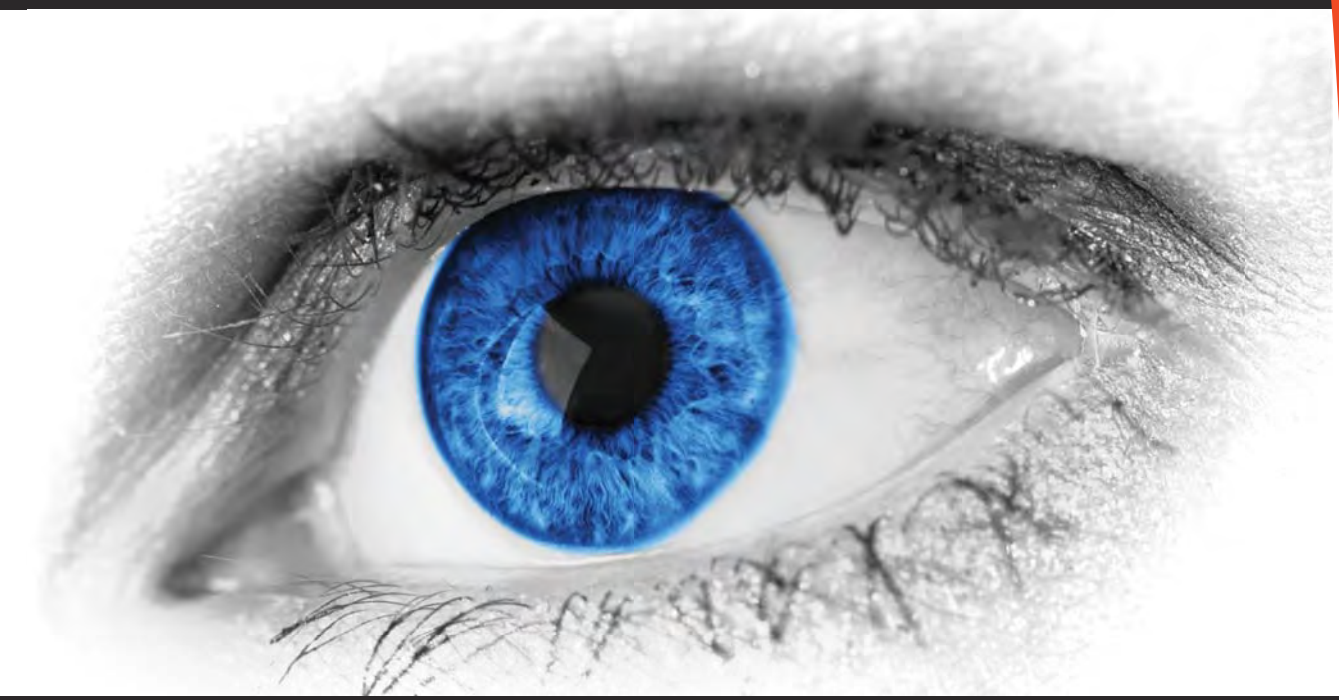
Computer Vision Intelligent Solutions



Video & Image Analytics

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An exponential growth in digital information has created more data than had ever had. Almost everything we do has a digital consequence since everything is now been constantly recorded and quantified. Due to incredible advancements and easy access to powerful technologies such as internet, smart phones, Internet of Things (IOT) etc. we are amassing huge amounts of data at an unbelievable rate. Cisco has predicted that by 2019, 80% of global Internet consumption will be video content. Data is now rightly seen as an invaluable asset that business can use to gain meaningful insights such as market trends and individual behaviour. However, it is beyond humans to analyse such massive amounts of data that will result in knowledge discovery for decision making process especially if it is in video and image form. This is where computer vision and machine learning techniques comes in.

As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences, views from multiple cameras, or multi-dimensional data from a medical scanner. Computer vision is a field that includes methods for acquiring, processing, analyzing, and understanding images and, in general, high-dimensional data from the real world in order to produce numerical or symbolic information, e.g., in the form of decisions.

The computer vision and machine vision fields have significant overlap. Computer vision covers the core technology of automated image analysis which is used in many fields. Machine vision usually refers to a process of combining automated image analysis with other methods and technologies to provide automated inspection and robot guidance in industrial applications. In many computer vision applications, the computers are pre-programmed to solve a particular task, but methods based on learning are now becoming increasingly common. Examples of applications of computer vision include systems for:

- Controlling processes, e.g., an industrial robot;
- Navigation, e.g., by an autonomous vehicle or mobile robot;
- Detecting events, e.g., for visual surveillance or people counting;
- Organizing information, e.g., for indexing databases of images and image sequences;
- Modeling objects or environments, e.g., medical image analysis or topographical modeling;
- Interaction, e.g., as the input to a device for computer-human interaction, and
- Automatic inspection, e.g., in manufacturing applications.

Advancements in machine learning algorithms such as face detection, object detection, tracking and face recognition has resulted in its popularity in the visual surveillance domain. In the following, we shall describe few of these popular computer vision techniques and its application domains.

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection determines the locations and sizes of human faces in digital images. It detects face and ignores anything else, such as buildings, trees and bodies. Many people often confuse face detection with face recognition. Face recognition consists of finding face/s provided by system (e.g. via camera or server) and finding the correct or closest match in the existing face database.

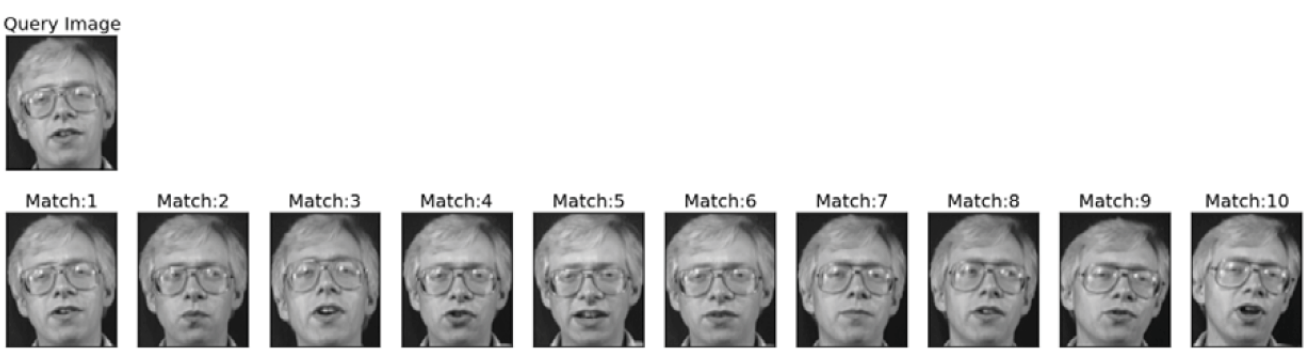
It is often used in the video surveillance domain as a part of face recognition technology. Dependent on the requirement, the faces can also be extracted from databases, folders or web camera.

A face recognition system is a computer application capable of identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. From the below figure, it can be seen that our algorithm is very robust to various facial expression and is able to accurately retrieve all the 10 images of the individual from the database. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. In addition to being used for security systems, authorities have found a number of other applications for facial recognition systems.

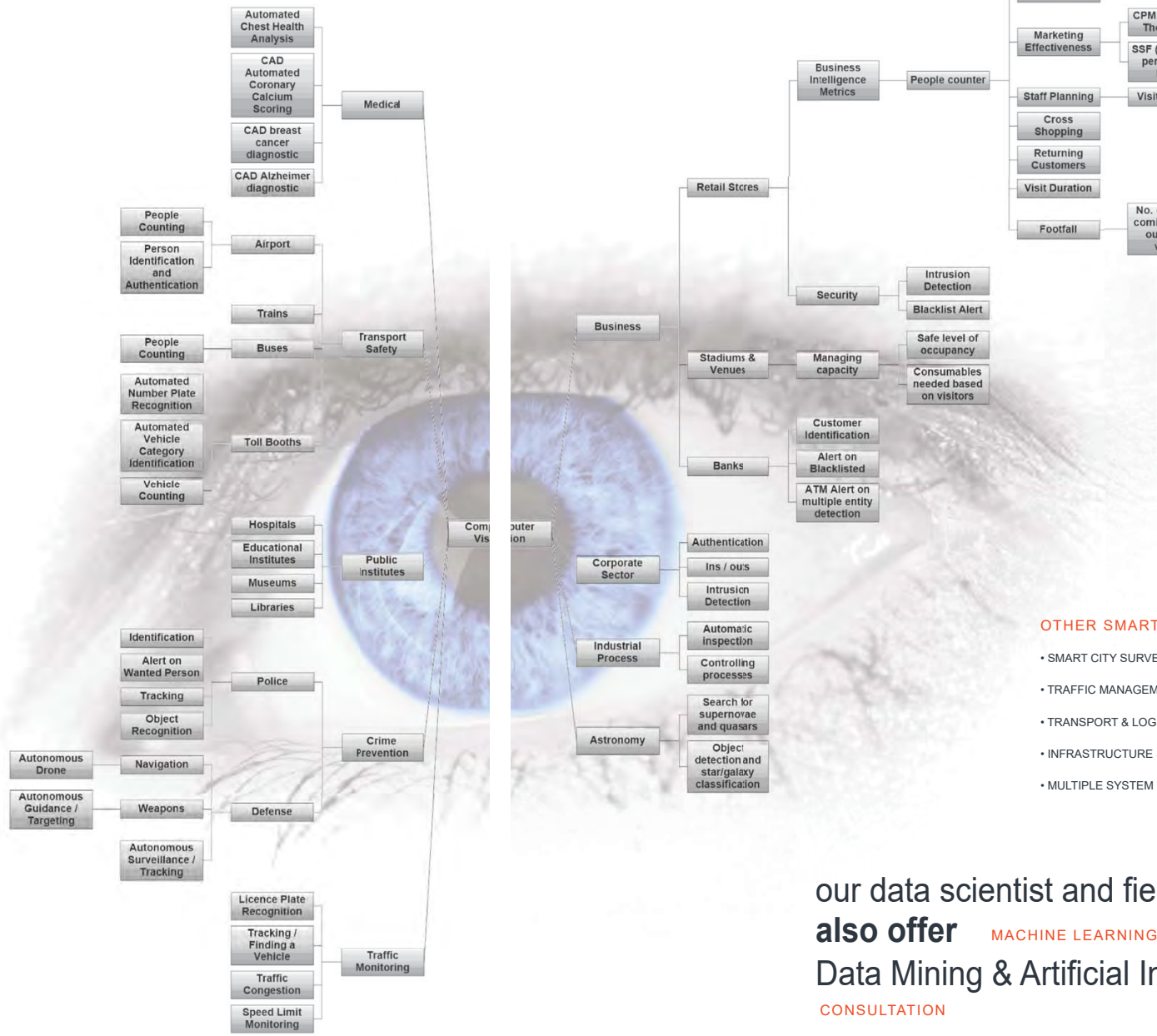
Law enforcement agencies can use the face recognition system to search for potential criminals and terrorists in attendance at a particular event or search for a wanted person from particular CCTV or web camera. Government agencies can also employ the recognition software to prevent voter fraud or prevent people from obtaining fake identification cards and driver’s licenses.

For financial institutes and banks, the technology could be used as a security measure at ATMs. Instead of using a bank card or personal identification number, the ATM would capture an image of the customer's face, and compare it to the account holder's photo in the bank database to confirm the customer's identity. Financial institutes could use this system as a preventive measure to shortlist or identify blacklisted individuals and therefore prevent an individual from obtaining multiple loans.

Corporates and other businesses can use face recognition system in conjunction with people counting system to get footfalls, Ins and Outs, access control system, VIP identification. They can also use it to identify an employee or customer who are from other branch, department or location that are visiting their premises.



COMPUTER VISION APPLICATION AREAS



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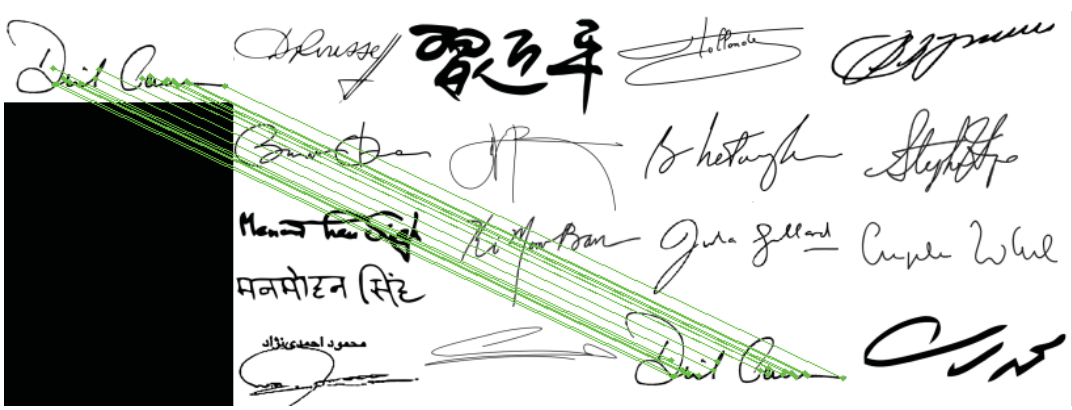
In the field of computer vision object recognition describes the task of finding and identifying objects in an image or video sequence. Object recognition is a process for identifying a specific object in a digital image or video. Object recognition algorithms rely on matching, learning, or pattern recognition algorithms using appearance-based or feature-based techniques. Humans recognize a multitude of objects in images with little effort, despite the fact that the image of the objects may vary somewhat in different view points, in many different sizes and scales or even when they are translated or rotated. Objects can even be recognized when they are partially obstructed from view. Similarly, using the state of art technology, we now present to you a computer vision - machine learning algorithm that is able to identify and recognise objects that are invarient to size, scale or rotation.

There are various application of object recogtion in various domians. As an example, we have presented to you the below images that was actually produced from an object recognition algorithm. The top image is that of breakfast cereal products and the bottom image is that of signatures. It can be seen that the object recognition algorithm is able to correctly able to identify the query image from the given list of images.

As mentioned earlier, there are various applications of object recognition, that can range from law enforcement agencies and financial institutes to industries and businesses such as retails. As a security application, it can be used to identify fingerprints, signatures, lost and found items or any other objects of interests such as guns or other dangerous weapons.

In retails, it can be used by customers via mobile app to find a particular product on shelf an know the price and discount offered on the product or find similar products such as garments having same pattern but different color or vice versa. It can also be used as a part of inventory management system. In industries, it can be as a part of machine vision system to read product serial number on conveyer belt or as a part of quality control to identify defective product or guage the level of product in the product container.



Computer vision applications are only limited by imagination. It can be used in drones for automated navigation and inspection of areas or objects, such as identifying any obstructions to high voltage power lines or patrolling terrains not navigable by humans.

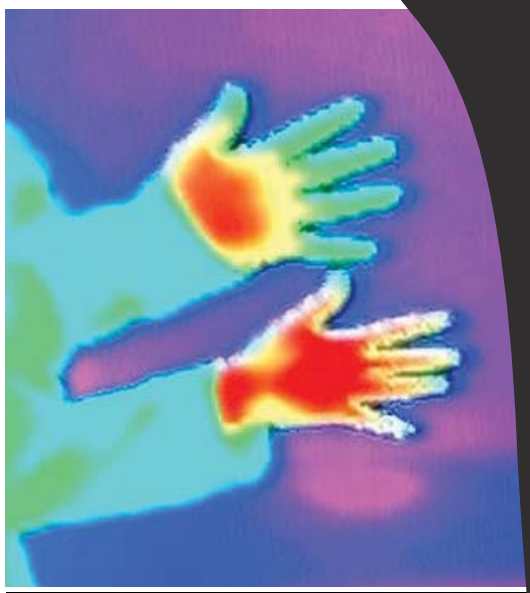
In automobiles, it works as a part of pedestrian detection and collision avoidance system, i.e. when a person, obstacle or a car is detected on collision course, the system can accordingly signals the car computer system to take appropriate actions such as slowing down or bringing the car to a halt. Computer vision also forms a vital part of optical character recognition, and some of its popular application includes automated licence plate recognition.

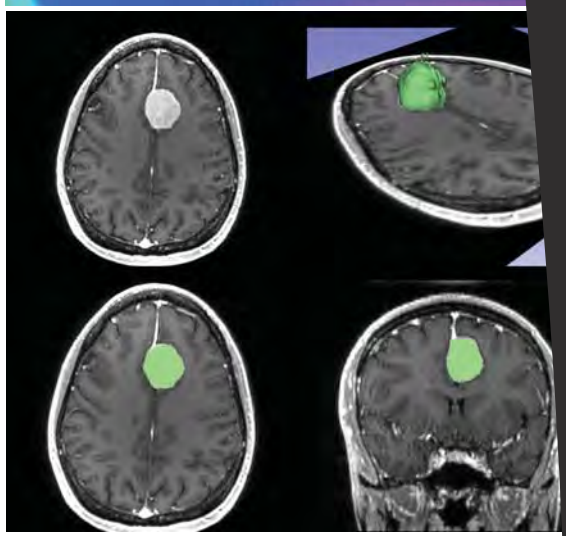
In medical domain, computer vision can play vital role in diagnostics in many cases. As an example, it could be used for automatically find tumour that can help the doctor in identifying or bringing to his/her attention, the area of interests, such as brain tumour, more easily.

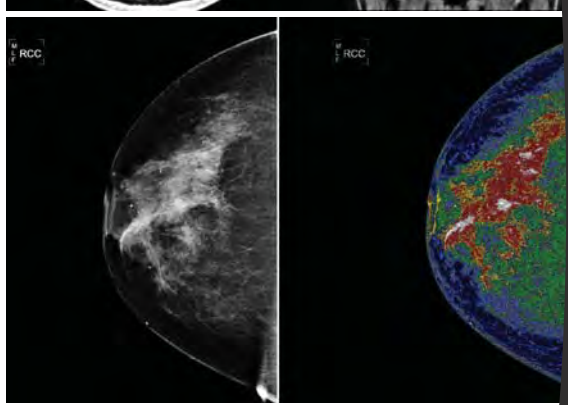
In the field of astronomy, computer vision and machine learning can be used for automated detection and classification of stars, galaxies and quasars. There is huge amount of space data generated, and a single picture could contain millions of galaxies and stars. With the aid of computer vision, finding and classifying these celestial objects becomes more efficient.

In security field, it can be used to only store video feed from CCTV having any activity, thereby saving huge space in storage. Alternatively, it could be used to sift through petabytes of video or image data to fine a particular object or person.

Machine learning and artificial intelligence algorithms form the core of computer vision based solutions and aid the system to identify and learn from what it sees. All you have to do is, present to us your problems, and our experts shall recommend flexible solutions for your business needs.







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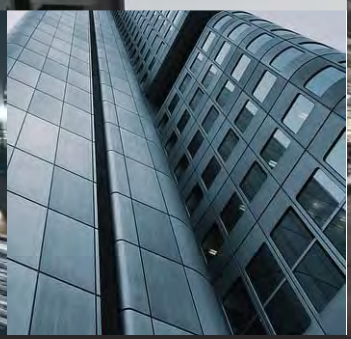

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