Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
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Department of Computer Technology

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: Dream of where you want.	**Mission:** Means to achieve Vision

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

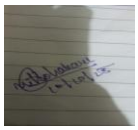
PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
(Signature and Date in Handwritten)

Mithilesh Lohakare



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Session	**2025-26 (ODD)**	**Course Name**	**Computer vision Lab**
Semester	**5**	**Course Code**	**CT**
Roll No	**57**	**Name of Student**	**Mithilesh Lohakare**

Practical Number	**6**
Course Outcome	**Upon successful completion of the course the students will be able to** 1. Apply image enhancement and smoothing techniques to improve image quality for further analysis. 2. Extract meaningful features from images using descriptors such as HOG and SIFT. 3. Implement and evaluate modern object detection methods including YOLO and R-CNN. 4. Analyze and develop solutions for motion estimation, object recognition, and facial expression recognition using classical and learning-based methods.
Aim	Implement R-CNN algorithms for object detection.
Problem Definition	Implement the R-CNN algorithm for object detection to identify and locate multiple objects within an image by drawing bounding boxes and labeling them with their respective classes.
Theory (100 words)	• R-CNN (Region-based Convolutional Neural Network) is an object detection algorithm that combines region proposals with CNN-based feature extraction. It works in three main steps: • Region Proposal: The algorithm first generates around 2000 candidate regions (using selective search) that may contain objects. • Feature Extraction: Each proposed region is passed through a Convolutional Neural Network (CNN) to extract fixed-length feature vectors. • Classification and Localization: The extracted features are then classified using an SVM to determine the object class, and a bounding box regressor refines the position of the detected object.

Procedure and Execution (100 Words)	Algorithm: • Propose Regions: The algorithm first uses Selective Search to scan an image and generate about 2,000 potential bounding boxes, called region proposals, that might contain an object. • Extract Features: Each of these ~2,000 proposals is warped to a fixed size and fed into a pre-trained Convolutional Neural Network (CNN). The CNN processes each region and outputs a feature vector (a numerical summary) that describes its visual content. • Classify Objects: A set of Support Vector Machine (SVM) classifiers (one for each object category like 'person', 'car', etc.) analyzes the feature vector for each region to determine what object, if any, is inside it. • Refine Bounding Boxes: For regions that are classified as an object, a linear regression model makes final adjustments to the bounding box's coordinates to ensure it fits tightly around the detected object.

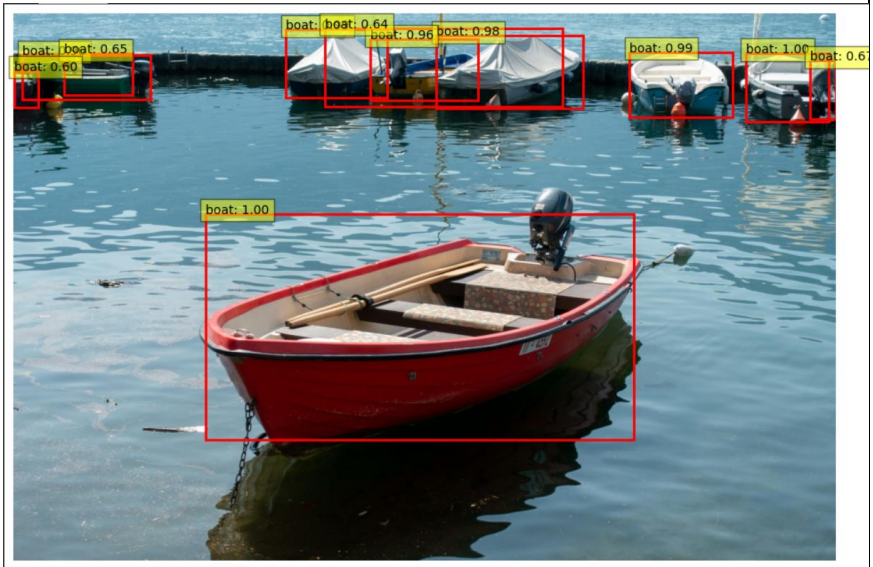
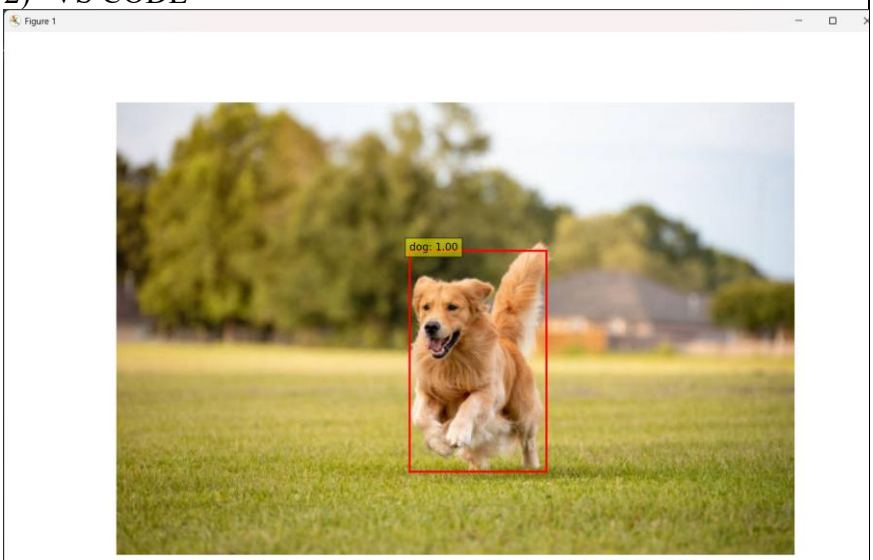
	Code:
	
	import torch
	import torchvision
	from torchvision.models.detection import fasterrcnn_resnet50_fpn
	from torchvision.transforms import functional as F
	from PIL import Image
	import matplotlib.pyplot as plt
	import matplotlib.patches as patches
	from google.colab import files
	
	uploaded = files.upload()
	
	image_path = next(iter(uploaded))
	
	img = Image.open(image_path).convert("RGB")
	
	model = fasterrcnn_resnet50_fpn(pretrained=True)
	model.eval()
	
	img_tensor = F.to_tensor(img)
	
	with torch.no_grad():
	  predictions = model([img_tensor])
	
	def plot_results(img, predictions, threshold=0.5):
	  plt.figure(figsize=(12,8))
	  plt.imshow(img)
	  ax = plt.gca()
	
	  COCO_INSTANCE_CATEGORY_NAMES = [
	  '__background__', 'person', 'bicycle', 'car', 'motorcycle',
	'airplane', 'bus',
	  'train', 'truck', 'boat', 'traffic light', 'fire hydrant', 'N/A', 'stop

```
sign',
        'parking meter', 'bench', 'bird', 'cat', 'dog', 'horse', 'sheep', 'cow',
        'elephant', 'bear', 'zebra', 'giraffe', 'N/A', 'backpack', 'umbrella',
        'N/A', 'N/A', 'handbag', 'tie', 'suitcase', 'frisbee', 'skis',
'snowboard',
        'sports ball', 'kite', 'baseball bat', 'baseball glove', 'skateboard',
        'surfboard', 'tennis racket', 'bottle', 'N/A', 'wine glass', 'cup',
'fork',
        'knife', 'spoon', 'bowl', 'banana', 'apple', 'sandwich', 'orange',
'broccoli',
        'carrot', 'hot dog', 'pizza', 'donut', 'cake', 'chair', 'couch',
        'potted plant', 'bed', 'N/A', 'dining table', 'N/A', 'N/A', 'toilet',
        'N/A', 'tv', 'laptop', 'mouse', 'remote', 'keyboard', 'cell phone',
        'microwave', 'oven', 'toaster', 'sink', 'refrigerator', 'N/A', 'book',
        'clock', 'vase', 'scissors', 'teddy bear', 'hair drier', 'toothbrush'
    ]

    boxes = predictions[0]['boxes']
    labels = predictions[0]['labels']
    scores = predictions[0]['scores']

    for box, label, score in zip(boxes, labels, scores):
        if score >= threshold:
            xmin, ymin, xmax, ymax = box
            rect = patches.Rectangle((xmin, ymin), xmax - xmin, ymax
- ymin,
                                     linewidth=2, edgecolor='r',
facecolor='none')
            ax.add_patch(rect)
            ax.text(xmin, ymin,
f"{COCO_INSTANCE_CATEGORY_NAMES[label]}:
{score:.2f}",
                    bbox=dict(facecolor='yellow', alpha=0.5))
    plt.axis('off')
    plt.show()

# Plot results on your uploaded image
plot_results(img, predictions)
```

	Output: 1) COLAB  2) VS CODE 
Output Analysis	The image shows a golden retriever dog running outdoors on grass. The dog is detected and enclosed in a red bounding box with the label "dog" and a confidence score of 1.00, indicating the object detection model has identified the dog with full confidence. The background is blurred trees and a building, focusing clearly on the running dog. This is output from RCNN algo impementataion.
Link of student Github profile where lab assignment has	https://github.com/mithileshlohakare/CV_Lab

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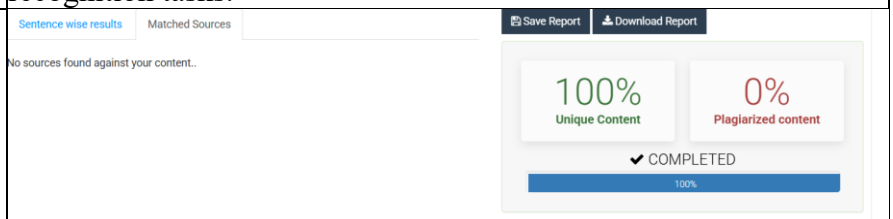
been uploaded	
Conclusion	The conclusion, based on the detected image, is that the object detection algorithm efficiently and accurately identified the presence and position of a dog in the scene, demonstrating high reliability and effectiveness for practical use in similar image recognition tasks.
Plag Report (Similarity index < 12%)	
Date	10/10/2025