Vehicle classification system using CNN with Keras

The use of computer vision in automatic vehicle classification has a long history. Over the years, technology for automated vehicle classification and vehicle counting have improved. Using ordinary, low-cost security cameras and deep learning algorithms, large-scale traffic analysis systems can be implemented.

Vehicles can be identified, tracked, and classified in several lanes concurrently using inexpensive sensors such as closed-circuit television (CCTV) cameras, light detection and ranging (LiDAR), and even thermal imaging equipment. Combining various sensors such as thermal imaging, LiDAR imaging, and RGB cameras can increase vehicle categorization accuracy (common surveillance, IP cameras).

There are also a variety of specialities; for example, a deep-learning-based computer vision system for construction truck recognition has been used for safety monitoring, productivity evaluation, and managerial decision-making.

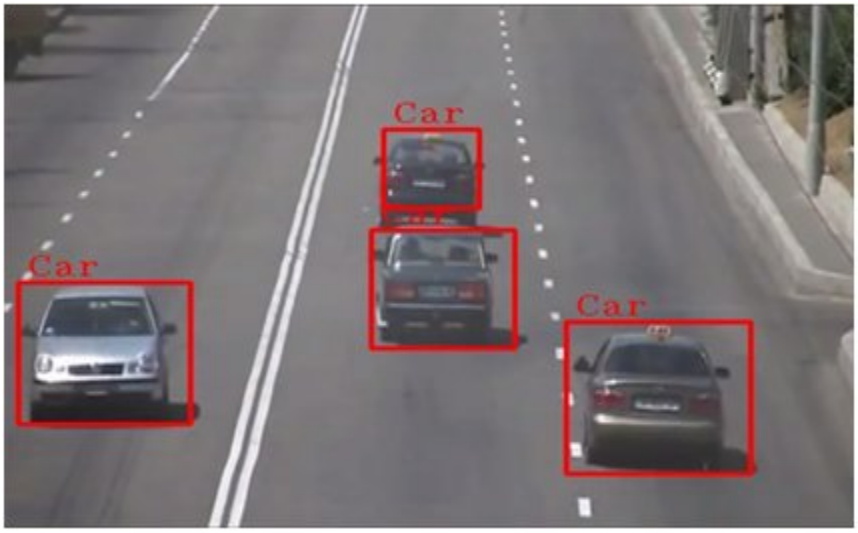


Image Classification:

Image classification, localisation, image segmentation, and object identification are some of the main problems in computer vision. Image classification can be regarded as the most fundamental of these issues. Other computer vision challenges are built on top of it.

Medical imaging, item recognition in satellite images, traffic management systems, brake light detection, machine vision, and other applications all require image classification software.

The task of categorising and giving labels to groups of pixels or vectors within an image based on specific rules is known as image classification. One or more spectral or textural characterizations can be used to apply the categorization law. There are primarily two types of image classification techniques: Techniques for supervised and unsupervised image categorization

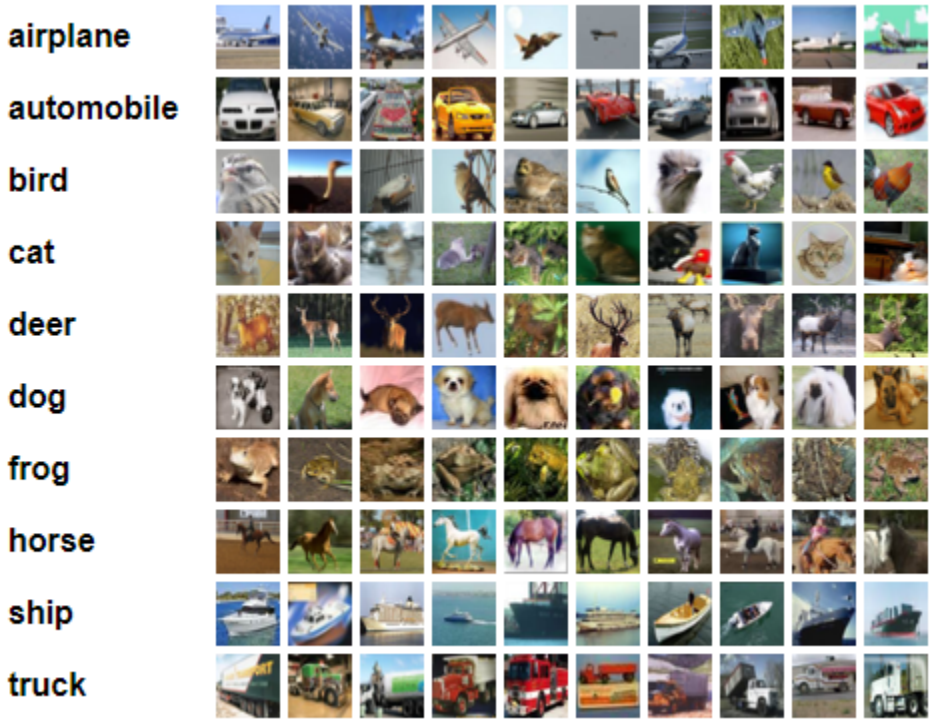
Data set

CIFAR-10 is an established computer-vision dataset used for object recognition. It is a subset of the 80 million tiny images dataset and consists of 60,000 32x32 color images containing one of 10 object classes, with 6000 images per class. It was collected by Alex Krizhevsky, Vinod Nair, and Geoffrey Hinton.

The CIFAR-10 data consists of 60,000 32x32 color images in 10 classes, with 6000 images per class. There are 50,000 training images and 10,000 test images in the official data. We have preserved the train/test split from the original dataset.

Note:- The classes are completely mutually exclusive. There is no overlap between automobiles and trucks. "Automobiles" includes sedans, SUVs, things of that sort. "Truck" includes only big trucks. Neither includes pickup trucks

Data Set Link



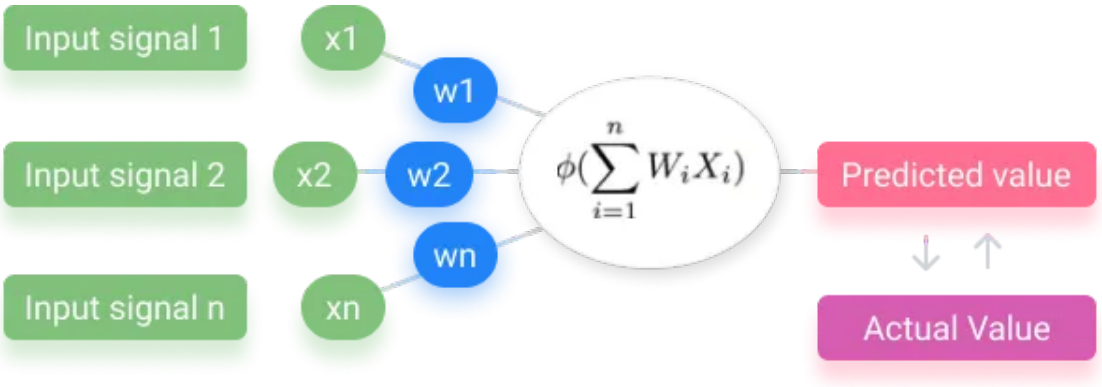
Convolutional Neural Network (CNN)

The task of categorising images into one or more preset classifications is known as image classification. Although people are instinctively and habitually capable of categorising images, it is far more difficult for an automated system to recognise and classify images.

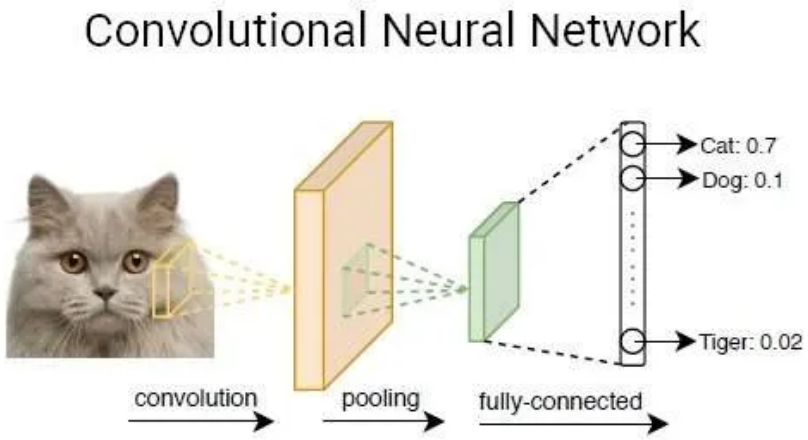
A CNN is a machine learning framework that was created using machine learning ideas. Without the need for human intervention, CNNs can learn and train from data on their own.

In fact, when using CNNs, only a little pre-processing is required. They create and alter their own image filters, which must be carefully designed in order to work with most algorithms and models. Layers in CNN frameworks fulfil certain functions, allowing the CNN to accomplish these functions.

A neuron is the fundamental building block of a CNN framework. Human neurons are the basis for the concept of neurons. These are statistical functions that compute the weighted average of inputs and then apply an activation function to the output. Layers are a collection of neurons, each with a distinct purpose.



A CNN system can include anywhere from three to 150 layers, or possibly more: The term "deep neural networks" refers to the amount of layers in the network. The output of one layer becomes the input of another. Resnet50 (50 layers) and ResNet101 (101 levels) are examples of deep multi-layer neural networks (101 layers).



References :-

1. A rapid learning algorithm for vehicle classification - link
2. Dynamic Bayesian Networks for Vehicle Classification in Video - Link
3. Automatic Vehicle Counting from Video for Traffic Flow Analysis - Link
4. Automatic Vehicle Counting for IoT based Smart Traffic Management System for Indian urban Settings - Link