

# Object Recognition Using MATLAB

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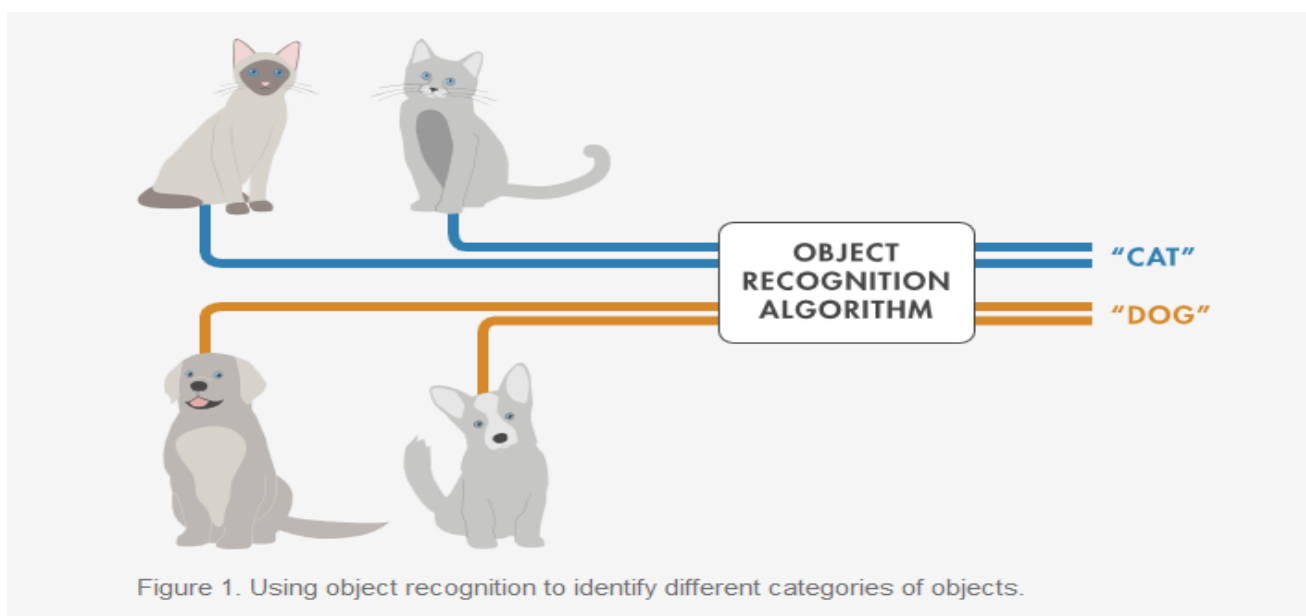
## *Abstract*

In the field of computer vision Object Recognition is a good technology. It considered to be one of the challenging and difficult tasks in computer vision. it has been Many approaches and proposed in the past, and a model with a new approach which is not only fast but also reliable. Easy net model has been compared with various other models as well. Easy net model looks at the whole image at test time so its predictions are informed by global context .At the prediction time, our model generates scores for the presence of the object in a particular category.

**Key words-** *Computer vision, Approach, Image detection, Object recognition, MATLAB*

## 1. INTRODUCTION

Object recognition is a good technique for identifying objects in images or videos in computer vision. Object recognition is a key output of deep machine and learning algorithms. When humans look at a photograph or watch a video, we can readily spot people, objects, scenes, and visual details. The goal is to teach a computer to do what comes naturally to humans: to gain a level of understanding of what an image contains.



Object recognition is a key technology behind driverless cars, enabling them to recognize a stop sign or to distinguish a pedestrian from a lamppost. It is also useful in a variety of applications such as disease identification in bio imaging, industrial inspection, and robotic vision. Object detection and object recognition are similar techniques for identifying objects, but they vary in their execution. Object detection is the process of finding instances of objects in images. In the case of deep learning, object detection is a subset of object recognition, where the object is not only identified but also located in an image. This allows for multiple objects to be identified and located within the same image.

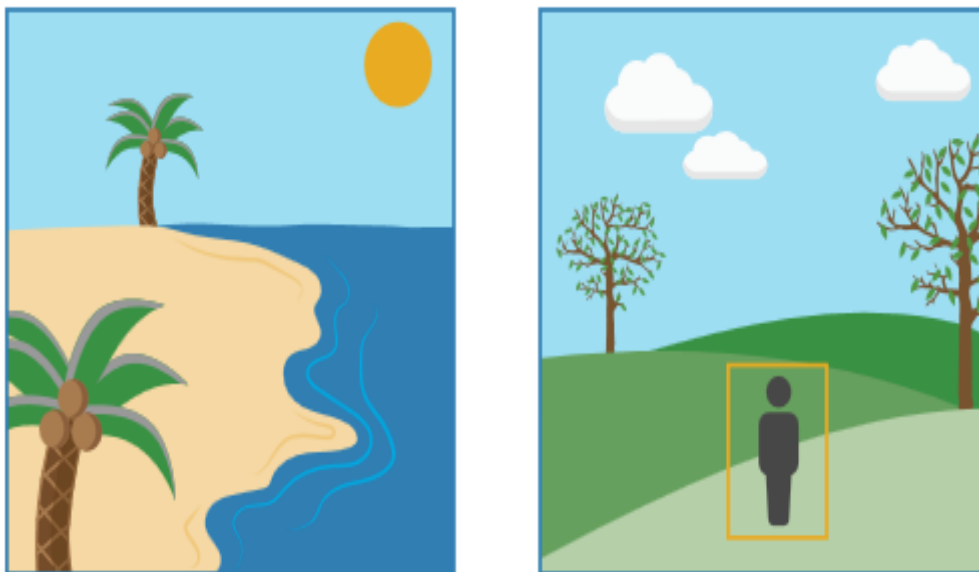


Figure 2. Object recognition (left) and object detection (right).

## **2. HOW OBJECT RECOGNITION WORKS**

We can use a variety of approaches for object recognition. Recently, techniques in machine learning and deep learning have become popular approaches to object recognition problems. Both techniques learn to identify objects in images, but they differ in their execution.

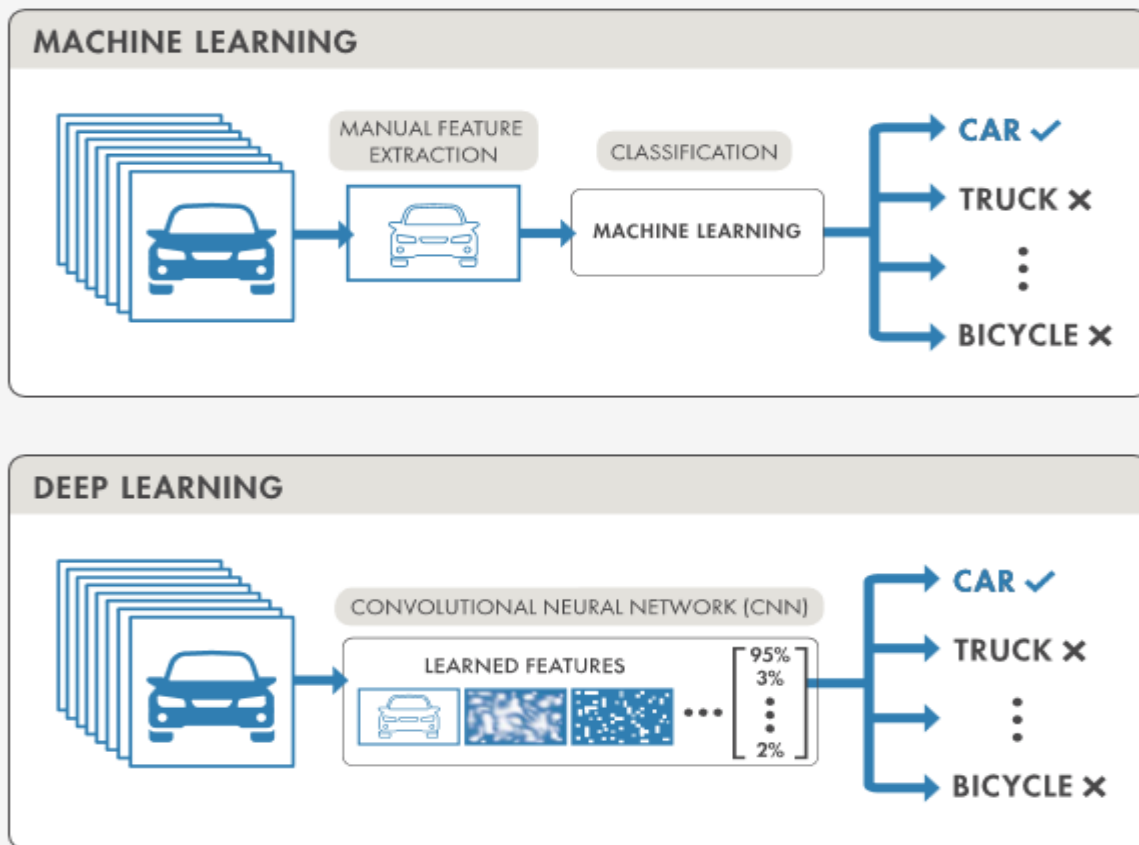


Figure 3: Machine learning and deep learning techniques for object recognition.

### 3. OBJECT RECOGNITION TECHNIQUES

#### 3.1 Object Recognition Using Deep Learning

Deep learning techniques have become a popular method for doing object recognition. Deep learning models such as convolution neural networks, or CNNs, are used to automatically learn an object's inherent features in order to identify that object. For example, a CNN can learn to identify differences between cats and dogs by analyzing thousands of training images and learning the features that make cats and dogs different.

There are two approaches to performing object recognition using deep learning:

- **Training a model from scratch:** To train a deep network from scratch, you gather a very large labeled dataset and design a network architecture that will learn the features and build the model. The results can be impressive, but this approach requires a large amount of training data, and you need to set up the layers and weights in the CNN.

- **Using a pretrained deep learning model:** Most deep learning applications use the transfer learning approach, a process that involves fine-tuning a pretrained model. You start with an existing network, such as Alex Net or GoogLe Net, and feed in new data containing previously unknown classes. This method is less time-consuming and can provide a faster outcome because the model has already been trained on thousands or millions of images.

Deep learning offers a high level of accuracy but requires a large amount of data to make accurate predictions.

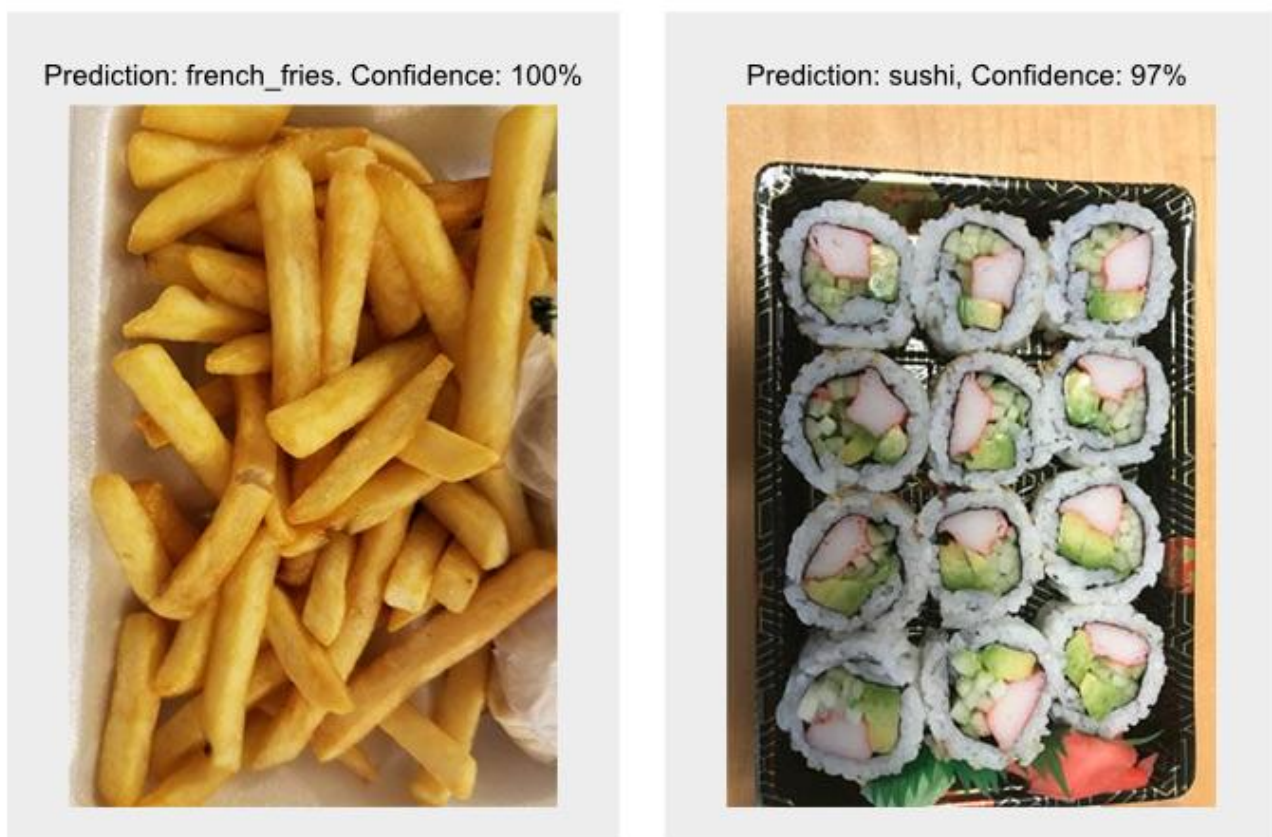


Figure 4: Deep learning application showing object recognition of restaurant food.

### 3.2 Object Recognition Using Machine Learning

Machine learning techniques are also popular for object recognition and offer different approaches than deep learning. Common examples of machine learning techniques are:

- HOG feature extraction with an SVM machine learning model
- Bag-of-words models with features such as SURF and MSER
- The Viola-Jones algorithm, which can be used to recognize a variety of objects, including faces and upper bodies

#### **4. OBJECT RECOGNITION METHODS**

- **Template matching** – which uses a small image, or template, to find matching regions in a larger image
- **Image segmentation and blob analysis** – which uses simple object properties, such as size, color, or shape.

#### **5. OBJECT RECOGNITION WITH MATLAB**

Using MATLAB for object recognition enables you to be successful in less time because it lets you:

##### **1. Use your domain expertise and learn data science with MATLAB:**

You can use MATLAB to learn and gain expertise in the areas of machine learning and deep learning. MATLAB makes learning about these fields practical and accessible. In addition, MATLAB enables domain experts to create object recognition models – instead of handing the task over to data scientists who may not know your industry or application.

##### **2. Use apps to label data and build models:**

MATLAB lets you build machine learning and deep learning models with minimal code.

With the **Classification Learner app**, you can quickly build machine learning models and compare different machine learning algorithms without writing code.

Using the **Image Labeler app**, you can interactively label objects within images and automate ground truth labeling within videos for training and testing deep learning models. This interactive and automated approach can lead to better results in less time.

##### **3. Integrate object recognition in a single workflow:**

MATLAB can unify multiple domains in a single workflow. With MATLAB, you can do your thinking and programming in one environment. It offers tools and functions for deep learning and machine learning, and also for a range of domains that feed into these algorithms, such as robotics, computer vision, and data analytics.

## **6. APPLICATIONS OF OBJECT RECOGNITION**

1. Self-Driving Cars-Self Driving Cars may use Object detection and recognition system to identify pedestrians and cars on the roads and then make the suitable decision in accordance.
2. Face Detection-Another application of Object detection and recognition is Face Detection .e.g.-Facebook recognizes people before they are tagged in images.
3. Medical Science-Object Detection and recognition system may help Medical science to detect diseases. For e.g.-Detecting Tumors and various cancers.
4. Text Recognition-Text recognition deals with recognizing letters/symbols, individual words and series of words. Ex-Recognizing handwriting of a person.
5. Hand Gesture Recognition-Hand Gesture Recognition deals with recognition of hand poses, and sign languages.

## **7. CONCLUSION**

Easy net model is very simple to implement and build. It is unified for object recognition. It generalizes the domains and can be trained easily on full images. It can also consist of object tracking along with detection. Also, acquiring the pertained Dataset PASCAL VOC 2007 made the work easier and hence the model could be implemented on hardware with no interruptions. Different types of identification can be done and multiple objects can be detected by Easy net model. In object, recognition, background subtracting approach has been used when an image is taken from a single camera with a static background. In future, the work can be extended by detecting the moving objects with non-static background.

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