrian counting, driverless cars appear. The software coding is centered around the python programming language. And a python build library known as ImageAI enables us to bring the concept of object detection to life.

Edge Detection: Edge detection technology refers to perceiving images as a sharp connection of lines or edges that when combined displays an image as similar as provided image. But by reading this a question arises in most of the minds that how does a computer detect edge ?. using mathematical functions and operations, curves and straight lines are observed to vary depending on image brightness level is often referred to as discontinuities. Discontinuity is a point where a function becomes discontinuous in its domain. Finding discontinuity in computer vision is done through step detection. There are numerous edge detection methods including canny edge detection, Sobel edge detection, Prewitt edge detection, and Laplacian edge detection. But edge detection leads to shrinking of the output and sometimes edges are left undetected or lost.

Hand gesture recognition: Hand gesture recognition is used to identify the gestures which are made by the hands and perform the exact task on detection, we usually see this splendid concept applied in our mobile device's camera, which easily detects palm and the command stored enables to capture the image and save it simultaneously. The computer recognizes hand gestures via mathematical algorithms.

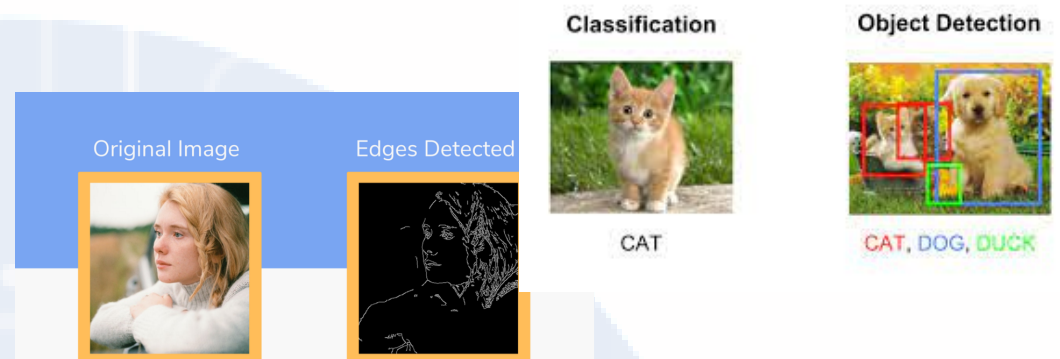


Image classification: Image classification is also a technique used by the software to detect similar features in the image and classify the image according to their domain, domain can be anything shapes, animals, tools. Image classification is mainly centered around the python computer language. If an image is 248 pixels wide and 400 pixels tall, consists of three colors red, green, and blue (RGB), then the image would consist of $248 \times 400 \times 3 = 297600$ numbers, it is perceived as an array of integers. There are a few problems faced such as variation in viewpoint, what may seem as one thing may be seen as other things by the computer. Classifying deformed object images is not possible. Sometimes background clutter may also affect the end result. Classifying images can prove to be a great help to softwares that are completely based on searching and sorting protocols. The sorting part is done via image classification and then the searching part in the pre-sorted data is a cinch.

We are advancing swiftly. The involvement of artificial intelligence in our lives and the existing technology is enabling the rise of a new era. The advancements in technology are providing various chances for everyone to take a step forward and live the future.



PARUL MEHRA
BCA 2ND YEAR (1ST SHIFT)



IT KALEIDOSCOPE

THEME: "THE ERA OF DIGITAL EYE"

FUTURE SCOPE OF COMPUTER VISION

Computer vision, or the ability of artificial intelligence systems to "see" humans, has been a topic of growing interest and intensive research for decades. This concept was initialized in 1970. To emulate the human visual system, research in computer vision aims to develop machines that can automate tasks that require visual perception. However, the process of deciphering images is much more complex than understanding other forms of binary information because of the vastly larger amount of multidimensional data that needs to be analyzed. This enables the development of AI systems that can recognize more complex visual data.

Today's computer vision technology is powered by deep learning algorithms that use a special type of neural network called convolutional neural networks (CNN) to give meaning to images. These neural networks are prepared with a large number of test images that help the calculation comprehend and separate pixels from a picture. These neural networks check the pictures pixel by pixel to perceive designs. It also saves the ideal result for each input image (in the case of supervised learning) or classifies image components by scanning properties such as outlines and colors. The systems then use this memory as a reference when scanning additional images. And with each iteration, the AI system improves by delivering the right result.

With more research and refinement of technology, computer vision will serve a wider range of functions in the future. vision advances won't just be simpler to prepare however can likewise perceive pictures better than anyone might have expected. For example, caption applications can be combined with Natural Language Generation (NLG) to interpret objects in the environment for the visually impaired. vision will likewise assume a significant part in the advancement of artificial general intelligence and artificial superintelligence enabling them to handle data better than the human visual framework. Computer vision in the automobile field is done by Tesla with their autopilot systems; it is capable of driving us from our place to a particular place or shopping complexes.



Future of Computer Vision and its applications

API has many applications that help in performing various operations at a fast pace. Video surveillance: enable security systems helps in engaging employees; Vision-based biometric authentication: provides safe and reliable authentication of employees. Without their physical presence, employees can virtually log in and it verifies user identity through their unique retina.



What if someone says that we can use our face-id to sign digital documents? Yes, now we can do this it is possible now. With the conceivable outcomes of computer vision today it is difficult to accept that there are more advantages and employments of the innovation that are as yet neglected. The future of computer vision will find the way for artificial intelligence systems that are as human as we are. Before that, however, there are still a few challenges to overcome, the largest of which is demystifying the AI black box. This is because, like other deep learning applications, computer vision is functionally effective, but internally it cannot be deciphered.



ISHIKA GUPTA
BCA 2ND YEAR (2ND SHIFT)

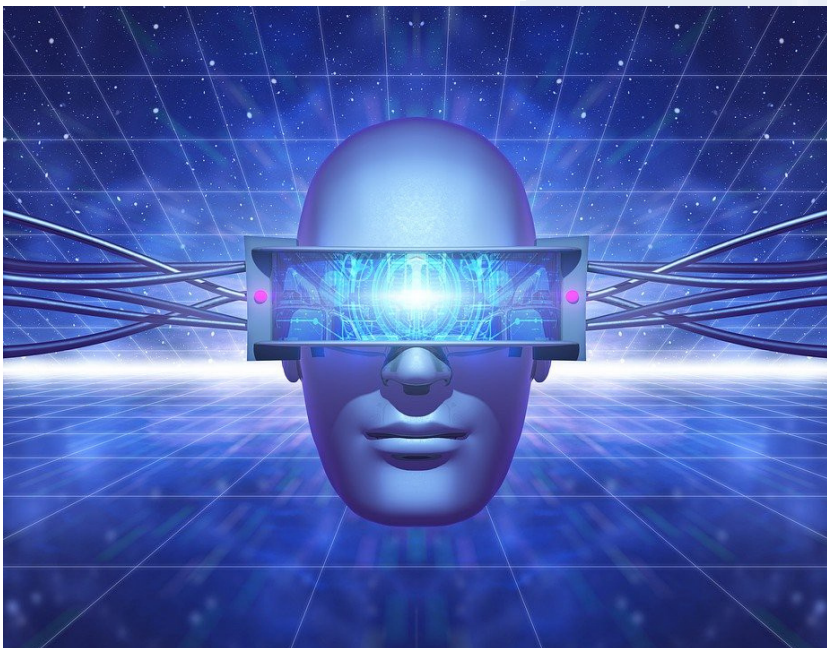
IT KALEIDOSCOPE

THEME: "THE ERA OF DIGITAL EYE"



**FUN
FACT!**

- 1) It is fascinating to know that the concept of computer vision is all started with an assignment that an MIT professor gave to a group of students around 50 years ago.
- 2) It is interesting to know that we have discovered very few uses in which the computer vision invented by humans is doing way better than the human vision itself.
- 3) The Computer Vision team of Google trained a machine that can diagnose diabetic retinopathy better than the certified human ophthalmologist.
- 4) The majority of people do not realize that the funny filters they are using in the famous app "Snapchat" are one of the common uses of Computer Vision.
- 5) Computer vision can even help you transform your autumn images to winter, an image of running Donkeys to Zebras, and many more.
- 6) CV researchers are working all way to make the vision of the computer surpass all the qualities of their vision one day.
- 7) Computer vision is used to enable automatic cars like Tesla. Driving requires focus to avoid accidents and in such a case a computer vision will ultimately reduce the risk of accidents.
- 8) Fei-Fei Li, one of the world's leading CV researchers compared computer vision to kids. As per him, the child isn't taught by anyone how to see. And visualizing a child's eye as a camera, it captures an image every 200 milliseconds. So in 2-3 years, the child would have already seen hundreds of millions of pictures which is a mind-blowing training set for a model.



MUSKAN JUNEJA
BCA 2ND YEAR (2ND SHIFT)



ROLES & RESPONSIBILITIES

PROGRAM INCHARGE
DR. PRAVEEN ARORA

FACULTY INCHARGE
MS. PRIYANKA GANDHI

COORDINATOR
ANKIT SINGHAL
(BCA 3RD YEAR 1ST SHIFT)

EDITOR
ANKIT SINGHAL
(BCA 3RD YEAR 1ST SHIFT)

SAHIL KUMAR
(BCA 1ST YEAR 1ST SHIFT)

DESIGNERS
SAMPADA VERMA
(BCA 2ND YEAR 2ND SHIFT)

SILVIYA
(BCA 1ST YEAR 2ND SHIFT)

THE STUDENT'S IT PRESS

Recent Innovations In IT Sector

- Amazon launches home -patrolling robot Astro.
- Hai Robotics picks up \$200M for its Warehouse robot.
- Intel Tiger lake H-series CPUs for Laptops announced.
- Researchers create AI that makes blurry faces look over 60 times sharper.
- MIT uses AI to recreate the possible painting techniques of famous artists.
- A robot that swabs a patient's throat for covid -19 developed in Denmark.
- AI monitor to ensure proper handwashing developed by japan's fuji.
- Google ends the trial of its printing service for AI -selected photos.
- Facebook trains AI to fool face recognition systems in real-time.
- Facebook develops robots that can install fiber- optic cable at \$3 per meter.
- AI model to predict survival of planetary systems made: Scientists.
- New AI chips can reduce 1-hour computing tasks to 5 mins : Alibaba.

Jagan Institute of Management Studies

3, Institutional Area, Sector-5, Rohini (Near Rithala Metro Station), Delhi-110085.

