



# Vidyavardhini's College of Engineering & Technology

## Department of Computer Engineering

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**Aim:** To Detecting and Recognizing Objects

**Objective:** : Object Detection and recognition techniques HOG descriptor The Scale issues The location issue Non-maximum (or non-maxima) suppression vector machine people detection

### **Theory :**

Object detection and recognition Techniques

Object detection and recognition are essential tasks in computer vision and image processing. They involve identifying and localizing objects of interest within images or videos. Several techniques and algorithms have been developed to achieve these objectives. In this experiment, we will explore some of these techniques:

**1. HOG Descriptors (Histogram of Oriented Gradients):** - HOG descriptors are a widely used feature extraction method for object detection. They capture the local gradient information of an image by dividing it into small cells and computing gradient histograms for each cell. These histograms represent the intensity and orientation of edges in the image. - HOG descriptors are particularly useful for detecting objects with distinctive texture or shape patterns, such as pedestrians and vehicles.

**2. The Scale Issue:** - Object detection often involves handling objects at different scales. Objects can appear larger or smaller in images depending on their distance from the camera or variations in perspective. Dealing with scale variations is a critical challenge in object detection. **3. The Location Issue:** - Accurately determining the location of objects within an image is another key challenge. Objects can be partially occluded, rotated, or in complex backgrounds. Detecting their precise position is crucial for various applications, including tracking and augmented reality.

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**4.Non-maximum (or Non-maxima) Suppression:** - After detecting potential object candidates in an image, there may be multiple detections for the same object or region. Non-maximum suppression is a post-processing step that eliminates redundant or overlapping detections, retaining only the most confident ones

**5.Support Vector Machines (SVM):** - SVM is a machine learning algorithm used for classification and regression tasks. In object detection, SVM can be employed to classify object candidates as either objects of interest or background. It helps in making decisions about whether a given region contains an object or not



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### Code :

```
import cv2
import numpy as np
from google.colab.patches import cv2_imshow

# Load the image for object detection
image = cv2.imread('/content/Img.jpeg')

# Create a HOG descriptor object
hog = cv2.HOGDescriptor()
hog.setSVMDetector(cv2.HOGDescriptor_getDefaultPeopleDetector())

# Detect people in the image using HOG and SVM
rectangles, weights = hog.detectMultiScale(image)

# Draw rectangles around detected pedestrians
for (x, y, w, h) in rectangles:
    cv2.rectangle(image, (x, y), (x + w, y + h), (0, 255, 0), 2)

# Display the image with detections
cv2_imshow(image)
```

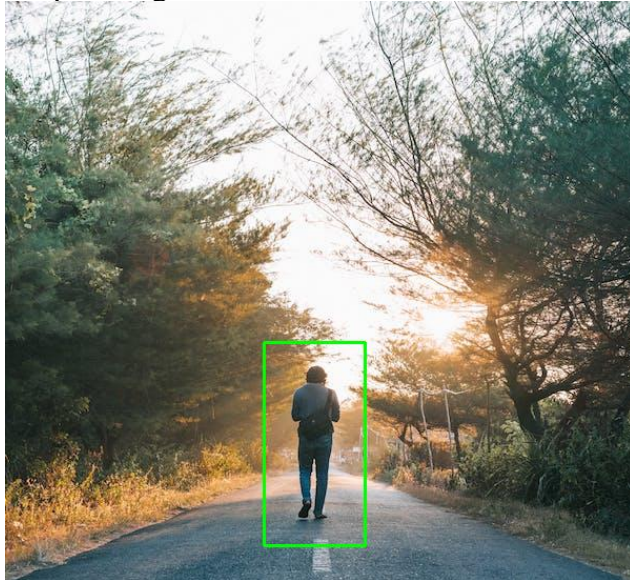
### Output :

Input Image -





Output Image -



### **Conclusion:**

Object detection and recognition are fundamental tasks in computer vision with numerous real-world applications. This experiment introduced techniques like HOG descriptors and addressed challenges related to scale and location. By implementing these techniques, we can detect and recognize objects in images effectively.